Ref. No. IC 22046

Date:27-10-2022

TO WHOMSOEVER IT MAY CONCERN

This is to certify that, Mr. Abin Jacob, son of Mr. Jacob Thomas studying at Musaliar College of Engineering & Technology, Pathanamthitta (B. Tech in Mechanical Engineering) has successfully completed his internship at our project sites and offices from 18/10/2022 to 22/10/2022.

During his internship, he has exposed to the various activities in our construction division. We found him extremely inquisitive and hard working. He was very much interested to learn the functions of our core division and also willing to put his best efforts and get in to the depth of the subject to understand it better.

His association with us was very fruitful and we wish all the best in his future endeavors.

Head - Training & Internships
Armstech Engineers Pvt. Ltd.

Sl.no 14 - Internship — 20pts

Srishti Innovative Computer Systems Pvt. Ltd.

Reg. No.: U72200KL2008PTC021755

1C, 1st Floor, Carnival Technopark, Technopark Campus,
Kazhakkoottam, Thiruvananthapuram- 695581

Certificate

Reg. No: SIAC3239   Date: 10th November 2022

This is to certify that **Mr. Akhil Chandran, Bachelor of Technology in Electronics and Communication Engineering** from **Musaliar College of Engineering & Technology,** has successfully completed his **15 Days Internship in Python** from **Srishti Innovative Computer Systems (P) Ltd., Technopark** for a period from 24th October 2022 to 9th November 2022. During this period, he was systematic, punctual, hardworking and his conduct is good and appreciable.

Monisha H Chandran

Manager

Date:27-10-2022

Ref. No. IC 22051

TO WHOMSOEVER IT MAY CONCERN

This is to certify that, Mr. Albin Aniyan Kunju, son of Mr. Aniyan Kunju studying at Musaliar College of Engineering & Technology, Pathanamthitta (B. Tech in Mechanical Engineering) has successfully completed his internship at our project sites and offices from 18/10/2022 to 22/10/2022.

During his internship, he has exposed to the various activities in our construction division. We found him extremely inquisitive and hard working. He was very much interested to learn the functions of our core division and also willing to put his best efforts and get in to the depth of the subject to understand it better.

His association with us was very fruitful and we wish all the best in his future endeavors.

Head - Training & Internships
Armstech Engineers Pvt. Ltd.

STQC Certification QMS

NABCB QM 034

KELTRON ®

Keltron Equipment Complex	Phone : 0472-2815999
Karakulam - 695 564	Fax : 0472-2888736
Thiruvananthapuram	E-mail : kectraining@keltron.org
KERALA, INDIA	Website : www.keltron.org

KEC/TDC/T/2022/2590/13776

November 10, 2022

CERTIFICATE

This is to certify that Mr. **AMJITH NOUSHAD**, B.Tech (Electronics & Communication Engineering) student, MUSALIAR COLLEGE OF ENGINEERING & TECHNOLOGY, PATHANAMTHITTA, has successfully completed the Internship Training in our **Power Electronics Group (PEG)**, **Fabrication Shop, Transformer Winding, Electro Plating, Tool Room, Security and Surveillance Group (SSG), Special Products Group (SPG), Search and Rescue Beacon (SRB) and Technology Development Centre** of Keltron Equipment Complex, Thiruvananthapuram from 22-10-2022, 25-10-2022 to 29-10-2022, 31-10-2022 to 05-11-2022 and 07-11-2022 to 08-11-2022.

His conduct and character during the period with us were good.

Kerala State Electronics Development Corporation Ltd.
Keltron Equipment Complex
Karakulam
Trivandrum
695 564
★ TDC ★

B Jely

Chief General Manager

armstech
ENGINEERS PRIVATE LIMITED

mail@armstech.in
armstechengrs@gmail.com
www.armstech.in
Tele: 91-484-4066604
91-484-4066605

Ref. No. IC 22047

Date:27-10-2022

TO WHOMSOEVER IT MAY CONCERN

This is to certify that, Mr. Anandu Krishnan U, son of Mr. Unni Krishnan studying at Musaliar College of Engineering & Technology, Pathanamthitta (B. Tech in Mechanical Engineering) has successfully completed his internship at our project sites and offices from 18/10/2022 to 22/10/2022.

During his internship, he has exposed to the various activities in our construction division. We found him extremely inquisitive and hard working. He was very much interested to learn the functions of our core division and also willing to put his best efforts and get in to the depth of the subject to understand it better.

His association with us was very fruitful and we wish all the best in his future endeavors.

2022-23
Sl. no. 14
Internship
20pts

Head - Training & Internships
Armstech Engineers Pvt. Ltd.

Corporate Office
Armstech Tower
Chakkungal Bylane
Palarivattom, Cochin
Kerala, India - 682025

An ISO 9001 certified company

Certificate

Reg No: SIAC3264   Date: 10th November 2022

This is to certify that **Ms. Devika Viswan, Bachelor of Technology in Electronics and Communication Engineering** from **Musaliar College of Engineering & Technology,** has successfully completed her **15 Days Internship** in **Python** from **Srishti Innovative Computer Systems (P) Ltd., Technopark** for a period from 24th October 2022 to 9th November 2022. During this period, she was systematic, punctual, hardworking and her conduct is good and appreciable.

Monisha H Chandran

Manager

armstech
ENGINEERS PRIVATE LIMITED

Ref. No. IC 22048

Date:27-10-2022

TO WHOMSOEVER IT MAY CONCERN

This is to certify that, Mr. Anurag S Kumar, son of Mr. Suresh Kumar studying at Musaliar College of Engineering & Technology, Pathanamthitta (B. Tech in Mechanical Engineering) has successfully completed his internship at our project sites and offices from 18/10/2022 to 22/10/2022.

During his internship, he has exposed to the various activities in our construction division. We found him extremely inquisitive and hard working. He was very much interested to learn the functions of our core division and also willing to put his best efforts and get in to the depth of the subject to understand it better.

His association with us was very fruitful and we wish all the best in his future endeavors.

Head – Training & Internships
Armstech Engineers Pvt. Ltd.

An ISO 9001 certified company

KELTRON®

Keltron Equipment Complex
Karakulam - 695 564
Thiruvananthapuram
KERALA, INDIA

Phone : 0472 - 2815999
Fax : 0472 - 2888736
E-mail : kectraining@keltron.org
Website : www.keltron.org

KEC / TDC / T / 2022 / 2589 / 13770

November 10, 2022

CERTIFICATE

This is to certify that **Mr. ASWIN A, B.Tech** (Electronics & Communication Engineering) student, MUSALIAR COLLEGE OF ENGINEERING & TECHNOLOGY, PATHANAMTHITTA, has successfully completed the Internship Training in our **Power Electronics Group (PEG), Fabrication Shop, Transformer Winding, Electro Plating, Tool Room, Security and Surveillance Group (SSG), Special Products Group (SPG), Search and Rescue Beacon (SRB) and Technology Development Centre** of Keltron Equipment Complex, Thiruvananthapuram from 22-10-2022, 25-10-2022 to 29-10-2022, 31-10-2022 to 05-11-2022 and 07-11-2022 to 08-11-2022.

His conduct and character during the period with us were good.

Chief General Manager

NEXORA

INTERNSHIP TRAINING ACADEMY
AN ISO 9001:2015 CERTIFIED

Certificate of Excellence

To be added

Sl. m. 14

FILE NO : 1830

REG NO : 22NA/INM1017

This is to certify that _____ **BINOY T BENNY** _____ has successfully completed the internship program on the basis **MECHANICAL ENGINEERING** specialised in **PIPING AND PIPELINE ENGINEERING** section of the prime industry **18/10/2022 TO 22/10/2022** and have also been awarded with **EXCELLENT** the conduct and curriculam.
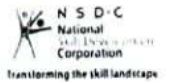
DATE OF ISSUE : **22/10/2022**

AJIMAL SALIM

COURSE COORDINATOR

INTERNSHIP INVIGILATOR

CERTIFICATE

This is to certify that the Project report entitled **"Design and Simulation of High Performance S-band Diplexers for Satellite launch vehicles"** is a bonafide record of the work carried out by **Mr. Akshay K B (Reg No:MCK19EE002), Ms. Muhisina I (Reg No:MCK19EE009), Mr. Rahul R (Reg No:MCK19EE010),** final year students of **Musaliar College of Engineering and Technology, Pathanamthitta** in partial fulfillment of the requirements for the award of B. Tech Degree in Electrical and Electronics Engineering from APJ Abdul Kalam Technological University (KTU) under my guidance and supervision at **Vikram Sarabhai Space Centre, Indian Space Research Organization,** Thiruvananthapuram during the period from 16-11-2022 to 31-12-2022.

Thiruvananthapuram
18-05-2023

Sajichandrachood O M
Scientist/Engineer-SF
ADD/RFSG/AVN
VSSC

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
MUSALIAR COLLEGE OF ENGINEERING AND TECHNOLOGY, PATHANAMTHITTA

CERTIFICATE

This is to certify that the report entitled **"Design and Simulation of High Performance S-Band Diplexers For Satellite Launch Vehicle"** submitted by **RAHUL R (MCK19EE010)** to the APJ Abdul Kalam Technological University in partial fulfillment of the requirements for the award of the Degree of Bachelor of Technology in Electrical and Electronics Engineering is a bonafide record of the project work carried out by him under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

Guide

Prof. Nizamoni S

Assistant Professor

Dept. of EEE

Project Co-ordinator

Prof. Sreerenjini K

Associate Professor

Dept. of EEE

Head of the Department

Prof. Sarath Raj S

Head of the Department

Dept. of EEE

2706-23
Anish J J
(External)

DEPARTMENT OF ELECRTICAL AND ELECTRONICS ENGINEERING

MUSALIAR COLLEGE OF ENGINEERING AND TECHNOLOGY,

PATHANAMTHITTA

CERTIFICATE

This is to certify that the report entitled "REDUCTION OF HARMONICS ON SOURCE SIDE USING ACTIVE FILTERS IN EV CHARGING APPLICATIONS" submitted by MUHISINA I(MCK19EE009) to the APJ Abdul Kalam Technological University in partial fulfillment of the requirements for the award of the Degree of Bachelor of Technology in Electrical and Electronics Engineering is a bonafide record of the seminar work carried out by her under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

Guide

Prof. Ciya Paulose

Assistant Professor

Dept. of EEE

Seminar Co-ordinator

Prof. Sarath Raj S

Head of the Department

Dept. of EEE

Head of the Department

Sarath RA. S
HOD
Dept. of Electrical and
Electronics Engineering

DEPARTMENT OF ELECRTICAL AND ELECTRONICS ENGINEERING

MUSALIAR COLLEGE OF ENGINEERING AND TECHNOLOGY,

PATHANAMTHITTA

CERTIFICATE

This is to certify that the report entitled **"Design and Simulation of High Performance S-Band Diplexers For Satellite Launch Vehicle"** submitted by **AKSHAY K B(MCK19EE002)** to the APJ Abdul Kalam Technological University in partial fulfillment of the requirements for the award of the Degree of Bachelor of Technology in Electrical and Electronics Engineering is a bonafide record of the project work carried out by him under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

Guide	Project Co-ordinator	Head of the Department
Prof. Nizamoni S	Prof. Sreerenjini K	Prof. Sarath Raj S
Assistant Professor	Associate Professor	Head of the Department
Dept. of EEE	Dept. of EEE	Dept. of EEE

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

MUSALIAR COLLEGE OF ENGINEERING AND TECHNOLOGY

PATHANAMTHITTA, KERALA- 689653

CERTIFICATE

This is to certify that the report entitled **"CONVERSION OF AN OLD IC ENGINE VEHICLE TO AN ELECTRIC VEHICLE"**, submitted by **AJMAL M A (MCK19EE001), ARCHA GOPAN (MCK19EE003), BIBIN VARGHESE (MCK19EE004), PRANAV P R(LMCK19EE018)** to the APJ Abdul Kalam Technological University in partial fulfillment of the requirements for the award of the Degree of Bachelor of Technology in Electrical and Electronics Engineering is a bonafide record of the project work carried out by them under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

Project guide   Project coordinator   Head of the Department

Prof. RENUKADEVI S M   Prof. SREERENJINI K   Prof. SARATH RAJ S

Associate Professor   Associate Professor   Head of the Department

Dept. of EEE   Dept. of EEE   Dept. of EEE

27-06-23

Anish S S
AP, EEE
(External)

Scanned with CamScanner

GREEN BUILDING:A PROPOSAL TO PATHANAMTHITTA MUNICIPALITY OFFICE FOR EFFICIENT ENERGY UTILIZATION AND HARVESTING

PROJECT REPORT

submitted by

BRINEEV CHERIAN(MCK19EE005)
JUSTIN JOSHUA(MCK19EE008)
SHIJO ABRAHAM VARGHESE(MCK19EE012)
VAISHNAV N(MCK19EE013)

to

the APJ Abdul Kalam Technological University

in partial fulfillment of the requirements for the award of the Degree

of

Bachelor of Technology

In

Electrical and Electronics Engineering

Department Of Electrical And Electronics Engineering

Musaliar College Of Engineering And Technology
Pathanamthitta, Kerala 689653

January 2023

DEPARTMENT OF ELECRTICAL AND ELECTRONICS ENGINEERING

MUSALIAR COLLEGE OF ENGINEERING AND TECHNOLOGY,

PATHANAMTHITTA

CERTIFICATE

This is to certify that the report entitled "Green Building: A Proposal to Pathanamthitta Municipality Office for Efficient Energy Utilization and Harvesting" submitted by JUSTIN JOSHUA (MCK19EE008) to the APJ Abdul Kalam Technological University in partial fulfillment of the requirements for the award of the Degree of Bachelor of Technology in Electrical and Electronics Engineering is a bonafide record of the project work carried out by them under our guidance and supervision.. This report in any form has not been submitted to any other University or Institute for any purpose.

Guide	Project Co-ordinator	Head of the Department
Prof. CIYA PAULOSE	Prof. SREERENJINI K	Prof. SARATH RAJ S
Assistant Professor	Associate Professor	Head of the Department
Dept. of EEE	Dept. of EEE	Dept. of EEE

LEAF-SWEEPING ROBOT

PROJECT REPORT

submitted by

AKHIL RAJ S (LMCK19EE014)

AMAL PRASANNAN (LMCK19EE015)

JERIL JOSE (LMCK19EE016)

JOBY SHAJI (MCK19EE007)

to

the APJ Abdul Kalam Technological University

in partial fulfillment of the requirements for the award of the Degree

of

Bachelor of Technology

In

Electrical and Electronics Engineering

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Musaliar College of Engineering and Technology

Pathanamthitta, Kerala 689653

January 2022

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

MUSALIAR COLLEGE OF ENGINEERING AND TECHNOLOGY,

PATHANAMTHITTA

CERTIFICATE

This is to certify that the report entitled "LEAF-SWEEPING ROBOT" submitted by JOBY SHAJI (MCK19EE007) to the APJ Abdul Kalam Technological University in partial fulfillment of the requirement for the Award of Degree of Bachelor of Technology in Electrical and Electronics Engineering is a bonafide record of the project work carried out by our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

Guide   Project Co-ordinator   Head of The Department

Prof. Blessy A Rahiman   Prof. Sreerenjini K   Prof. Sarath Raj S

Assistant professor   Associate Professor   Head of the Department

Dept. of EEE   Dept. of EEE   Dept. of EEE

Certificate

Reg No: SIAC3264

Date: 10th November 2022

This is to certify that Ms. **Devika Viswan**, **Bachelor of Technology in Electronics and Communication Engineering** from **Musaliar College of Engineering & Technology**, has successfully completed her **15 Days Internship** in **Python** from **Srishti Innovative Computer Systems (P) Ltd., Technopark** for a period from 24th October 2022 to 9th November 2022. During this period, she was systematic, punctual, hardworking and her conduct is good and appreciable.

Monisha H Chandran
Manager

Certificate

Reg. No: SIAC3267

Date: 10th November 2022

This is to certify that **Ms. Anju Varghese, Bachelor of Technology in Electronics and Communication Engineering** from *Musaliar College of Engineering & Technology*, has successfully completed her **15 Days Internship** in **Python** from *Srishti Innovative Computer Systems (P) Ltd., Technopark* for a period from 24th October 2022 to 9th November 2022. During this period, she was systematic, punctual, hardworking and her conduct is good and appreciable.

Monisha H Chandran

Manager

Certificate

Reg. No: SIAC3263

Date: 10th November 2022

This is to certify that **Mr. Bibin Binu, Bachelor of Technology in Electronics and Communication Engineering** from **Musaliar College of Engineering & Technology,** has successfully completed his **15 Days Internship** in **Python** from **Srishti Innovative Computer Systems (P) Ltd.,** Technopark for a period from 24th October 2022 to 9th November 2022. During this period, he was systematic, punctual, hardworking and his conduct is good and appreciable.

Monisha H Chandran

Manager

CERTIFICATE

This is to certify that **Mr. ARJUN A NAIR B.Tech**(ECE) student of **MUSALIAR COLLEGE OF ENGINEERING & TECHNOLOGY, Pathanamthitta, Kerala Pin-689,653** has successfully completed his 14 days *Internship program* from 09.11.2021 to 24.11.2021 in **KELTRON CONTROLS, AROOR, A division of *Kerala State Electronics Development Corporation Limited (K.S.E.D.C.),*** in partial fulfillment of his **Bachelor Degree of Technology in Electronics and Communication Engineering** studies.

He has undergone his study in our various Strategic Business Units (SBU) (1) Control & Instrumentation Group (CIG), (2) Strategic Services Group (STSG), (3) Pneumatic Business Group (PNG), (4) Information Technology & Coastal Security Services group (ITG & CSSG) & Common Services Groups (CSG) like Mechanical, Electronics and Fabrication Assembly Shops and Quality Assurance Department (QA).

We wish all success in his future endeavor.

ANIL KUMAR K.V
GENERAL MANAGER

29.11.2021

Email:kelkca@keltron.org

Benoy Peter - Training Co.ordinator

RINA Member of CISQ Federation
ISO 9001 Certified Quality System

KELTRON

CERTIFICATE

This is to certify that **Mr. MOOSA ABDULLA B.Tech**(ECE) student of **MUSALIAR COLLEGE OF ENGINEERING & TECHNOLOGY**, Pathanamthitta, Kerala Pin-689,653 has successfully completed his 14 days *Internship program* from 09.11.2021 to 24.11.2021 in **KELTRON CONTROLS, AROOR,** A division of *Kerala State Electronics Development Corporation Limited (K.S.E.D.C.)*, in partial fulfillment of his **Bachelor Degree of Technology in Electronics and Communication Engineering** studies.

He has undergone his study in our various Strategic Business Units (SBU) (1) Control & Instrumentation Group (CIG), (2) Strategic Services Group (STSG), (3) Pneumatic Business Group (PNG), (4) Information Technology & Coastal Security Services group (ITG & CSSG) & Common Services Groups (CSG) like Mechanical, Electronics and Fabrication Assembly Shops and Quality Assurance Department (QA).

We wish all success in his future endeavor.

ANIL KUMAR K.V
GENERAL MANAGER

29.11.2021

Email:kelkca@keltron.org

Benoy Peter - Training Co.ordinator

Regd. Office : KELTRON HOUSE, VELLAYAMBALAM, THIRUVANANTHAPURAM - 695 033, website : www.keltron.org

CERTIFICATE

This is to certify that **Ms. GAYATHRI M   B.Tech**(ECE) student of **MUSALIAR COLLEGE OF ENGINEERING & TECHNOLOGY**, Pathanamthitta, Kerala Pin-689,653 has successfully completed her 14 days *Internship program*   from 09.11.2021 to 24.11.2021 in **KELTRON CONTROLS, AROOR, A division of *Kerala State Electronics Development Corporation Limited (K.S.E.D.C.)*,** in partial fulfillment of her **Bachelor Degree of Technology in Electronics and Communication Engineering** studies.

She has undergone her study in our various Strategic Business Units (SBU) (1) Control & Instrumentation Group (CIG), (2) Strategic Services Group (STSG), (3) Pneumatic Business Group (PNG), (4) Information Technology & Coastal Security Services group (ITG & CSSG) & Common Services Groups (CSG) like Mechanical, Electronics and Fabrication Assembly Shops and Quality Assurance Department (QA).

We wish all success in her future endeavor.

ANIL KUMAR K.V
GENERAL MANAGER

29.11.2021

Email:kelkca@keltron.org

Benoy Peter - Training Co ordinator

CERTIFICATE

This is to certify that **Mr. ASIF MALIK B.Tech**(ECE) student of **MUSALIAR COLLEGE OF ENGINEERING & TECHNOLOGY, Pathanamthitta, Kerala Pin-689653** has successfully completed his 14 days *Internship program* from 09.11.2021 to 24.11.2021 in **KELTRON CONTROLS, AROOR, A division of** *Kerala State Electronics Development Corporation Limited (K.S.E.D.C.),* in partial fulfillment of his **Bachelor Degree of Technology in Electronics and Communication Engineering** studies.

He has undergone his study in our various Strategic Business Units (SBU) (1) Control & Instrumentation Group (CIG), (2) Strategic Services Group (STSG), (3) Pneumatic Business Group (PNG), (4) Information Technology & Coastal Security Services group (ITG & CSSG) & Common Services Groups (CSG) like Mechanical, Electronics and Fabrication Assembly Shops and Quality Assurance Department (QA).

We wish all success in his future endeavor.

ANIL KUMAR K.V
GENERAL MANAGER

29.11.2021

Email:kelkca@keltron.org

Benoy Peter - Training Co.ordinator

KERALA STATE ELECTRONICS DEVELOPMENT CORPORATION LTD.
(A Government of Kerala Undertaking)

ᴋᴇKELTRON®

KELTRON CONTROLS
Aroor P.O, Alappuzha District
Kerala, India, Pin : 688 534
E-mail : kelkca@ketron.org

Phone :
+91 478 2830700
+91 478 2872323 - 4 (2 Lines)
Fax : +91 478 2872322

CERTIFICATE

This is to certify that **Mr. BITHIN JOHNSON BIJOY B.Tech**(ECE) student of **MUSALIAR COLLEGE OF ENGINEERING & TECHNOLOGY, Pathanamthitta, Kerala Pin-689,653** has successfully completed his 14 days *Internship program* from 09.11.2021 to 24.11.2021 in **KELTRON CONTROLS, AROOR, A division of *Kerala State Electronics Development Corporation Limited(K.S.E.D.C.),*** in partial fulfillment of his **Bachelor Degree of Technology in Electronics and Communication Engineering** studies.

He has undergone his study in our various Strategic Business Units (SBU) (1) Control & Instrumentation Group (CIG), (2) Strategic Services Group (STSG), (3) Pneumatic Business Group (PNG), (4) Information Technology & Coastal Security Services group (ITG & CSSG) & Common Services Groups (CSG) like Mechanical, Electronics and Fabrication Assembly Shops and Quality Assurance Department (QA).

We wish all success in his future endeavor.

ANIL KUMAR K.V
GENERAL MANAGER

29.11.2021

Email:kelkca@keltron.org

Benoy Peter - Training Co.ordinator

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

(A State Government University)

Upon the recommendation of

the Board of Governors hereby confers

the Degree of

Bachelor of Technology

in

Electronics and Communication Engineering

on

DHANA MADHU

having fulfilled the requirements as prescribed under the regulations

at the examination held in

June 2019

Given under the seal of the University, this day, the 26th of November 2019

Register Number: MCK15EC018

Cumulative Grade Point Average(CGPA): 7.75

Vice-Chancellor

Thiruvananthapuram
Kerala, India

0114934

ar/\stech
ENGINEERS PRIVATE LIMITED

mail@armstech.in
armstechengrs@gmail.com
www.armstech.in
Tele: 91-484-4066604
91-484-4066605

Ref. No. IC 22050

Date:27-10-2022

TO WHOMSOEVER IT MAY CONCERN

This is to certify that, Mr. Hassan Ibrahim, son of Mr. Abdul Majeed studying at Musaliar College of Engineering & Technology, Pathanamthitta (B. Tech in Mechanical Engineering) has successfully completed his internship at our project sites and offices from 18/10/2022 to 22/10/2022.

During his internship, he has exposed to the various activities in our construction division. We found him extremely inquisitive and hard working. He was very much interested to learn the functions of our core division and also willing to put his best efforts and get in to the depth of the subject to understand it better.

His association with us was very fruitful and we wish all the best in his future endeavors.

Head - Training & Internships
Armstech Engineers Pvt. Ltd.

Corporate Office
Armstech Tower
Chakkungal Bylane
Palarivattom, Cochin
Kerala, India - 682025

An ISO 9001 certified company

Department of Civil Engineering
Internship details of S6 CE-CE 2020-2024 Batch
During Vacation (May 2023

Sl. No.	Register Number	Name	Company name with Place	Date of intership- (Starting date)	date of intership- (End Date)	Duration
1	MCK20CE001	ABEY JOSE	Raaji Mathew and company, pala	16/05/2023	31/05/2023	14
2	MCK20CE002	ABHIJITH UTHAMAN	Raaji Mathew and company, pala	16/05/2023	31/05/2023	14
3	MCK20CE004	AKASH A B				
5	MCK20CE006	ANANDHU HARI	Raaji Mathew and company, pala	16/05/2023	31/05/2023	14
6	MCK20CE008	ARIF MUHAMMED	Raaji Mathew and company, pala	16/05/2023	31/05/2023	14
7	MCK20CE009	ARYA AJITH	Neema Builders	17/05/23	31/05/23	15
8	MCK20CE010	ASHHAD NAZAR				
9	MCK20CE011	ASHNA SHAHUL	TECHMAGHI	16/05/2023	21/05/2033	7
10	MCK20CE012	ASWIN ASHOKAN				
11	MCK20CE014	BADHUSHA BADARUDEEN	A R construction pathanapuram	15/05/2023	24/05/2023	10
12	MCK20CE015	DEVADUTH U				
13	MCK20CE016	ELIAS JITHIN VARGHESE	Raaji Mathew and company, pala	16/05/2023	31/05/2023	14
14	MCK20CE017	FATHIMA NAVAS				
15	MCK20CE018	FEBA SARA GEORGE	TECHMAGHI	16/05/2023	21/05/2023	7
16	MCK20CE019	GOURI M	Neema Builders	17/05/23	31/05/23	15
17	MCK20CE020	HRUDYA SABU				
18	MCK20CE021	JINTO THOMAS	A R constructions pathanapuram	15/05/2023	24/05/2023	10
19	MCK20CE022	JOE S YOHANNAN	TECHMAGHI	16 / 05 /2023	21/05/2023	7
20	MCK20CE023	KIRAN KRISHNAN	Raaji Mathew and company, pala	16/05/2023	31/05/2023	14
21	MCK20CE024	MERINA	TECHMAGHI	16/05/2023	21/05/2023	7
22	MCK20CE025	MIDHUN M	Raaji Mathew and company, pala	16/05/2023	31/05/2023	14
23	MCK20CE026	MOHAMMED SAIFUDEEN S	A R construction pathanapuram	15/05/2023	24/05/2023	10
24	MCK20CE027	RAMZANA R	SAS surveyors&Engineers	16/05/2023	28/05/2023	13
25	MCK20CE028	REVATHI SAJEEV	TECHMAGHI	16 /05/2023	21/05/2023	7
26	MCK20CE029	RIZWAN RAHIM	A R construction pathanapuram	15/05/2023	24/05/2023	10
27	MCK20CE030	SACHU ABHILASH	TECHMAGHI	16/05/2023	21/05/2023	7
28	MCK20CE031	SARATH KUMAR S				
29	MCK20CE032	SHABANA BASHEER	TECHMAGHI	16/05/2023	21/05/2023	7
30	MCK20CE033	SHAN S	TECHMAGHI	16/05/2023	21/05/2023	7
31	MCK20CE034	SHINAZ SHAJI	Raaji Mathew and company, pala	16/05/2023	31/05/2023	14
32	MCK20CE035	SREEJITH T S				
33	MCK20CE036	SUJITH OMANAKUTTAN	TECHMAGHI	16/05/2023	21/05/2023	7
34	MCK20CE037	VIDYA SAGAR	TECHMAGHI	16/05/2023	21/05/2023	7
35	MCK20CE038	V S NAVEEN	A R construction pathanapuram	15/05/2023	24/05/2023	10
36	LMCK20CEO40	RAHUL R	TECHMAGHI	16/05/2023	21/05/2023	7

RMC **Raji Mathew & Co.**
Engineers and Highway Contractors

31/05/2023

INTERNSHIP CERTIFICATE

TO WHOM IT MAY CONCERN

This is to certify that Mr. ABEY JOSE (B-TECH Civil Engineering) student of MUSALIAR COLLEGE OF ENGINEERING & TECHNOLOGY, PATHANAMTHITTA has undergone training under this section from 16/05/2023 to 31/05/2023. He has attended the maintenance works of the project "Rehabilitation and Upgradation of Mallappally, Komalam Paduthodu Kalloopara Chengaroor Komalam Kavungaprayar Pattakala, TMV road Pavement work (Rigid &Flexible) culvert , Retaining wall and Irish Drain and has also done office works during these days. It is also certified that his character and conduct are good.

We wish him all success in his future endeavours.

For Raji Mathew & Co.

Authorised Signatory

RMC
Raji Mathew & Co.
Engineers and Highway Contractors

31/05/2023

INTERNSHIP CERTIFICATE

TO WHOM IT MAY CONCERN

This is to certify that Mr. ABHIJITH UTHAMAN (B-TECH Civil Engineering) student of MUSALIAR COLLEGE OF ENGINEERING & TECHNOLOGY, PATHANAMTHITTA has undergone training under this section from 16/05/2023 to 31/05/2023. He has attended the maintenance works of the project "Rehabilitation and Upgradation of Mallappally, Komalam Paduthodu Kalloopara Chengaroor Komalam Kavungaprayar Pattakala, TMV road Pavement work (Rigid &Flexible) culvert , Retaining wall and Irish Drain and has also done office works during these days. It is also certified that his character and conduct are good.

We wish him all success in his future endeavours.

For Raji Mathew & Co.

Authorised Signatory

[Seal: RAJI MATHEW & CO., Kottayam Dist Pin-686 578, Pamplaniyil Bharananganam]

RMC
Raji Mathew & Co.
Engineers and Highway Contractors

31/05/2023

INTERNSHIP CERTIFICATE

TO WHOM IT MAY CONCERN

This is to certify that Mr. ANANDHU HARI (B-TECH Civil Engineering) student of MUSALIAR COLLEGE OF ENGINEERING & TECHNOLOGY, PATHANAMTHITTA has undergone training under this section from 16/05/2023 to 31/05/2023. He has attended the maintenance works of the project "Rehabilitation and Upgradation of Mallappally, Komalam Paduthodu Kalloopara Chengaroor Komalam Kavungaprayar Pattakala, TMV road Pavement work (Rigid &Flexible) culvert , Retaining wall and Irish Drain and has also done office works during these days. It is also certified that his character and conduct are good.

We wish him all success in his future endeavours.

For Raji Mathew & Co.

Authorised Signatory

Raji Mathew & Co.
RMC
Engineers and Highway Contractors

31/05/2023

INTERNSHIP CERTIFICATE

TO WHOM IT MAY CONCERN

This is to certify that Mr. ARIF MUHAMMED (B-TECH Civil Engineering) student of MUSALIAR COLLEGE OF ENGINEERING & TECHNOLOGY, PATHANAMTHITTA has undergone training under this section from 16/05/2023 to 31/05/2023. He has attended the maintenance works of the project "Rehabilitation and Upgradation of Mallappally, Komalam Paduthodu Kalloopara Chengaroor Komalam Kavungaprayar Pattakala, TMV road Pavement work (Rigid &Flexible) culvert, Retaining wall and Irish Drain and has also done office works during these days. It is also certified that his character and conduct are good.

We wish him all success in his future endeavours.

For Raji Mathew & Co.

Authorised Signatory

Vysyamparambil Complex
Near Bishop's House, Pala- 689 575
Kottayam (Dist)
04822-213877 9447113877

1st Floor Assissi Arcade,
Bharananganam - 686 578
Pala, Kottayam (Dist)
04822-236400

GSTIN: 32AAHFR8487P1ZB

Pamplaniyil
Bharananganam- 686 578
Pala, Kottayam (Dist)
rajimathew.co@gmail.com

NEEMA BUILDERS
Engineers & Contractors

1st Floor
Mar Philoxenos Memorial Buildings
Near KSRTC Bus Stand,
Pathanamthitta - 689 645
Ph : 0468 - 2222536, 2227635
Email:neemapta@gmail.com

09.06.2023

TO WHOM SOEVER IT MAY CONCERN

This is to certify that Miss. **ARYA AJITH (Reg No. MCK20CE009)** a 6th Semester Civil Engineering student of Musaliar College of Engineering and Technology, Malayalapuzha has undergone in house training in our organization for the period starting from 17.05.2023 to 31.05.2023. During this period she has familiarized herself with the construction of framed structure including handling of structural drawings.

She was found to be studious, enthusiastic and hard working during the period of training in our organization.

I wish her all the best.

For NEEMA BUILDERS

MANAGING PARTNER

INTD23012

 TECHMAGHI

C E R T I F I C A T E

This is to certify that

ASHNA SHAHUL

of

MUSALIAR COLLEGE OF ENGINEERING AND TECHNOLOGY PATHANAMTHITTA

has successfully completed a 7 day internship in the field of Interior Design from 16th May 2023 to 21st May 2023. During this period she got exposed to industry relevant softwares like AutoCAD, SketchUp and actively participated in hands-on exercises.

25-05-2023

Date

Deepak Rajan
Founder & CEO
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A R CONSTRUCTIONS

Pathanapuram, Kollam, Kerala - 689 695
Tel: 9037555885, 0475 2851829

Date : 26/05/2023

CERTIFICATE

This is to certify that Mr Badhusha Badarudeen 6th semester Civil Engineering student of Musaliar College of Engineering & Technology, Pathanamthitta has undergone training under this section from 15/05/2023 to 24/05/2023. He has attended the work of the project PWD(Roads) - RM 2022-23/Cluster 2/One Year RC /Pathanapuram /KLM-RM 2022-23 Zone 2-One Year Running Contract for Various PWD Roads Under Roads Section Pathanapuram in Kollam District. His approach towards internship programme was very enthusiastic. During this period we found him sincere and hardworking.

We wish best wishes and success in his future carrier

For AR Constructions

Authorised Signatory

Proprietor: **Afsal R**
Govt. Contractor
Reg.No:PWD/CIVIL/885/2022-2023

Email: afzalzera@gmail.com

RMC **Raji Mathew & Co.**
Engineers and Highway Contractors

31/05/2023

INTERNSHIP CERTIFICATE

TO WHOM IT MAY CONCERN

This is to certify that Mr. ELIAS JITHIN VARGHESE (B-TECH Civil Engineering) student of MUSALIAR COLLEGE OF ENGINEERING & TECHNOLOGY, PATHANAMTHITTA has undergone training under this section from 16/05/2023 to 31/05/2023. He has attended the maintenance works of the project "Rehabilitation and Upgradation of Mallappally, Komalam Paduthodu Kalloopara Chengaroor Komalam Kavungaprayar Pattakala, TMV road Pavement work (Rigid &Flexible) culvert , Retaining wall and Irish Drain and has also done office works during these days. It is also certified that his character and conduct are good.

We wish him all success in his future endeavours.

For Raji Mathew & Co.

Authorised Signatory

INTD23024

 TECHMAGHI

CERTIFICATE

This is to certify that

FEBA SARA GEORGE

of

MUSALIAR COLLEGE OF ENGINEERING AND TECHNOLOGY PATHANAMTHITTA

has successfully completed a 7 day internship in the field of Interior Design from 16th May 2023 to 21st May 2023. During this period she got exposed to industry relevant softwares like AutoCAD, SketchUp and actively participated in hands-on exercises.

25-05-2023

Date

Deepak Rajan
Founder & CEO
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Engineers & Contractors

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Mar Philoxenos Memorial Buildings
Near KSRTC Bus Stand,
Pathanamthitta - 689 645
Ph : 0468 - 2222536, 2227635
Email:neemapta@gmail.com

09.06.2023

TO WHOM SOEVER IT MAY CONCERN

This is to certify that Miss. GOURI .M. (Reg No. MCK20CE019) a 6th Semester Civil Engineering student of Musaliar College of Engineering and Technology, Malayalapuzha has undergone in house training in our organization for the period starting from 17.05.2023 to 31.05.2023. During this period she has familiarized herself with the construction of framed structure including handling of structural drawings.

She was found to be studious, enthusiastic and hard working during the period of training in our organization.

I wish her all the best.

For NEEMA BUILDERS

MANAGING PARTNER

Date : 26/05/2023

CERTIFICATE

This is to certify that Mr Jinto Thomas 6th semester Civil Engineering student of Musaliar College of Engineering &Technology,Pathanamthitta has undergone training under this section from 15/05/2023 to 24/05/2023.   He has attended the work of the project PWD(Roads) - RM 2022-23/Cluster 2/One Year RC / Pathanapuram / KLM-RM 2022-23 Zone 2-One Year Running Contract for Various PWD Roads Under Roads Section Pathanapuram in Kollam District. His approach towards internship programme was very enthusiastic. During this period we found him sincere and hardworking.

We wish best wishes and success in his future carrier

For AR Constructions

Authorised Signatory

INTD23069

CERTIFICATE

TECHMAGHI

This is to certify that

JOE S YOHANNAN

of

MUSALIAR COLLEGE OF ENGINEERING AND TECHNOLOGY PATHANAMTHITTA

has successfully completed a 7 day internship in the field of **Interior Design** from 16th May 2023 to 21st May 2023. During this period he got exposed to industry relevant softwares like AutoCAD, SketchUp and actively participated in hands-on exercises.

25-05-2023
Date

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RMC Raji Mathew & Co.
Engineers and Highway Contractors

31/05/2023

INTERNSHIP CERTIFICATE

TO WHOM IT MAY CONCERN

This is to certify that Mr. KIRAN KRISHNAN (B-TECH Civil Engineering) student of MUSALIAR COLLEGE OF ENGINEERING & TECHNOLOGY, PATHANAMTHITTA has undergone training under this section from 16/05/2023 to 31/05/2023. He has attended the maintenance works of the project "Rehabilitation and Upgradation of Mallappally, Komalam Paduthodu Kalloopara Chengaroor Komalam Kavungaprayar Pattakala, TMV road Pavement work (Rigid &Flexible) culvert , Retaining wall and Irish Drain and has also done office works during these days. It is also certified that his character and conduct are good.

We wish him all success in his future endeavours.

For Raji Mathew & Co.

Authorised Signatory

TECHMAGHI

CERTIFICATE

This is to certify that

MERINA KUNJUMON

of

MUSALIAR COLLEGE OF ENGINEERING AND TECHNOLOGY PATHANAMTHITTA

has successfully completed a 7 day internship in the field of Interior Design from 16th May 2023 to 21st May 2023. During this period she got exposed to industry relevant softwares like AutoCAD, SketchUp and actively participated in hands-on exercises.

25-05-2023

Date

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INTERNSHIP CERTIFICATE

TO WHOM IT MAY CONCERN

This is to certify that Mr. MITHUN M (B-TECH Civil Engineering) student of MUSALIAR COLLEGE OF ENGINEERING & TECHNOLOGY, PATHANAMTHITTA has undergone training under this section from 16/05/2023 to 31/05/2023. He has attended the maintenance works of the project "Rehabilitation and Upgradation of Mallappally, Komalam Paduthodu Kalloopara Chengaroor Komalam Kavungaprayar Pattakala, TMV road Pavement work (Rigid &Flexible) culvert , Retaining wall and Irish Drain and has also done office works during these days. It is also certified that his character and conduct are good.

We wish him all success in his future endeavours.

For Raji Mathew & Co.

Authorised Signatory

[Seal: RAJI MATHEW & CO. Kottayam Dist Pin-686 578 Pamplaniyil Bharananganam]

Date : 26/05/2023

CERTIFICATE

This is to certify that Mr Mohammed Saifudeen s 6th semester Civil Engineering student of Musaliar College of Engineering & Technology, Pathanamthitta has undergone training under this section from 15/05/2023 to 24/05/2023. He has attended the work of the project PWD(Roads) - RM 2022-23/Cluster 2/One Year RC / Pathanapram / KLM-RM 2022-23 Zone 2-One Year Running Contract for Various PWD Roads Under Roads Section Pathanapuram in Kollam District. His approach towards internship programme was very enthusiastic. During this period we found him sincere and hardworking.

We wish best wishes and success in his future carrier

For AR Constructions

Authorised Signatory

S.A.S SURVEYORS & ENGINEERS

KAITHAVANAYIL BUILDING, 1ˢᵗ FLOOR, OPP. INDIAN OIL PETROL PUMP
THAMARAKKULAM, ALAPPUZHA. PIN : 690 530
Ph : 9747081645, 9072792516 e-mail : sasliju@gmail.com

INTERNSHIP CERTIFICATE

TO WHOM IT MAY CONCERN

This is to certify that Miss.**RAMZANA R** (B -TECH Civil Engineering) Student of MUSALIAR COLLEGE OF ENGINEERING & TECHNOLOGY , PATHANAMTHITTA . She has undergone training under **TOTAL STATION ,LEVELLING, DGPS & AUTO CAD** from 16/05/2023 to 28/05/2023. She has attended the maintenance work of the project "Ezhamkulam Kaipattoor Road , MC Road" and has also done office works during these days.It is also certified that her character and conduct are good.

We wish her all success in her future endeavours

For SAS Surveyors & Engineers

Authorised Signatory

TECHMAGHI

CERTIFICATE

This is to certify that

REVATHY SAJEEV

of

MUSALIAR COLLEGE OF ENGINEERING AND TECHNOLOGY PATHANAMTHITTA

has successfully completed a 7 day internship in the field of Interior Design from 16th May 2023 to 21st May 2023. During this period she got exposed to industry relevant softwares like AutoCAD, SketchUp and actively participated in hands-on exercises.

25-05-2023

Date

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Founder & CEO
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Date : 26/05/2023

CERTIFICATE

This is to certify that Mr Rizwan Rahim 6th semester Civil Engineering student of Musaliar College of Engineering &Technology,Pathanamthitta has undergone training under this section from 15/05/2023 to 24/05/2023.   He has attended the work of the project PWD(Roads) - RM 2022-23/Cluster 2/One Year RC / Pathanapuram / KLM-RM 2022-23 Zone 2-One Year Running Contract for Various PWD Roads Under Roads Section Pathanapuram in Kollam District. His approach towards internship programme was very enthusiastic. During this period we found him sincere and hardworking.

We wish best wishes and success in his future carrier·

For AR Constructions

Authorised Signatory

TM TECHMAGHI

CERTIFICATE

This is to certify that

SACHU ABHILASH

of

MUSALIAR COLLEGE OF ENGINEERING AND TECHNOLOGY PATHANAMTHITTA

has successfully completed a 7 day internship in the field of Interior Design from 16th May 2023 to 21st May 2023. During this period he got exposed to industry relevant softwares like AutoCAD, SketchUp and actively participated in hands-on exercises.

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Founder & CEO
Techmaghi

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Date

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INTD23048

TM TECHMAGHI

CERTIFICATE

This is to certify that

SHABANA BASHEER

of

MUSALIAR COLLEGE OF ENGINEERING AND TECHNOLOGY PATHANAMTHITTA

has successfully completed a 7 day internship in the field of Interior Design from 16th May 2023 to 21st May 2023. During this period she got exposed to industry relevant softwares like AutoCAD, SketchUp and actively participated in hands-on exercises.

25-05-2023

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TECHMAGHI

CERTIFICATE

This is to certify that

SHAN S

of

MUSALIAR COLLEGE OF ENGINEERING AND TECHNOLOGY PATHANAMTHITTA

has successfully completed a 7 day internship in the field of Interior Design from 16th May 2023 to 21st May 2023. During this period he got exposed to industry relevant softwares like AutoCAD, SketchUp and actively participated in hands-on exercises.

25-05-2023
Date

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Founder & CEO
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RMC **Raji Mathew & Co.**
Engineers and Highway Contractors

31/05/2023

INTERNSHIP CERTIFICATE

TO WHOM IT MAY CONCERN

This is to certify that Mr. SHINAZ SHAJI (B-TECH Civil Engineering) student of MUSALIAR COLLEGE OF ENGINEERING & TECHNOLOGY, PATHANAMTHITTA has undergone training under this section from 16/05/2023 to 31/05/2023. He has attended the maintenance works of the project "Rehabilitation and Upgradation of Mallappally, Komalam Paduthodu Kalloopara Chengaroor Komalam Kavungaprayar Pattakala, TMV road Pavement work (Rigid &Flexible) culvert , Retaining wall and Irish Drain and has also done office works during these days. It is also certified that his character and conduct are good.

We wish him all success in his future endeavours.

For Raji Mathew & Co.

Authorised Signatory

[Seal: RAJI MATHEW & CO. Kottayam Dist Pin-686 578 Pamplaniyil Bharananganam]

INTD23086

TECHMAGHI

CERTIFICATE

This is to certify that

SUJITH OMANAKUTTAN

of

MUSALIAR COLLEGE OF ENGINEERING AND TECHNOLOGY PATHANAMTHITTA

has successfully completed a 7 day internship in the field of Interior Design from 16th May 2023 to 21st May 2023. During this period he got exposed to industry relevant softwares like AutoCAD, SketchUp and actively participated in hands-on exercises.

Deepak Rajan
Founder & CEO
Techmaghi

25-05-2023
Date

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AAY-0105
• KOTTAYAM, KERALA •

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Date : 26/05/2023

CERTIFICATE

This is to certify that Mr VS Naveen 6th semester Civil Engineering student of Musaliar College of Engineering & Technology, Pathanamthitta has undergone training under this section from 15/05/2023 to 24/05/2023. He has attended the work of the project PWD(Roads) - RM 2022-23/Cluster 2/One Year RC / Pathanapuram / KLM-RM 2022-23 Zone 2-One Year Running Contract for Various PWD Roads Under Roads Section Pathanapuram in Kollam District. His approach towards internship programme was very enthusiastic. During this period we found him sincere and hardworking.

We wish best wishes and success in his future carrier

For AR Constructions

Authorised Signatory

Proprietor: **Afsal R**
Govt. Contractor
Reg.No:PWD/CIVIL/885/2022-2023

Email: afzalzera@gmail.com

TM TECHMAGHI

CERTIFICATE

This is to certify that

RAHUL R

of

MUSALIAR COLLEGE OF ENGINEERING AND TECHNOLOGY PATHANAMTHITTA

has successfully completed a 7 day internship in the field of **Interior Design** from 16th May 2023 to 21st May 2023. During this period he got exposed to industry relevant softwares like AutoCAD, SketchUp and actively participated in hands-on exercises.

25-05-2023
Date

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Founder & CEO
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KADAVANTHARA, COCHIN - 20
+91 9020302028, +91 9020065566
info@aesterindia.com | www.aesterindia.in

Date: 9th November 2022

To Whom It May Concern

ID: 1328/AII/2022

INTERNSHIP COMPLETION CERTIFICATE

This is an **Internship** Completion Certificate for **Mr VIVEK VENU**, 2nd Year Electronics and Communication, **Musaliar College of Engineering and Technology**, Pathanamthitta.

We state on record that he has successfully completed 15 days Internship program on **Robotics** at **AESTER INDIA PVT. LTD**, Ernakulam, Kerala,India.

During this period, he worked on various areas of Robotics and successfully met the objectives that were set at the beginning of the internship. He shows a lot of promise and skill in his work and we wish all the best in all his future endeavours.

Thanking You,
Yours Sincerely,

HR DEPARTMENT
RATHEESH C.R
AESTER INDIA PVT.LTD .
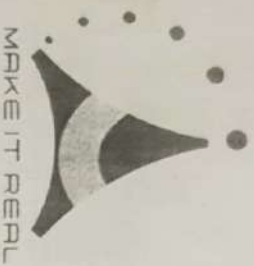
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OPP OLIVE DOWN TOWN HOTEL,
KADAVANTHARA, COCHIN - 20
+91 9020302028, +91 9020065566
info@aesterindia.com | www.aesterindia.in

Date: 9th November 2022

To Whom It May Concern

ID: 1334/AII/2022

INTERNSHIP COMPLETION CERTIFICATE

This is an **Internship Completion Certificate** for Ms PUNNYA. S, 2nd Year Electronics and Communication, Musaliar College of Engineering and Technology,Pathanamthitta.

We state on record that she has successfully completed 15 days Internship program on **Robotics** at **AESTER INDIA PVT. LTD**, Ernakulam, Kerala,India.

During this period, she worked on various areas of Robotics and successfully met the objectives that were set at the beginning of the internship. She shows a lot of promise and skill in her work and we wish all the best in all her future endeavours.

Thanking You,
Yours Sincerely,

HR DEPARTMENT
RATHEESH C.R
AESTER INDIA PVT.LTD

www.aesterindia.com

Date: 9th November 2022

To Whom It May Concern
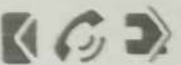
ID: 1322/AII/2022

INTERNSHIP COMPLETION CERTIFICATE

This is an Internship Completion Certificate for Mr MUHAMMED SAHAL, 2nd Year Electronics and Communication, Musaliar College of Engineering and Technology, Pathanamthitta.

We state on record that he has successfully completed 15 days Internship program on Robotics at AESTER INDIA PVT. LTD, Ernakulam, Kerala, India.

During this period, he worked on various areas of Robotics and successfully met the objectives that were set at the beginning of the internship. He shows a lot of promise and skill in his work and we wish all the best in all his future endeavours.

Thanking You,
Yours Sincerely,

HR DEPARTMENT
RATHEESH C.R
AESTER INDIA PVT.LTD

www.aesterindia.com

S3

ID: 1337/AII/2022

Date: 9th November 2022
To Whom It May Concern

INTERNSHIP COMPLETION CERTIFICATE

This is an Internship Completion Certificate for Ms KARTHIKA SUNIL, 2nd Year Electronics and Communication, Musaliar College of Engineering and Technology,Pathanamthitta.

We state on record that she has successfully completed 15 days Internship program on **Robotics** at AESTER INDIA PVT. LTD, Ernakulam, Kerala,India.

During this period, she worked on various areas of Robotics and successfully met the objectives that were set at the beginning of the internship. She shows a lot of promise and skill in her work and we wish all the best in all her future endeavours.
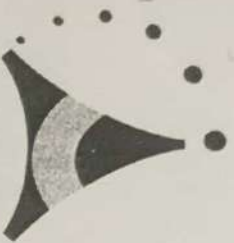
Thanking You,
Yours Sincerely,

HR DEPARTMENT
RATHEESH C.R
AESTER INDIA PVT.LTD

AESTER INDIA PVT LTD

MAKE IT REAL

Date: 9th November 2022

ID: 1332/AII/2022

To Whom It May Concern

INTERNSHIP COMPLETION CERTIFICATE

This is an **Internship Completion Certificate** for **Ms JOICY JOY**, 2nd Year Electronics and Communication, **Musaliar College of Engineering and Technology, Pathanamthitta.**

We state on record that she has successfully completed 15 days Internship program on **Robotics** at **AESTER INDIA PVT. LTD**, Ernakulam, Kerala, India.

During this period, she worked on various areas of Robotics and successfully met the objectives that were set at the beginning of the internship. She shows a lot of promise and skill in her work and we wish all the best in all her future endeavours.

Thanking You,
Yours Sincerely,

HR DEPARTMENT
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Date: 9th November 2022   ID: 1335/AII/2022

To Whom It May Concern

INTERNSHIP·COMPLETION CERTIFICATE

This is an Internship Completion Certificate for Ms DEVIPRIYA. S, 2nd Year Electronics and Communication, Musaliar College of Engineering and Technology, Pathanamthitta.

We state on record that she has successfully completed 15 days Internship program on **Robotics** at AESTER INDIA PVT. LTD, Ernakulam, Kerala, India.

During this period, she worked on various areas of Robotics and successfully met the objectives that were set at the beginning of the internship. She shows a lot of promise and skill in her work and we wish all the best in all her future endeavours.
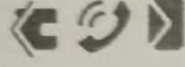
Thanking You,
Yours Sincerely,

HR DEPARTMENT
RATHEESH C.R
AESTER INDIA PVT.LTD

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S3

AESTER INDIA PVT LTD

MAKE IT REAL

Date: 9th November 2022

ID: 1331/AII/2022

To Whom It May Concern

INTERNSHIP COMPLETION CERTIFICATE

This is an **Internship Completion Certificate** for Ms DEVI NANDANA. P, 2nd Year Electronics and Communication, **Musaliar College of Engineering and Technology,Pathanamthitta.**

We state on record that she has successfully completed 15 days Internship program on **Robotics at AESTER INDIA PVT. LTD**, Ernakulam, Kerala,India.

During this period, she worked on various areas of Robotics and successfully met the objectives that were set at the beginning of the internship. She shows a lot of promise and skill in her work and we wish all the best in all her future endeavours.

Thanking You,
Yours Sincerely,

HR DEPARTMENT
RATHEESH C.R
AESTER INDIA PVT.LTD

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Date: 9th November 2022   ID: 1324/AII/2022

To Whom It May Concern

INTERNSHIP COMPLETION CERTIFICATE

This is an **Internship Completion Certificate** for Mr ASWIN. S, 2nd Year Electronics and Communication, **Musaliar College of Engineering and Technology, Pathanamthitta.**
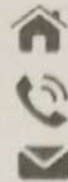
We state on record that he has successfully completed 15 days Internship program on **Robotics** at **AESTER INDIA PVT. LTD**, Ernakulam, Kerala, India.

During this period, he worked on various areas of Robotics and successfully met the objectives that were set at the beginning of the internship. He shows a lot of promise and skill in his work and we wish all the best in all his future endeavours.

Thanking You,
Yours Sincerely,

HR DEPARTMENT
RATHEESH C.R
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KADAVANTHARA, COCHIN - 20
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info@aesterindia.com | www.aesterindia.in

ID: 1333/AII/2022

Date: 9ᵗʰ November 2022

To Whom It May Concern

INTERNSHIP COMPLETION CERTIFICATE

This is an Internship Completion Certificate for Ms ATHIRA RAJESH, 2ⁿᵈ Year Electronics and Communication, Musaliar College of Engineering and Technology,Pathanamthitta.

We state on record that she has successfully completed 15 days Internship program on **Robotics** at **AESTER INDIA PVT. LTD**, Ernakulam, Kerala,India.
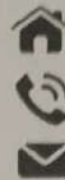
During this period, she worked on various areas of Robotics and successfully met the objectives that were set at the beginning of the internship. She shows a lot of promise and skill in her work and we wish all the best in all her future endeavours.

Thanking You,
Yours Sincerely,

HR DEPARTMENT
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www.aesterindia.com

ID: 1329/AII/2022

Date: 9th November 2022

To Whom It May Concern

INTERNSHIP COMPLETION CERTIFICATE

This is an **Internship Completion Certificate** for Mr AROMAL K S, 2nd Year Electronics and Communication, Musaliar College of Engineering and Technology,Pathanamthitta.

We state on record that he has successfully completed 15 days Internship program on **Robotics** at **AESTER INDIA PVT. LTD**, Ernakulam, Kerala,India.

During this period, he worked on various areas of Robotics and successfully met the objectives that were set at the beginning of the internship. He shows a lot of promise and skill in his work and we wish all the best in all his future endeavours.

Thanking You,
Yours Sincerely,

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www.aesterindia.com

Date: 9th November 2022

ID: 1336/AII/2022

To Whom It May Concern

INTERNSHIP COMPLETION CERTIFICATE

This is an Internship Completion Certificate for Ms ANASWARA S, 2nd Year Electronics and Communication, Musaliar College of Engineering and Technology,Pathanamthitta.

We state on record that she has successfully completed 15 days Internship program on **Robotics** at AESTER INDIA PVT. LTD, Ernakulam, Kerala,India.

During this period, she worked on various areas of Robotics and successfully met the objectives that were set at the beginning of the internship. She shows a lot of promise and skill in her work and we wish all the best in all her future endeavours.

Thanking You,
Yours Sincerely,

HR DEPARTMENT
RATHEESH C.R
AESTER INDIA PVT.LTD

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info@aesterindia.com | www.aesterindia.in

ID: 1323/AII/2022

Date: 9ᵗʰ November 2022

To Whom It May Concern

INTERNSHIP COMPLETION CERTIFICATE

This is an **Internship Completion Certificate** for Mr ANANDU. T, 2ⁿᵈ Year Electronics and Communication, Musaliar College of Engineering and Technology,Pathanamthitta.

We state on record that he has successfully completed 15 days Internship program on **Robotics** at **AESTER INDIA PVT. LTD**, Ernakulam, Kerala,India.

During this period, he worked on various areas of Robotics and successfully met the objectives that were set at the beginning of the internship. He shows a lot of promise and skill in his work and we wish all the best in all his future endeavours.

Thanking You,
Yours Sincerely,

HR DEPARTMENT
RATHEESH C.R
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Date: 9ᵗʰ November 2022

ID: 1330/AII/2022

To Whom It May Concern

INTERNSHIP COMPLETION CERTIFICATE

This is an **Internship Completion Certificate** for Mr AMEEN. P, 2ⁿᵈ Year Electronics and Communication, Musaliar College of Engineering and Technology, Pathanamthitta.
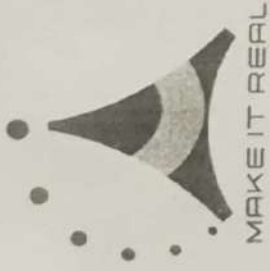
We state on record that he has successfully completed 15 days Internship program on **Robotics** at **AESTER INDIA PVT. LTD**, Ernakulam, Kerala, India.

During this period, he worked on various areas of Robotics and successfully met the objectives that were set at the beginning of the internship. He shows a lot of promise and skill in his work and we wish all the best in all his future endeavours.

Thanking You,
Yours Sincerely,

HR DEPARTMENT
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Date: 9th November 2022 ID: 1325/AII/2022

To Whom It May Concern

INTERNSHIP COMPLETION CERTIFICATE

This is an **Internship Completion Certificate** for Mr ALAN BENNY, 2nd Year Electronics and Communication, **Musaliar College of Engineering and Technology, Pathanamthitta.**

We state on record that he has successfully completed 15 days Internship program on **Robotics** at **AESTER INDIA PVT. LTD**, Ernakulam, Kerala, India.
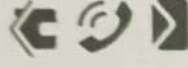
During this period, he worked on various areas of Robotics and successfully met the objectives that were set at the beginning of the internship. He shows a lot of promise and skill in his work and we wish all the best in all his future endeavours.

Thanking You,
Yours Sincerely,

HR DEPARTMENT
RATHEESH C.R
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Date: 9th November 2022

To Whom It May Concern

ID: 1327/AII/2022

handwritten notes: 21-22, Sept 21 to Aug, Aug 21 to July 22, Aug 22 to July 23

INTERNSHIP COMPLETION CERTIFICATE

This is an **Internship Completion Certificate** for Mr **ABHIJITH. S**, 2nd Year Electronics and Communication, **Musaliar College of Engineering and Technology,Pathanamthitta.**

We state on record that he has successfully completed 15 days Internship program on **Robotics** at **AESTER INDIA PVT. LTD**, Ernakulam, Kerala,India.

During this period, he worked on various areas of Robotics and successfully met the objectives that were set at the beginning of the internship. He shows a lot of promise and skill in his work and we wish all the best in all his future endeavours.
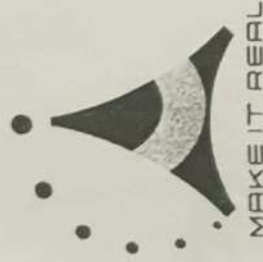
Thanking You,
Yours Sincerely,

HR DEPARTMENT
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Date: 9th November 2022   ID: 1326/AII/2022

To Whom It May Concern

INTERNSHIP COMPLETION CERTIFICATE

This is an **Internship Completion Certificate** for **Mr AKARSH VIJAYAN**, 2nd Year Electronics and Communication, **Musaliar College of Engineering and Technology,Pathanamthitta.**

We state on record that he has successfully completed 15 days Internship program on **Robotics** at **AESTER INDIA PVT. LTD**, Ernakulam, Kerala,India.

During this period, he worked on various areas of Robotics and successfully met the objectives that were set at the beginning of the internship. He shows a lot of promise and skill in his work and we wish all the best in all his future endeavours.
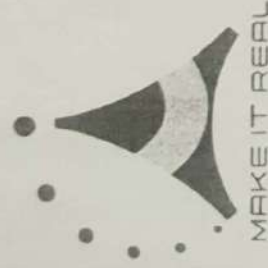
Thanking You,
Yours Sincerely,

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KALLADA IRRIGATION PROJECT

MECHANICAL SUB DIVISION THENMALA
THENMALA DAM PO, THENMALA , KOLLAM

INTERNSHIP TRAINING CERTIFICATE

This is to certify that the following Fifth Semester B. Tech Students of the Mechanical Engineering Department, Musaliar Collage of Engineering and Technology, Pathanamthitta visited Thenmala Dam and undergone training from 18.10.2022 to 22.10.2022 as a part of their curriculum

SL. No	NAME	REGISTER No.
1	ALIF MUHAMMADU	MCK20ME010
2	NANDHU S	MCK20ME026

This certificate is issued to produce before the HOD of Mechanical Engineering Department of the above college for necessary action.

Thenmala
02.11.2022

Assistant Executive Engineer
Mechanical Sub Division
Thenmala

2022-23
Sl No 14
Internship - 20pts

MUSALIAR COLLEGE OF ENGINEERING & TECHNOLOGY,PATHANAMTHITTA
DEPARTMENT OF CIVIL ENGINEERING
Internship Details (2021-2025) Batch
S5CE (2021- 2025 Batch)

SI No	Roll No	University Reg No	Student name	Name of Company	Duration	Number of Days
1	2101	MCK21CE001	ABDUL AHAD	SR CONSTRUCTIONS,KAKKANAD,KOCHI	17/10/2022 to 24/10/2022	8
2	2102	MCK21CE002	ABEL K GEORGE	SR CONSTRUCTIONS,KAKKANAD,KOCHI	17/10/2022 to 24/10/2022	8
3	2103	MCK21CE003	AFSAL SULAIMAN	SR CONSTRUCTIONS,KAKKANAD,KOCHI	17/10/2022 to 24/10/2022	8
4	2104	MCK21CE004	AFSANA SALIM	SR CONSTRUCTIONS,KAKKANAD,KOCHI	17/10/2022 to 24/10/2022	8
5	2105	MCK21CE005	AISWARYA R PANICKER	SR CONSTRUCTIONS,KAKKANAD,KOCHI	17/10/2022 to 24/10/2022	8
6	2106	MCK21CE006	AKASH P SURESH	SR CONSTRUCTIONS,KAKKANAD,KOCHI	17/10/2022 to 24/10/2022	8
7	2107	MCK21CE007	ASHLEY T SAMUEL	SR CONSTRUCTIONS,KAKKANAD,KOCHI	17/10/2022 to 24/10/2022	8
8	2108	MCK21CE009	JIBIN B	SR CONSTRUCTIONS,KAKKANAD,KOCHI	17/10/2022 to 24/10/2022	8
9	2109	MCK21CE010	KRISHNA PRIYA SANTHOSH	SR CONSTRUCTIONS,KAKKANAD,KOCHI	17/10/2022 to 24/10/2022	8
10	2110	MCK21CE012	RIYA ANNA CHERIAN	SR CONSTRUCTIONS,KAKKANAD,KOCHI	17/10/2022 to 24/10/2022	8
11	2111	MCK21CE014	SANJU S KUMAR	SR CONSTRUCTIONS,KAKKANAD,KOCHI	17/10/2022 to 24/10/2022	8
12	2112	LMCK21CE015	ANANTH RAJ K	ANVIN BUILDING DESIGNERS AND CONSTRUCTIONS	24/5/2023 to 1/6/2023	9
13	2113	LMCK21CE016	HRIDYA SURESH	SR CONSTRUCTIONS,KAKKANAD,KOCHI	17/10/2022 to 24/10/2022	8
14	1114	LMCK21CE017	PARVATHY RADHAKRISHNAN	SR CONSTRUCTIONS,KAKKANAD,KOCHI	17/10/2022 to 24/10/2022	8

Faculty Advisor

25/10/2022

CERTIFICATE

This is to certify that AFSANA SALIM, having the university register number : MCK21CE004, B.Tech Civil Engineering student of Musaliar College of Engineering and Technology, Pathanamthitta has successfully completed internship program based on Civil Engineering and visited our work sites from 17/10/2022 to 24/10/2022.

For SR Construction,

HR Manager

SR CONSTRUCTION

25/10/2022

CERTIFICATE

This is to certify that AKASH P SURESH, having the university register number : MCK21CE006, B.Tech   Civil Engineering student of Musaliar College of Engineering and Technology, Pathanamthitta has successfully completed internship program based on Civil Engineering and visited our work sites from 17/10/2022 to 24/10/2022.

For SR Construction,

HR Manager

25/10/2022

CERTIFICATE

This is to certify that KRISHNA PRIYA SANTHOSH, having the university register number : MCK21CE010, B.Tech Civil Engineering student of Musaliar College of Engineering and Technology, Pathanamthitta has successfully completed internship program based on Civil Engineering and visited our work sites from 17/10/2022 to 24/10/2022.

For SR Construction,

HR Manager

25/10/2022

CERTIFICATE

This is to certify that RIYA ANNA CHERIAN, having the university register number : MCK21CE012, B.Tech Civil Engineering student of Musaliar College of Engineering and Technology, Pathanamthitta has successfully completed internship program based on Civil Engineering and visited our work sites from 17/10/2022 to 24/10/2022.

For SR Construction,

HR Manager

ANVIN

BUILDING DESIGNERS & CONSTRUCTIONS

ARCHITECTURAL DESIGN & PROJECT CONSULTANCY
INTERIOR & LANDSCAPE DESIGN
TURN-KEY CONSTRUCTION

Ar.Remya Chandy (M.Arch, B Arch)
Lead Architect & Managing Partner
0091 – 6238201924

Er.Vinish John (M.Tech, B.Tech-Civil)
Lead Engineer & Managing Director
0091-9961156703

ANVIN Building, 2nd & 3rd Floor, Adoor PO,
Pathanamthitta Dist, Kerala, India. Pin-691523
anvinbdc@gmail.com

FN : 123/130/3

02-06-2023

INTERNSHIP CERTIFICATE

This is to certify that, Mr. Ananthraj K. (Reg. No – 22172), a student of Civil Engineering Department studying in Musaliar College of Engineering and Technology, Pathanamthitta has successfully completed 7 days (from May 24th, 2023 till June 1st, 2023) internship programme in Anvin Building Designers and Constructions. During the period of his internship programme with us, he was found punctual, hardworking, and inquisitive.

Sincerely

Er. Vinish John
M.Tech, B.Tech - Civil
Managing Director

REGISTERED CIVIL ENGINEER
ENGINEER-A F.-4044/14/E.A-795/KLM
VINISH JOHN
M.Tech , B.Tech Civil Engineer
ANVIN, ADOOR PO, PATHANAMTHITTA Dist
KERALA-691523, INDIA, Ph:04734-229973

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AI, MACHINE LEARNING, ROBOTICS

NGP/EKM/2023–77/190   02 June,2023

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Ms. Shijimol Shibu** fourth semester MCA student of Musaliar College of Engineering and Technology, Pathanamthitta has successfully completed her internship program in *"Python-Machine Learning"*.

She has completed her internship program **(March 13, 2023 to May 08, 2023)** under the guidance of Mr. Anish Mathew Abraham in partial fulfilment of the requirements for the award of the degree of Masters in Computer Applications. During the period of her internship program with us, she was found diligent, hardworking and inquisitive.

We wish her every success in her life and career.

Yours Truly,

For,

NextGenPro Innovations & Edupark Pvt Ltd

Shabna Sara Jithin
HR Manager

Logix Space

Nasscom Startup WareHouse
InfoPark Campus
Cochin, Kerala, IN
Email : info@logixspace.com
Website : www.logixspace.com
CIN: U72200KL2014PTC036931

To Whom It May Concern

This is to certify that **Asiya Salim**, a student of **Musaliar College Of Engineering And Technology, Pathanamthitta**, has successfully completed an Internship in **Python for Data Science and Machine Learning** at Logix Space Technologies Pvt Ltd from **May 2 2023** to **May 12 2023**.

During the internship, **Asiya Salim** actively participated in various projects related to machine learning and demonstrated a keen interest in learning new concepts and technologies. She also exhibited excellent teamwork and communication skills while working with other members of the team.

The internship provided a great opportunity for **Asiya Salim** to develop her skills in the field of ML and gain hands-on experience with industry-standard tools and techniques.

We at Logix Space Technologies Pvt Ltd are extremely impressed with her dedication and contribution during the internship. We wish her all the best in future endeavors.

Sincerely,

ANISH S NAIR
Director, Logix Space

REF.No. GCS105/19/05/2023

19th may 2023

Internship Certificate

This is to certify that Mr. Mithun P M fourth semester MCA student of Musaliar College of Engineering and Technology, Pathanamthitta has successfully completed his internship program in "Data Science using Python"

He has completed her Internship program (February 10, 2023, to May 15, 2023) under the guidance of Mr. Arun K S in partial fulfillment of the requirement for the award of the degree Master in Computer Applications. During the period of his Internship program with us, he was found diligent, hardworking, and inquisitive.

We wish him every success in his life and career

Yours Truly,

For,

Go-Tech Center for Studies

BEENA KUAMRI S

CENTER MANAGER

Internship Certificate

This is to certify that Ms. Sini fourth semester MCA student of Musaliar College of Engineering and Technology, Pathanamthitta has successfully completed her internship program in "Data Science using Python"

She has completed her Internship program (February 10, 2023, to May 15, 2023) under the guidance of Mr. Arun K S in partial fulfillment of the requirement for the award of the degree Master in Computer Applications. During the period of her Internship program with us, she was found diligent, hardworking, and inquisitive.

We wish her every success in her life and career

Yours Truly,

For,

Go-Tech Center for Studies

BEENA KUAMRI S
CENTER MANAGER

LCC
Computer Education

June 1, 2023

INTERNSHIP CERTIFICATE

This is to certify that **SELIN SUNNY** 4TH Semester **MCA** student of **MUSALIAR COLLEGE OF ENGINEERING & TECHNOLOGY, PATHANAMTHITTA** has successfully completed a 1-month Internship program in **PYTHON** Technologies under the guidance of Mr. Vishnu .B. Kumar at our organization. The internship included live demos and interaction with industry experts.

Thanking you,

For **LCC Computer Education**

Ramaswamy
Director

INTERNSHIP CERTIFICATE

This is to certify that **MCA** Student **KRISHNAVANI MP**, from **MUSALIAR COLLEGE OF ENGINEERING AND TECHNOLOGY, PATHANAMTHITTA** under **APJ Abdul Kalam Technological University**, has successfully completed her Internship on 6th March 2023 to 25th May 2023 with the Data Science team at **Wahy Lab Solutions Ernakulam**.

Authorised Signatory

26-5-2023

Date

INTERNSHIP CERTIFICATE

This is to certify that MCA Student **LINCY T SAJI** from **MUSALIAR COLLEGE OF ENGINEERING AND TECHNOLOGY, PATHANAMTHITTA** under APJ Abdul Kalam Technological University, has successfully completed her Internship on 6" March 2023 to 25" May, 2023 with the Data Science team at **Wahy Lab Solutions Ernakulam**.

Authorised Signatory

26 - 5 -2023

Date

REF.No. GCS102/19/05/2023

19th may 2023

Internship Certificate

This is to certify that Ms. Lekshmi Mohan fourth semester MCA student of Musaliar College of Engineering and Technology, Pathanamthitta has successfully completed her internship program in "Data Science using Python"

She has completed her Internship program (February 10, 2023, to May 15, 2023) under the guidance of Mr. Arun K S in partial fulfillment of the requirement for the award of the degree Master in Computer Applications. During the period of her Internship program with us, she was found diligent, hardworking, and inquisitive.

We wish her every success in her life and career

Yours Truly,

For,

Go-Tech Center for Studies

BEENA KUAMRI S
CENTER MANAGER

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BI & CUSTOMIZED ERP SOLUTIONS
AI, MACHINE LEARNING, ROBOTICS

NGP/EKM/2023–77/191   05 June,2023

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Ms. Malavika Somarajan** fourth semester MCA student of Musaliar College of Engineering and Technology, Pathanamthitta has successfully completed her internship program in **"Python-Machine Learning"**.

She has completed her internship program **(March 13, 2023 to May 08, 2023)** under the guidance of Mr. Anish Mathew Abraham in partial fulfilment of the requirements for the award of the degree of Masters in Computer Applications. During the period of her internship program with us, she was found diligent, hardworking and inquisitive.

We wish her every success in her life and career.

Yours Truly,

For,

NextGenPro Innovations & Edupark Pvt Ltd

Shabna Sara Jithin
HR Manager

PROJECT CERTIFICATE

This is to certify that **MCA** Student **AKSHAYA K S**, Register Number: **MCK21MCA-2005** from **MUSALIAR COLLEGE OF ENGINEERING AND TECHNOLOGY, PATHANAMTHITTA** under **APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**, has successfully completed her Project on **"EDIBLE AND POISONOUS MUSHROOM CLASSIFICATION USING DEEP LEARNING"** with the Data Science team at Wahy Lab Solutions Ernakulam.

Authorised Signatory

26 5 - 2023
Date

Wahy Lab So
Kochi
682021

PROJECT CERTIFICATE

This is to certify that **MCA** Student **AKSHARA K S**, Register Number: **MCK21MCA-2003** from **MUSALIAR COLLEGE OF ENGINEERING AND TECHNOLOGY, PATHANAMTHITTA** under **APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**, has successfully completed her Project on **"CUSTOMER CHURN PREDICTION IN TELECOM"** with the Data Science team at **Wahy Lab Solutions Ernakulam**.

Authorised Signatory

26 5-2022

Date

Wahy Lab Solutions
Kochi
682021

PROJECT CERTIFICATE

This is to certify that MCA Student **LINCY T SAJI**, Register Number: **MCK21MCA-2017** from **MUSALIAR COLLEGE OF ENGINEERING AND TECHNOLOGY, PATHANAMTHITTA** under **APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**, has successfully completed her Project on **"INTELLI-DOCTOR"** with the Data Science team at Wahy Lab Solutions Ernakulam.

Authorised Signatory

26·5·2023

Date

PROJECT CERTIFICATE

This is to certify that MCA Student **KRISHNAVANI M P, Register Number: MCK21MCA-2015** from **MUSALIAR COLLEGE OF ENGINEERING AND TECHNOLOGY, PATHANAMTHITTA** under **APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY,** has successfully completed her Project on **"TOWARDS PERSONALISED ADAPTIVE LEARNING IN E-LEARNING RECOMMENDER SYSTEMS"** with the Data Science team at **Wahy Lab Solutions Ernakulam."**

Authorised Signatory

26 · 5- 2023

Date

05 June,2023

NGP/EKM/2023–77/192

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Ms. Aswathy R** fourth semester MCA student of Musaliar College of Engineering and Technology, Pathanamthitta has successfully completed her internship program in **"Python-Machine Learning"**.

She has completed her internship program **(March 13, 2023 to May 08, 2023)** under the guidance of Mr. Anish Mathew Abraham in partial fulfilment of the requirements for the award of the degree of Masters in Computer Applications. During the period of her internship program with us, she was found diligent, hardworking and inquisitive.

We wish her every success in her life and career.

Yours Truly,

For,

NextGenPro Innovations & Edupark Pvt Ltd

Shabna Sara Jithin
HR Manager

PROJECT CERTIFICATE

This is to certify that **MCA** Student **SACHIN SADANANDAN**, Register Number: **MCK21MCA-2028** from **MUSALIAR COLLEGE OF ENGINEERING AND TECHNOLOGY, PATHANAMTHITTA** under **APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**, has successfully completed his Project on **"FACE LANDMARK DETECTION"** with the Data Science team at **Wahy Lab Solutions Ernakulam**.

Authorised Signatory

26 - 5 - 2023

Date

Kochi
_682021_

INTERNSHIP CERTIFICATE

This is to certify that **MCA** Student **SACHIN SADANANDAN**, from **MUSALIAR COLLEGE OF ENGINEERING AND TECHNOLOGY, PATHANAMTHITTA** under **APJ Abdul Kalam Technological University**, has successfully completed his Project on 6th March 2023 to 25th May 2023 with the Data Science team at **Wahy Lab Solutions Ernakulam**.

Authorised Signatory

26 - 5 - 2023

Date

Kochi
682021

INTERNSHIP CERTIFICATE

This is to certify that **MCA** Student **AKSHARA K S**, from **MUSALIAR COLLEGE OF ENGINEERING AND TECHNOLOGY, PATHANAMTHITTA** under **APJ Abdul Kalam Technological University**, has successfully completed her Internship on 6th March 2023 to 25th May 2023 with the Data Science team at **Wahy Lab Solutions Ernakulam**.

Authorised Signatory

26. 5. 2023
Date

Lab Solutions
Kochi
682021

INTERNSHIP CERTIFICATE

This is to certify that **MCA** Student **AKSHAYA K S**, from **MUSALIAR COLLEGE OF ENGINEERING AND TECHNOLOGY, PATHANAMTHITTA** under **APJ Abdul Kalam Technological University**, has successfully completed her Internship on 6th March 2023 to 25th May 2023 with the Data Science team at **Wahy Lab Solutions Ernakulam**.

Authorised Signatory

26- 5.- 2023

Date

Kochi
682021

INTERNSHIP CERTIFICATE

This is to certify that **MCA** Student **RESHMA P R**, from **MUSALIAR COLLEGE OF ENGINEERING AND TECHNOLOGY, PATHANAMTHITTA** under **APJ Abdul Kalam Technological University**, has successfully completed her Internship on 6th March 2023 to 25th May 2023 with the Data Science team at **Wahy Lab Solutions Ernakulam**.

Authorised Signatory

26 5-2023

Date

Kochi
682021

PROJECT CERTIFICATE

This is to certify that MCA Student **RESHMA P R, Register Number: MCK21MCA-2026** from **MUSALIAR COLLEGE OF ENGINEERING AND TECHNOLOGY, PATHANAMTHITTA** under **APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**, has successfully completed her Project on ''**LANE LINE DETECTION SYSTEM IN PYTHON USING OPENCV**'' with the Data Science team at **Wahy Lab Solutions Ernakulam**.

Authorised Signatory

26-5-2023

Date

NGP/EKM/2023–77/184   01 June,2023

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Ms. Alfiya Nizam** fourth semester MCA student of Musaliar College
of Engineering and Technology, Pathanamthitta has successfully completed her internship
program in *"Python-Machine Learning"*.

She has completed her internship program **(March 13, 2023 to May 08, 2023)** under
guidance of Mr. Anish Mathew Abraham in partial fulfilment of the requirements for the award
the degree of Masters in Computer Applications. During the period of her internship program wi
us, she was found diligent, hardworking and inquisitive.

We wish her every success in her life and career.

Yours Truly,

For,

NextGenPro Innovations & Edupark Pvt Ltd

Shabna Sara Jithin
HR Manager

NGP/EKM/2023–77/186

01 June,2023

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Ms. Akhila S Pillai** fourth semester MCA student of Musaliar College of Engineering and Technology, Pathanamthitta has successfully completed her internship program in *"Python-Machine Learning"*.

She has completed her internship program **(March 13, 2023 to May 08, 2023)** under the guidance of Mr. Anish Mathew Abraham in partial fulfilment of the requirements for the award of the degree of Masters in Computer Applications. During the period of her internship program with us, she was found diligent, hardworking and inquisitive.

We wish her every success in her life and career.

Yours Truly,

For,

NextGenPro Innovations & Edupark Pvt Ltd

Shabna Sara Jithin
HR Manager

REF.No. GCS101/19/05/2023

19th may 2023

Internship Certificate

This is to certify that Ms. Akshara Madhusoodanan fourth semester MCA student of Musaliar College of Engineering and Technology, Pathanamthitta has successfully completed her internship program in "Data Science using Python"

She has completed her Internship program (February 10, 2023 to May 15, 2023) under the guidance of Mr. Arun K S in partial fulfillment of the requirement for the award of the degree Master in Computer Applications. During the period of her Internship program with us, she was found diligent, hardworking, and inquisitive.

We wish her every success in her life and career

Yours Truly,

For,

Go-Tech Center for Studies

BEENA KUAMRI S

CENTER MANAGER

REF.No. GCS104/19/05/2023

19th may 2023

Internship Certificate

This is to certify that Ms Aswathy Biju fourth semester MCA student of Musaliar College of Engineering and Technology. Pathanamthitta has successfully completed her internship program in "Data Science using Python"

She has completed her Internship program (February 10, 2023, to May 15, 2023) under the guidance of Mr. Arun K S in partial fulfillment of the requirement for the award of the degree Master in Computer Applications. During the period of her Internship program with us, she was found diligent, hardworking, and inquisitive.

We wish her every success in her life and career

Yours Truly,

For,

Go-Tech Center for Studies

BEENA KUAMRI S

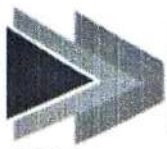**CENTER MANAGER**

NEXT GEN PRO
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**NEXTGENPRO INNOVATIONS &
EDUPARK PVT.LTD**
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WEB, SOFTWARE , MOBILE APP DEVELOPMENT
BI & CUSTOMIZED ERP SOLUTIONS
AI, MACHINE LEARNING, ROBOTICS

NGP/EKM/2023–77/188

01 June,2023

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Ms. Akshaya R** fourth semester MCA student of Musaliar College of Engineering and Technology, Pathanamthitta has successfully completed her internship program in *"Python-Machine Learning"*.

She has completed her internship program **(March 13, 2023 to May 08, 2023)** under the guidance of Mr. Anish Mathew Abraham in partial fulfilment of the requirements for the award of the degree of Masters in Computer Applications. During the period of her internship program with us, she was found diligent, hardworking and inquisitive.

We wish her every success in her life and career.

Yours Truly,

For,

NextGenPro Innovations & Edupark Pvt Ltd

Shabna Sara Jithin
HR Manager

NEXTGEN
PRO
Next Generation Professionals

**NEXTGENPRO INNOVATIONS &
EDUPARK PVT.LTD**
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WEB, SOFTWARE , MOBILE APP DEVELOPMEN
BI & CUSTOMIZED ERP SOLUTIONS
AI, MACHINE LEARNING, ROBOTICS

NGP/EKM/2023–77/187

01 June,2023

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Ms. Keerthy Sudev** fourth semester MCA student of Musaliar College of Engineering and Technology, Pathanamthitta has successfully completed her internship program in **"Web Development"**.

She has completed her internship program **(March 13, 2023 to May 08, 2023)** under the guidance of Mr. Anish Mathew Abraham in partial fulfilment of the requirements for the award of the degree of Masters in Computer Applications. During the period of her internship program with us, she was found diligent, hardworking and inquisitive.

We wish her every success in her life and career.

Yours Truly,

For,

NextGenPro Innovations & Edupark Pvt Ltd

Shabna Sara Jithin
HR Manager

NGP/EKM/2023–77/185

01 June,2023

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Ms. Devika Prabhakar** fourth semester MCA student of Musaliar College of Engineering and Technology, Pathanamthitta has successfully completed her internship program in **"Web Development"**.

She has completed her internship program **(March 13, 2023 to May 08, 2023)** under the guidance of Mr. Anish Mathew Abraham in partial fulfilment of the requirements for the award of the degree of Masters in Computer Applications. During the period of her internship program with us, she was found diligent, hardworking and inquisitive.

We wish her every success in her life and career.

Yours Truly,

For,

NextGenPro Innovations & Edupark Pvt Ltd

Shabna Sara Jithin
HR Manager

NGP/EKM/2023-77/189

01 June,2023

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Ms. Akshaya S Nadh** fourth semester MCA student of Musaliar College of Engineering and Technology, Pathanamthitta has successfully completed her internship program in **"Web Development"**.

She has completed her internship program **(March 13, 2023 to May 08, 2023)** under the guidance of Mr. Anish Mathew Abraham in partial fulfilment of the requirements for the award of the degree of Masters in Computer Applications. During the period of her internship program with us, she was found diligent, hardworking and inquisitive.

We wish her every success in her life and career.

Yours Truly,

For,

NextGenPro Innovations & Edupark Pvt Ltd

Shabna Sara Jithin
HR Manager

31 May,2023

NGP/EKM/2023–77/183

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Ms. Merin Samuel** fourth semester MCA student of Musaliar College of Engineering and Technology, Pathanamthitta has successfully completed her internship program in "Python-Machine Learning".

She has completed her internship program **(March 13, 2023 to May 08, 2023)** under the guidance of Mr. Anish Mathew Abraham in partial fulfilment of the requirements for the award of the degree of Masters in Computer Applications. During the period of her internship program with us, she was found diligent, hardworking and inquisitive.

We wish her every success in her life and career.

Yours Truly,

For,

NextGenPro Innovations & Edupark Pvt Ltd

Shabna Sara Jithin
HR Manager

NGP/EKM/2023–77/182   31 May,2023

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Ms. Mahima V Pillai** fourth semester MCA student of Musaliar College of Engineering and Technology. Pathanamthitta has successfully completed her internship program in **"Python-Machine Learning"**.

She has completed her internship program (**March 13, 2023 to May 08, 2023**) under the guidance of Mr. Anish Mathew Abraham in partial fulfilment of the requirements for the award of the degree of Masters in Computer Applications. During the period of her internship program with us, she was found diligent, hardworking and inquisitive.

We wish her every success in her life and career.

Yours Truly,

For,

NextGenPro Innovations & Edupark Pvt Ltd

Shabna Sara Jithin
HR Manager

NGP/EKM/2023–77/158   18 May,2023

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Ms. Mefin Mathew** fourth semester MCA student of Musaliar College of Engineering and Technology, Pathanamthitta has successfully completed her internship program in **"Web Development"**.
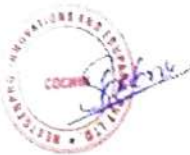
She has completed her internship program (**March 13, 2023 to May 08, 2023**) under the guidance of Mr. Anish Mathew Abraham in partial fulfilment of the requirements for the award of the degree of Masters in Computer Applications. During the period of her internship program with us, she was found diligent, hardworking and inquisitive.

We wish her every success in her life and career.

Yours Truly,

For,

NextGenPro Innovations & Edupark Pvt Ltd

Shabna Sara Jithin
HR Manager

NGP/EKM/2023–77/157   18 May,2023

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Ms. Reshml R** fourth semester MCA student of Musaliar College of Engineering and Technology, Pathanamthitta has successfully completed her internship program in **"Web Development"**.

She has completed her internship program (**March 13, 2023 to May 08, 2023**) under the guidance of Mr. Anish Mathew Abraham in partial fulfilment of the requirements for the award of the degree of Masters in Computer Applications. During the period of her internship program with us, she was found diligent, hardworking and inquisitive.

We wish her every success in her life and career.

Yours Truly,

For,

NextGenPro Innovations & Edupark Pvt Ltd

Shabna Sara Jithin
HR Manager

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Next Generation Professionals

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EDUPARK PVT.LTD
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BI & CUSTOMIZED ERP SOLUTIONS
AI, MACHINE LEARNING, ROBOTICS

NGP/EKM/2023–77/156   18 May,2023

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Ms. Neha Mariam Daniel** fourth semester MCA student of Musaliar College of Engineering and Technology,Pathanamthitta has successfully completed her internship program in **"Python-Machine Learning"**.
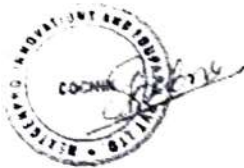
She has completed her internship program (**March 13, 2023** to **May 08, 2023**) under the guidance of Mr. Anish Mathew Abraham in partial fulfilment of the requirements for the award of the degree of Masters in Computer Applications. During the period of her internship program with us, she was found diligent, hardworking and inquisitive.

We wish her every success in her life and career.

Yours Truly,

For,

NextGenPro Innovations & Edupark Pvt Ltd

Shabna Sara Jithin
HR Manager

Ref. No. IC 22052

Date:27-10-2022

TO WHOMSOEVER IT MAY CONCERN

This is to certify that, Mr. Jerry John Thomas, son of Mr. Binu A Thomas studying at Musaliar College of Engineering & Technology, Pathanamthitta (B. Tech in Mechanical Engineering) has successfully completed his internship at our project sites and offices from 18/10/2022 to 22/10/2022.

During his internship, he has exposed to the various activities in our construction division. We found him extremely inquisitive and hard working. He was very much interested to learn the functions of our core division and also willing to put his best efforts and get in to the depth of the subject to understand it better.

His association with us was very fruitful and we wish all the best in his future endeavors.

2022-23
sl. 14
Internship
20/pd

Head - Training & Internships
Armstech Engineers Pvt. Ltd.

K KELTRON CONTROL... 2/11/2021
to me, benoypeter321, keltrone... ⌄ ↩ ⋮

Dear students,

Request of 20 students(B Tech-ECE&EEE) from Musaliar College of Engineering & Technology, Pathanamthitta , provisionally permitted to visit our factory(Keltron Controls,Aroor, Div.of KSEDC Ltd) for Internship from 16th Nov to 30th Nov 2021 (14 days).Reporting time 10 am.

You are required to remit an amount of Rs.1750+18%GST per Head @applicable rate as Registration cum Administrative charges on the first day of the visit.

The students should strictly maintain precautions and safety measures to Break the Chain of Covid-19 and relevant Government rule.

The students should wear their college ID card at the time of visit.

The students should not use mobile phones or photography in the factory premises.

The students should strictly maintain the discipline and take care of any accident at the time of production and

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INTERNSHIP TRAINING ACADEMY
AN ISO 9001:2015 CERTIFIED

Certificate of Excellence

Sl. n. 14
Internship 20

FILE NO : 1831

REG NO : 22NA/INM1018

This is to certify that **KEVIN SANIL VARGHESE** has successfully completed the internship program on the basis **MECHANICAL ENGINEERING** specialised in **PIPING AND PIPELINE ENGINEERING** section of the prime industry **18/10/2022 TO 22/10/2022** and have also been awarded with **EXCELLENT** the conduct and curriculam.

DATE OF ISSUE : 22/10/2022

AJIMAL SALIM

COURSE COORDINATOR

INTERNSHIP INVIGILATOR

BMSCERT
ISO 9001:2015 Certified

eiac
Emirates International Accreditation Centre
CB-006-MS

IAF
MEMBER OF MULTILATERAL RECOGNITION ARRANGEMENT

QRO
QUALITY ASSURANCE

EGAC
CAB - 119005

TÜVRheinland
CERTIFIED

Skill India

N·S·D·C
National Skill Development Corporation
Transforming the skill landscape
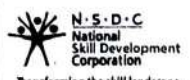
A

From   athul ashok1773 • athulashok1773@gmail.com

To   kelkca@keltron.org

Date   2 Nov 2021, 1:52 pm

See security details

Sir / madam good day,

        Myself I'm Athul from pathanamthitta and I'm studying B tech in ECE from musaliar college of engineering and technology.we 20 students are planning to conduct an internship program in your reputed company.so please give me the details and procedures for the above mentioned subject.

Waiting for your quick response

Thanks and regards

Athul T Ashok
Musaliar college pathanamthitta
8921525022

From

Students of S4 ECE

To

The Principal

MCET

Pathanamthitta.

Subject:- Request for attending internship at Keltron, Aroor, Ernakulam.

Respected Sir,

1. We, the students of S4 ECE, 2019-'23 batch writting this letter to request permission for attending an internship at Keltron, Aroor, Ernakulam.

2. The timings of the internship is from November 16 to November 24. The number of students attending the internship are attached below.

3. This internship being a really important and integral part of our learning procedure, we request you to consider our situation and grant us permission for the same.

Date:- 08/11/21

Place:- Pathanamthitta.

Thanking You

Yours Faithfully,

Students of S4 ECE

Remarks by Staff Advisor.

Recommended & Forwarded

(LIJESH.L)

Remarks by HOD:-

Recommended & Forwarded

Juby Raju

8/11/2021.

Remarks by Principal

Prepare a letter to General Manager
Kaltoon Ltd
Aroor
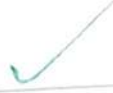
✓

Approved / Not Approved

08/4

Certificate

Reg. No: SIAC3266

Date: 10th November 2022

This is to certify that *Ms. Liji Thomas, Bachelor of Technology in Electronics and Communication Engineering from Musaliar College of Engineering & Technology, has successfully completed her 15 Days Internship in Python from Srishti Innovative Computer Systems (P) Ltd., Technopark for a period from 24th October 2022 to 9th November 2022. During this period, she was systematic, punctual, hardworking and her conduct is good and appreciable.*
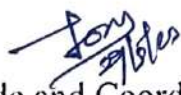
Monisha H Chandran

Manager

DEPARTMENT OF COMPUTER APPLICATION
MUSALIAR COLLEGE OF ENGINEERING & TECHNOLOGY
PATHANAMTHITTA, KERALA-689645

CERTIFICATE

This is to certify that the report entitled **"SMART SECURE HEALTHCARE CLOUD DATA MODEL BY FOG"** submitted by **DEVIKA PRABHAKAR (Register no: MCK21MCA-2012)**, to the APJ Abdul Kalam Technological University in partial fulfilment of requirement for the award of Degree of Master of Computer Applications is a bona-fide record of theproject work carried out by her, under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

Guide and Coordinator
Prof. Jogimol Joseph
Assistant Professor
Dept. of Computer Applications

Head of Department
Prof.Shyma Kareem
Assistant Professor
Dept. of Computer Applications

External Examiner
Dr. Biku Abraham.

DEPARTMENT OF COMPUTER APPLICATIONS
MUSALIAR COLLEGE OF ENGINEERING & TECHNOLOGY
PATHANAMTHITTA, KERALA-689645

CERTIFICATE

This is to certify that the report entitled **"Group Sign"** submitted by **KEERTHY SUDEV** **(Register no: MCK21MCA-2014)**, to the APJ Abdul Kalam Technological University in partial fulfillment of the requirement for the award of Degree of Master of Computer Applications is a bona-fide record of the project work carried out by him, under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

Project Guide & Coordinator

Prof Jogimol Joseph

Assistant Professor

Dept. of MCA

Head of the Department

Prof Shyma Kareem

Assistant Professor

Dept. of MCA

Dr. Biku Abraham.
External Examiner

DEPARTMENT OF COMPUTER APPLICATIONS
MUSALIAR COLLEGE OF ENGINEERING & TECHNOLOGY
PATHANAMTHITTA, KERALA-689645

CERTIFICATE

This is to certify that the report entitled "**A Model for Fake Product Identification Using Supply Chain**" submitted by **RESHMI R (MCK21MCA-2027)**, to the APJ Abdul Kalam Technological University in partial fulfilment of requirement for the award of Degree of Master of Computer Applications is a bona-fide record of the project work carried out by her, under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

Guide
Prof. Sindhu Daniel
Assistant Professor
Dept. of Computer
Applications

Head of Department
Prof. Shyma Kareem
Assistant Professor
Dept. of Computer
Applications

Project Coordinator
Prof. Jogimol Joseph
Assistant Professor
Dept. of Computer
Applications

External Examiner

DEPARTMENT OF COMPUTER APPLICATIONS
MUSALIAR COLLEGE OF ENGINEERING & TECHNOLOGY
PATHANAMTHITTA, KERALA

CERTIFICATE

This is to certify that the report entitled, **"Sign Language to Speech Conversion using Deep Learning "** submitted by **AKSHAYA R (MCK21MCA-2006)** to the APJ Abdul Kalam Technological University in partial fulfillment of the requirements for the award of the Degree of Master of Computer Application is a bonafide record of the project work carried out by him under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

Guide

Prof Sindhu Daniel

Assistant Professor

Dept of Computer Applications

Head of the Department

Prof Shyma Kareem

Assistant Professor

Dept of Computer Applications

Project Coordinator

Prof Jogimol Joseph

Assistant Professor

Dept of Computer Applications

External Examiner

Dr. Biku Abraham

DEPARTMENT OF COMPUTER APPLICATIONS
MUSALIAR COLLEGE OF ENGINEERING & TECHNOLOGY
PATHANAMTHITTA, KERALA-689645

CERTIFICATE

This is to certify that the report entitled **"Edible And Poisonous Mushroom Classification Using Deep Learning"**, submitted by **AKSHAYA K S (Register no: MCK21MCA-2005)**, to the APJ Abdul Kalam Technological University in partial fulfilment of requirement for the award of Degree of Master of Computer Applications is a bona-fide record of the project work carried out by him, under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

Guide

Prof Sanobja Beegam

Assistant Professor

Dept. of Computer Applications

Head of the Department

Prof Shyma Kareem

Assistant Professor

Dept.of Computer Applications

Project Coordinator

Prof Jogimol Joseph

Assistant Professor

Dept. of Computer Applications

External Examinar

Dr. Biku Abraham.

DEPARTMENT OF COMPUTER APPLICATIONS
MUSALIAR COLLEGE OF ENGINEERING & TECHNOLOGY
PATHANAMTHITTA, KERALA-689653

CERTIFICATE

This is to certify that the report entitles **"CUSTOMER CHURN PREDICTION IN TELECOM"**, submitted by **AKSHARA K S (Register no: MCK21MCA-2003)**, to the APJ Abdul Kalam Technological University in partial fulfilment of requirement for the award of Degree of Master of Computer Applications is a bona-fide record of theproject work carried out by him, under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

Guide

Prof Jogimol Joseph

Assistant Professor

Dept of Computer Applications

Head of the Department

Prof Shyma Kareem

Assistant Professor

Dept of Computer Applications

Project Coordinator

Prof Jogimol Joseph

Assistant Professor

Dept of Computer Applications

External Examiner

Dr. Biku Abraham

DEPARTMENT OF COMPUTER APPLICATIONS

MUSALIAR COLLEGE OF ENGINEERING & TECHNOLOGY

PATHANAMTHITTA, KERALA-689645

CERTIFICATE

This is to certify that the report entitled **"ABNORMAL INFANT MOVEMENTS CLASSIFICATION USING DEEP LEARNING"** submitted by **ALFIYA NIZAM (Register no: MCK21MCA-2008)**, to the APJ Abdul Kalam Technological University in partial fulfilment of requirement for the award of Degree of Master of Computer Applications is a bona-fide record of the project work carried out by her, under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

Guide

Prof Sanooja Beegam

Assistant Professor

Dept. of Computer Applications

Head of the department

Prof Shyma Kareem

Assistant Professor

Dept. of Computer Applications

Project Coordinator

Prof Jogimol Joseph

Assistant Professor

Dept. of Computer Applications

External Examiner

Dr. Biku Abraham.

DEPARTMENT OF COMPUTER APPLICATION

MUSALIAR COLLEGE OF ENGINEERING & TECHNOLOGY

PATHANAMTHITTA, KERALA-689653

CERTIFICATE

This is to certify that the report entitled "TOWARDS PERSONALISED ADAPTIVE LEARNING IN E-LEARNING RECOMMENDER SYSTEMS" submitted by **KRISHNAVANI M P (Register no: MCK21MCA- 2015)**, to the APJ Abdul Kalam Technological University in partial fulfilment of requirement for the award of Degree of Master of Computer Application is a bona-fide record of the project work carried out by him, under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

Guide & Project Coordinator
Prof Jogimol Joseph
Assistant professor
Dept. of Computer Applications

Head of the Department
Prof Shyma Kareem
Assistant Professor
Dept. of Computer Applications

External Examiner
Dr. Biku Abraham

DEPARTMENT OF COMPUTER APPLICATIONS

MUSALIAR COLLEGE OF ENGINEERING & TECHNOLOGY

PATHANAMTHITTA, KERALA-689645

CERTIFICATE

This is to certify that the report entitled "STOCK MARKET PREDICTION" submitted by **ASIYA SALIM (Register no: MCK21MCA-2009)**, to the APJ Abdul Kalam Technological University in partial fulfilment of requirement for the award of Degree of Master of Computer Applications is a bona-fide record of the project work carried out by her, under my guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

Guide & Head of the Department

Prof Shyma Kareem

Assistant Professor

Dept of Computer Applications

Project Coordinator

Prof Jogimol Joseph

Assistant Professor

Dept of Computer Applications

External Examiner
Dr. Biku Abraham

DEPARTMENT OF COMPUTER APPLICATION MUSALIAR COLLEGE OF ENGINEERING & TECHNOLOGY PATHANAMTHITTA, KERALA-689645

CERTIFICATE

This is to certify that the report entitled **"DETECTING REAL TIME DEEP FAKE VIDEO USING NEURAL NETWORK"** submitted by **MITHUN P M (Register no: MCK21MCA-2022)**, to the APJ Abdul KalamTechnological University in partial fulfilment of requirement for the award of Degree of Master of Computer Applications is a bona-fide record of the project work carried out by her, under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

Guide

Prof SINDHU DANIEL

Assistant professor

Dept of Computer Applications

Head of the Department

Prof SHYMA KAREEM

Assistant professor

Dept of Computer Applications

Project Coordinator

Prof JOGIMOL JOSEPH

Assistant professor

Dept of Computer Applications

05/06/2

External Examiner

DEPARTMENT OF COMPUTER APPLICATION
MUSALIAR COLLEGE OF ENGINEERING & TECHNOLOGY
PATHANAMTHITTA, KERALA-689653

CERTIFICATE

This is to certify that the report entitled "**FIRE AND SMOKE DETECTION FROM CCTV IMAGES USING CNN** " submitted by **SHREYAS S PILLAI (Register no: MCK21MCA-2032)**, to the APJ Abdul Kalam Technological University in partial fulfillment of requirement for the award of Degree of Master of Computer Application is a bona-fide record of the project work carried out by him, under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

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III

DEPARTMENT OF COMPUTER APPLICATION
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CERTIFICATE

This is to certify that the report entitled " **Dynamic Hand Gesture Recognition Based on Short-Term Sampling Neural Networks**" submitted by **KIRAN M KURUP (Register no: MCK20MCA-2027)**, to the APJ Abdul Kalam Technological University in partial fulfilment of requirement for the award of Degree of Master of Computer Application is a bona-fide record of the project work carried out by her, under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

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CERTIFICATE

This is to certify that the report entitled " **LUNG DISEASE CLASSIFICATION USING DEEP LEARNING** " submitted by **ABHINAND A R (Register no: MCK21MCA- 2001)**,to the APJ Abdul Kalam Technological University in partial fulfilment of requirement for the award of Degree of Master of Computer Applications is a bona-fide record of the project work carried out by him, under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

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CERTIFICATE

This is to certify that the report entitled " **HATE SPEECH DETECTION USING DEEP LEARNING**", submitted by **ASWATHY BIJU (Register no: MCK21MCA-2011)**, to the APJ Abdul Kalam Technological University in partial fulfillment of requirement for the award of Degree of Master of Computer Applications is a bona-fide record of the project work carried out by him, under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

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CERTIFICATE

This is to certify that the report entitles "SUBJECTIVE ANSWER EVALUATION USING MACHINE LEARNING", submitted by SHIJIMOL SHIBU (Reg no: MCK21MCA -2031), to the APJ Abdul Kalam Technological University in partial fulfilment of requirement for the award of Degree of Master of Computer Applications is a bona-fide record of the project work carried out by her, under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

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CERTIFICATE

This is to certify that the report entitled, **"Intelligent Surveillance System For Crime Prevention Using Deep Learning"** submitted by **SAM K THAMPAN (MCK21MCA-2029)** to the APJ Abdul Kalam Technological University in partial fulfillment of the requirements for the award of the Degree of Master of Computer Application is a bonafide record of the project work carried out by him under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

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CERTIFICATE

This is to certify that the report entitled, **"GARBAGE CLASSIFICATION"** submitted by **ASWATHY R (MCK21MCA-2010)** to the APJ Abdul Kalam Technological University in partial fulfillment of the requirements for the award of the Degree of Master of Computer Application is a bonafide record of the project work carried out by her under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

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CERTIFICATE

This is to certify that the report entitled "**Wealth Monitoring and Analysis based on Token Generation**" submitted by MEFIN MATHEW (Register no: MCK20MCA-2020), to the APJ Abdul Kalam Technological University in partial fulfilment of requirement for the award of Degree of Master of Computer Applications is a bona-fide record of the project work carried out by her, under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

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CERTIFICATE

This is to certify that the report entitled **"EATHQUAKE PREDICTION USING DEEP LEARNING"** submitted by **LEKSHMI MOHAN (Register no: MCK21MCA-2016)**,to the APJ Abdul Kalam Technological University in partial fulfilment of requirement for the award of Degree of Master of Computer Application is a bona-fide record of the project work carried out by her, under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

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CERTIFICATE

This is to certify that the report entitled **"IMAGE CAPTION GENERATOR WITH SPEECH GENERATOR USING CNN AND LSTM"** submitted by **AKSHARA MADHUSOODANAN** **(Register No: MCK21MCA-2004)**, to the APJ Abdul KalamTechnological University in partial fulfilment of requirement for the award of Degree of Master of Computer Applications is a bona-fide record of the project work carried out by her, under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

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CERTIFICATE

This is to certify that the report entitled " **FACE LANDMARK DETECTION** " submitted by **SACHIN SADANANDAN (Register no: MCK21MCA- 2028)**, to the APJ Abdul Kalam Technological University in partial fulfilment of requirement for the award of Degree of Master of Computer Application is a bona-fide record of the project work carried out by him, under our guidance and supervision. This report in any form has not been submitted to anyother University or Institute for any purpose.

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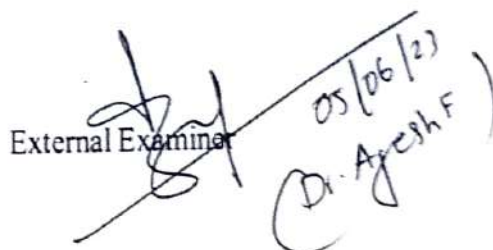# PATHANAMTHITTA, KERALA-689645

CERTIFICATE

This is to certify that the report entitled "**3D RECONSTRUCTION FROM MULTIMODEL DATA**" submitted by **SELIN SUNNY** (Register no: MCK21MCA-2030), to the APJ Abdul Kalam Technological University in partial fulfilment of requirement for the award of Degree of Master of Computer Applications is a bona-fide record of the project work carried out by her, under my guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

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CERTIFICATE

This is to certify that the report entitled " AN ADVANCED METHOD FOR THE DETECTION OF BOTNET TRAFFIC USING RANDOMIZED PARTITIONED LEARNING MODEL" submitted by AKHILA S PILLAI (Register no: MCK21MCA-2002), to the APJ Abdul Kalam Technological University in partial fulfilment of the requirement for the award of Degree of Master of Computer Applications is a bona-fide record of theproject work carried out by him, under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

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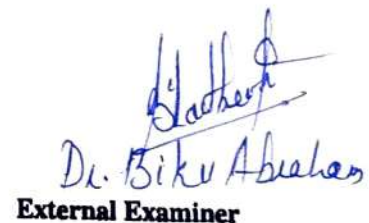
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CERTIFICATE

This is to certify that the report entitled **"Chatbot for Replace a Mentor"** submitted by **NEHA MARIAM DANIEL (MCK21MCA-2023)**, to the APJ Abdul Kalam Technological University in partial fulfillment of requirement for the award of Degree of Master of Computer Applications is a bona-fide record of the project work carried out by her, under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

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CDr. Ayesh F)

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CERTIFICATE

This is to certify that the report entitled, **"MEDICARE"** submitted by **NIJO JACOB** **(MCK21MCA-2024)** to the APJ Abdul Kalam Technological University in partial fulfillment of the requirements for the award of the Degree of Master of Computer Application is a bonafide record of the project work carried out by him under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

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CERTIFICATE

This is to certify that the report entitled "**Early Autism Spectrum Disorder Detection**" submitted by **MERIN SAMUEL (Register no: MCK21MCA-2021)**, to the APJ Abdul Kalam Technological University in partial fulfillment of requirement for the award of Degree of Master of Computer Applications is a bonafide record of the project work carried out by her, under my guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

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CERTIFICATE

This is to certify that the report entitled " **LANE LINE DETECTION SYSTEM IN PYTHON USING OPENCV** " submitted by **RESHMA P R (Register no: MCK21MCA-2026)** to the APJ Abdul Kalam Technological University in partial fulfillment of the requirement for the award of Degree of Master of Computer Applications is a bonafide record of the project work carried out by her, under our guidance and supervision.

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CERTIFICATE

This is to certify that the report entitled "**CATARACTNET**" submitted by **PRANAV PRAKASH** (Register no: **MCK21MCA- 2025**), to the APJ Abdul Kalam Technological University in partial fulfilment of requirement for the award of Degree of Master of Computer Applications is a bona-fide record of the project work carried out by him, under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

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CERTIFICATE

This is to certify that the report entitled **"NIGHT PATROL ROBOT"** submitted by **MAHIMA V PILLAI** **(Register no: MCK21MCA-2018)**, to the APJ Abdul Kalam Technological University in partial fulfillment of requirement for the award of Degree of Master of Computer Applications is a bonafide record of the project work carried out by her, under my guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

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CERTIFICATE

This is to certify that the report entitled " **INTELLI_DOCTOR** " submitted by **LINCY T SAJI** (**Register no: MCK21MCA-2017**), to the APJ Abdul Kalam Technological University in partial fulfilment of requirement for the award of Degree of Master of Computer Applications is a bona-fide record of the project work carried out by her, under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

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CERTIFICATE

This is to certify that the report entitled **"Emergency Vehicle Detection"** submitted by **MALAVIKA SOMARAJAN (Register no: MCK21MCA-2019)**, to the APJ Abdul Kalam Technological University in partial fulfillment of requirement for the award of Degree of Master of Computer Applications is a bonafede record of the project work carried out by her, under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

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CERTIFICATE

This is to certify that the report entitled "ELECTRICITY-THEFT DETECTION IN SMART GRIDS BASED ON DEEP LEARNING" submitted by SINI ELSA JOHN (Register no: MCK21MCA-2034), to the APJ Abdul KalamTechnological University in partial fulfilment of requirement for the award of Degree of Master of Computer Application is a bona-fide record of the project work carried out by her, under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

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CERTIFICATE

This is to certify that the report entitled, **"Sign Language to Speech Conversion using Deep Learning "** submitted by **AKSHAYA R (MCK21MCA-2006)** to the APJ Abdul Kalam Technological University in partial fulfillment of the requirements for the award of the Degree of Master of Computer Application is a bonafide record of the project work carried out by him under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

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CERTIFICATE

This is to certify that the report entitled "**Edible And Poisonous Mushroom Classification Using Deep Learning**", submitted by **AKSHAYA K S (Register no: MCK21MCA-2005)**, to the APJ Abdul Kalam Technological University in partial fulfilment of requirement for the award of Degree of Master of Computer Applications is a bona-fide record of the project work carried out by him, under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

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CERTIFICATE

This is to certify that the report entitles **"CUSTOMER CHURN PREDICTION IN TELECOM"**, submitted by **AKSHARA K S (Register no: MCK21MCA-2003)**, to the APJ Abdul Kalam Technological University in partial fulfilment of requirement for the award of Degree of Master of Computer Applications is a bona-fide record of theproject work carried out by him, under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

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CERTIFICATE

This is to certify that the report entitled "**ABNORMAL INFANT MOVEMENTS CLASSIFICATION USING DEEP LEARNING**" submitted by **ALFIYA NIZAM (Register no: MCK21MCA-2008)**, to the APJ Abdul Kalam Technological University in partial fulfilment of requirement for the award of Degree of Master of Computer Applications is a bona-fide record of the project work carried out by her, under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

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CERTIFICATE

This is to certify that the report entitled "TOWARDS PERSONALISED ADAPTIVE LEARNING IN E-LEARNING RECOMMENDER SYSTEMS" submitted by **KRISHNAVANI M P (Register no: MCK21MCA- 2015)**, to the APJ Abdul Kalam Technological University in partial fulfilment of requirement for the award of Degree of Master of Computer Application is a bona-fide record of the project work carried out by him, under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

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CERTIFICATE

This is to certify that the report entitled "**STOCK MARKET PREDICTION**" submitted by **ASIYA SALIM (Register no: MCK21MCA-2009)**, to the APJ Abdul Kalam Technological University in partial fulfilment of requirement for the award of Degree of Master of Computer Applications is a bona-fide record of the project work carried out by her, under my guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

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CERTIFICATE

This is to certify that the report entitled **"DETECTING REAL TIME DEEP FAKE VIDEO USING NEURAL NETWORK"** submitted by **MITHUN P M (Register no: MCK21MCA-2022)**, to the APJ Abdul KalamTechnological University in partial fulfilment of requirement for the award of Degree of Master of Computer Applications is a bona-fide record of the project work carried out by her, under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

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CERTIFICATE

This is to certify that the report entitled **"FIRE AND SMOKE DETECTION FROM CCTV IMAGES USING CNN "** submitted by **SHREYAS S PILLAI (Register no: MCK21MCA-2032)**, to the APJ Abdul Kalam Technological University in partial fulfillment of requirement for the award of Degree of Master of Computer Application is a bona-fide record of the project work carried out by him, under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

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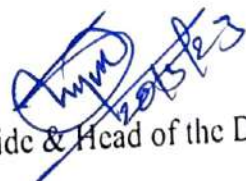
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CERTIFICATE

This is to certify that the report entitled " **Dynamic Hand Gesture Recognition Based on Short-Term Sampling Neural Networks**" submitted by **KIRAN M KURUP (Register no: MCK20MCA-2027)**, to the APJ Abdul Kalam Technological University in partial fulfilment of requirement for the award of Degree of Master of Computer Application is a bona-fide record of the project work carried out by her, under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

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This is to certify that the report entitled " **HATE SPEECH DETECTION USING DEEP LEARNING**", submitted by **ASWATHY BIJU** **(Register no: MCK21MCA-2011)**, to the APJ Abdul Kalam Technological University in partial fulfillment of requirement for the award of Degree of Master of Computer Applications is a bona-fide record of the project work carried out by him, under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

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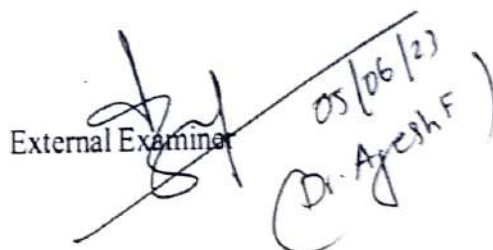# PATHANAMTHITTA, KERALA-689645

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IOT BASED SAFETY ENABLED INTELLIGENT STOVE

PROJECT REPORT

Submitted by

ANVARSHA C (MCK19CS008)
DAINE THOMAS (MCK19CS015)
SIBYL (MCK19CS035)

to

The APJ Abdul Kalam Technological University

in partial fulfillment of the requirements for the award of the Degree

of

Bachelor of Technology

In

Computer Science & Engineering

Department of Computer Science & Engineering

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June 2023

DECLARATION

We undersigned hereby declare that the project report on " **IOT BASED SAFETY ENABLED INTELLIGENT STOVE**", submitted for partial fulfillment of the requirements for the award of degree of Bachelor of Technologyof the APJ Abdul Kalam Technological University, Kerala is a bonafide work done by us under the supervision of **PROF. RAJEENA RAHMAN**. This submission represents our ideas in our own words and where ideas or words of others have been included. We have adequately and accurately cited and referenced the original sources. We also declare that we have adhered to ethics of academic honesty and integrity and have not misrepresented or fabricated any data or idea or fact or source in our submission. We understand that any violation of the above will be a cause for disciplinary action by the institute and/or the University and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been obtained. This report has not previously formed the basis for the award of any degree, diploma or similar title of any other University.

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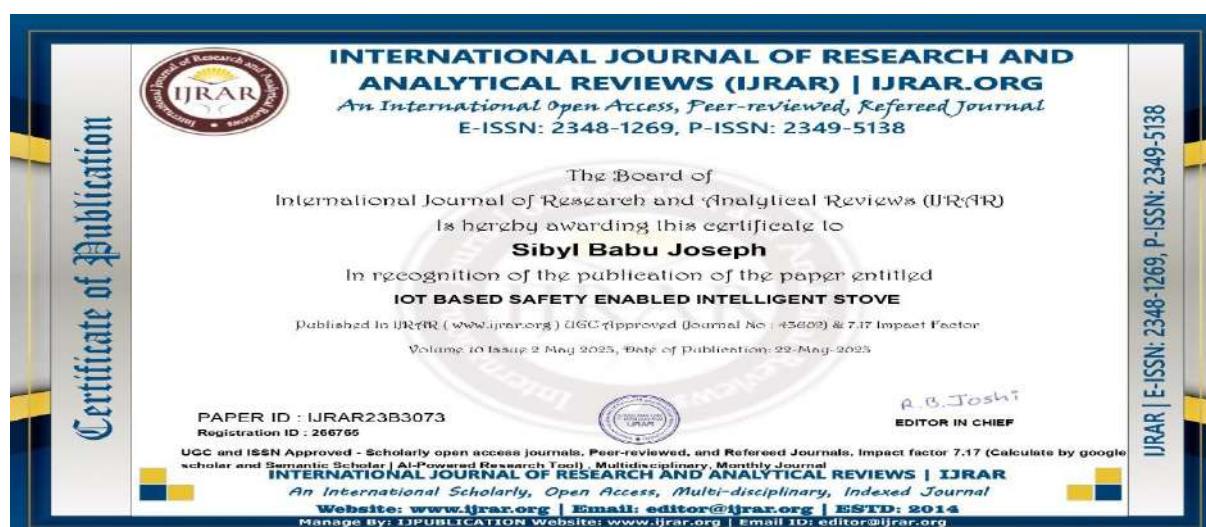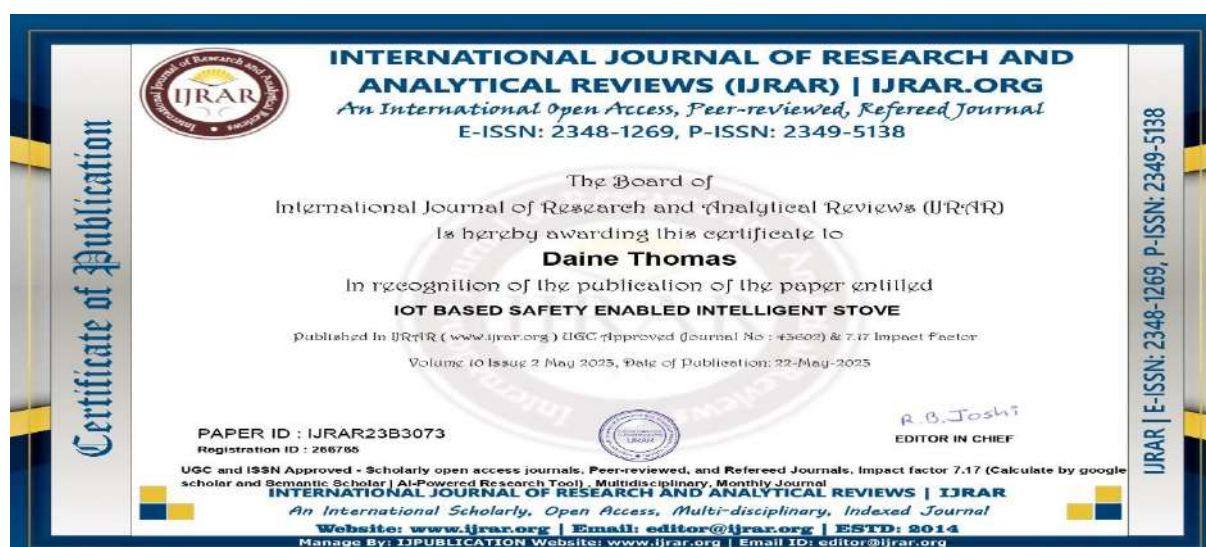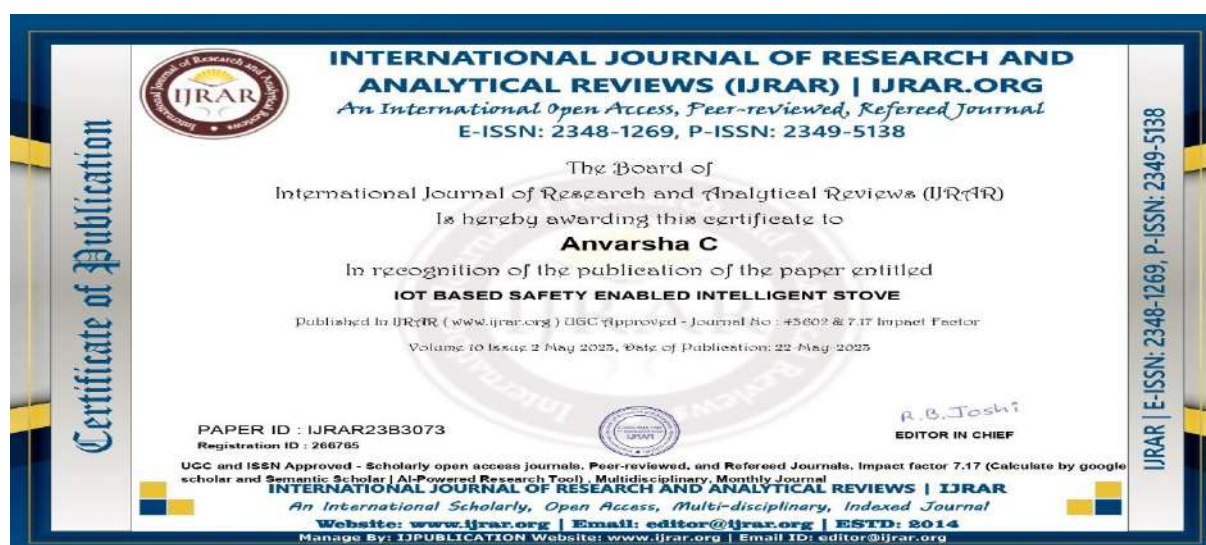
ACKNOWLEDGEMENT

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We take this opportunity to express our highest regard and sincere thanks to the project guide **PROF. RAJEENA RAHMAN**, Assistant Professor, Department of Computer Science and Engineering for the incomparable way in which she helped with valuable guidance, constructive criticism, and support in finishing our project successfully.

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ABSTRACT

Accidents on the kitchen stove are very dangerous, especially when there are kids around and when it is used carelessly. This study introduces a three-featured smart stove that is IoT-based and safety enabled. First, a camera-based child lock mechanism takes a picture of the user and uses machine learning models to assess their age; if their age is below a predetermined threshold, the stove won't light. Second, a gas leak module that makes use of a MQ2 gas sensor and GSM module detects the presence of dangerous gases and notifies the user via a buzzer and a text message sent to their mobile device. Thirdly, a PIR motion sensor and GSM module together identify the presence of people next to the stove. A warning message is sent to the user's cell phone if no presence is found after a certain amount of time. The suggested intelligent stove improves security and lowers the risk of mishaps.

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ABBREVIATIONS

ADC   -   Analog to Digital Coverter

ARPANET -   Advanced Research Projects Agency Network

CNN   -   Convolutional Neural Network

IOT   -   Internet of Things

GPIO   -   General Purpose Input/Ouput

GSM   -   Global System for Mobile communication

MQTT   -   Message Queuing Telemetry Transport

PIR   -   Passive Infrared

VNC   -   Virtual Networking Computer

WI-FI   -   Wireless Fidelity

CHAPTER 1

INTRODUCTION

1.1 General Background

One of the most rapidly expanding industries that has the potential to alter how people live their daily lives is the internet and embedded systems. The goal of embedded devices is to create a distinctive computer system. In most cases, an embedded system only performs one operation. However, these internet-connected embedded devices can converse via other network equipment. Additionally, these gadgets offer flexibility and amenities to enhance the living space. Through IoT (Internet of Things) characteristics, people have the ability to remotely manage and monitor the gadgets. Embedded systems have transformed many industries and improved the functionality and security of everyday gadgets. In this regard, it is important to note that although kitchen appliances are an integral part of our everyday lives, they also carry a certain amount of risk, particularly when used carelessly or in the company of small children. A novel IoT-based safety-enabled intelligent stove model is described and it uses the Raspberry Pi microprocessor as its fundamental technology combined with cutting-edge machine learning and computer vision techniques to address these problems.

Burns, gas leaks, and unattended operation on kitchen stoves are common safety concerns that necessitate appropriate preventive measures. Traditional safety features like timers and manual knobs are ineffective at reducing the risks of these mishaps. By adding intelligent features and real-time monitoring, the suggested solution seeks to get over these constraints.

The system's key component is the Raspberry Pi microprocessor, which serves as the stove's central control panel. The versatile and powerful Raspberry Pi makes an excellent platform for creating intelligent and interconnected systems. A complete safety system for kitchen stoves using the Raspberry Pi and a variety of sensors and modules is introduced.

The use of computer vision technology, specifically a Convolutional Neural Network (CNN) model, which enables accurate age detection by analysing the user's image acquired by a camera, is one of the major components of our intelligent stove model. Traditional child lock systems rely on manual controls or physical barriers, which can be tampered with or forgotten about, potentially resulting in accidents. The system prohibit access to young children and reduce the danger of mishaps brought on by their interaction with the stove by using our CNN-

based age prediction to ensure that the stove does not ignite if the user's age is below the predetermined age limit.

Additionally, The intelligent stove model incorporates a gas leak module that uses a MQ2 gas sensor to continuously check gas levels. Gas leaks present a serious safety risk since they could result in explosions or dangerous inhalation. The system enables real-time monitoring of gas levels by including a gas sensor in our system. An alarm is set off whenever the gas level rises above a predefined threshold, warning the user via a siren and immediately sending a message to their mobile phone via a GSM module. With the help of this real-time signal, users can take timely action to reduce the danger of gas-related events. For example, they can ventilate the area or turn off the gas supply.

To further detect the presence of a human close to the stove, the system includes a passive infrared (PIR) motion sensor. This feature promotes energy efficiency while also improving safety, among other things. A message informing the user that the stove is on and unattended is sent to their cell phone if no presence is detected for a predetermined amount of time. This feature acts as an active defence against careless use and shields against potential mishaps brought on by leaving the stove unattended.

The suggested intelligent stove model considerably improves safety and lowers the possibility of mishaps in the kitchen by combining the capabilities of the Raspberry Pi microprocessor, CNN-based age prediction, real-time gas monitoring, and presence detection. Users are given the ability to make knowledgeable judgements and act quickly to avoid potential hazards thanks to the integration of cutting-edge technologies and real-time notifications. Additionally, the system's adaptability and scalability makes it simple to integrate with already-existing kitchen appliances, making it a useful and workable option for boosting kitchen safety.

1.2 PROBLEM STATEMENT

The lack of an effective and intelligent method for monitoring and managing stoves in homes is the issue this model seeks to solve. Traditional stove systems don't have modern features, and they can't give real-time feedback, which can create safety risks and waste energy. Accurate age prediction techniques are also required to offer personalised settings and guarantee user security.

Stove systems currently in use frequently have manual controls and no automated safety features. Gas leaks, fires, and energy waste are all risks as a result of this. Additionally, these

systems do not take into account the age and tastes of each user, which results in less than ideal cooking circumstances.

Additionally, precise age prediction is essential for customising stove settings. Traditional age estimation techniques are frequently subjective or rely on labor-intensive, error-prone manual input. To optimise stove settings based on the user's age and preferences, a more accurate and automatic age prediction algorithm is needed.

The construction of an IoT-based stove model that incorporates several modules for gas detection, age prediction, and motion sensing is suggested in this research as a solution to these problems. The goal of the gas detection module is to immediately identify and notify users of any potential gas leaks or abnormal gas levels. A CNN model is used by the age prediction module to determine the user's age and enable customised stove settings. To ensure safety and energy efficiency, the PIR motion sensor module monitors the presence and movement of people in the kitchen.

The goal is to develop and put into operation an intelligent stove system that improves user comfort, energy efficiency, and safety. The suggested system seeks to offer real-time gas detection, precise age prediction, and effective motion sensing capabilities by integrating cutting-edge technologies including IoT, machine learning, and computer vision. Through comprehensive experimentation and analysis, the system's performance and effectiveness will be assessed.

In general, the suggested stove model seeks to overcome the shortcomings of conventional stove systems by integrating intelligent elements that improve user experience, safety, and energy efficiency.

1.3 PROJECT SCOPE

The project's scope includes creating an IoT-based stove model with several modules for motion sensing, age prediction, and gas detection. The main goal is to make cooking surroundings safer and more convenient. To avoid potential risks, the gas detection module seeks to precisely identify and track gas leaks. The age prediction module focuses on guessing users' ages, which can be used for safety features and personalised settings. The motion sensor module enables automatic stove activation or deactivation by detecting human presence. The project also investigates how real-time data analytics and remote monitoring could offer users insightful information and improved functionality.

CHAPTER 2

LITERATURE REVIEW

2.1 " Deeply Learned Classifiers for Age and Gender Predictions of Unfiltered Faces." By Agbo-Ajala, O., & Viriri, S , The Scientific World Journal, 2020, 1–12.

Recently, the field of computer vision has become more aware of facial analysis. The features of a person's face can be used to infer information about their identity, age, gender, emotions, and ethnicity. Age and gender classification among these features can be particularly useful in a number of real-world applications, such as security and video surveillance, electronic customer relationship management, biometrics, electronic vending machines, human-computer interaction, entertainment, cosmetology, and forensic art. However, there are still unresolved issues with how age and gender are classified. Despite the advancements the computer vision community continues to make with the constant development of new techniques that advance the state of the art, age and gender predictions of unfiltered real-life faces have not yet been able to satisfy the requirements of commercial and practical applications. In order to combat these issues a CNN model is proposed. The model predicts age and gender from face images. Following steps are taken to ensure efficient gender and age classification :-

1. A CNN architecture is introduced to accurately identify the gender and age group of human faces in unfiltered, outside surroundings.

2. A robust preprocessing algorithm is designed that prepare and preprocess the raw pictures for the CNN model, which has a significant impact on how well our age and gender classifiers perform.

3. Pretraining on massive datasets enables age and gender CNN models to be trained effectively, allowing the classifiers to generalise on test images and then prevent overfitting.

4. Finally, OIU-Adience benchmark is used to assess the performance of our novel CNN model. Despite the extremely difficult nature of the dataset's images, this approach significantly outperforms state-of-the-art methods in terms of age group and gender classification accuracy, and the outcome can meet the needs of numerous real-world applications.

2.2 Jamadagni, S., Sankpal, P., Patil, S., Chougule, N., & Gurav, S. (2019)."Gas Leakage and Fire Detection using Raspberry Pi". 2019 3rd International Conference on Computing Methodologies and Communication (ICCMC).

The performance of the pre-existing systems is significantly outperformed by the newly implemented gas leakage and fire detection system. This technique uses MQ-2 gas sensors and a Raspberry Pi as a control system. Utilizing the Internet of Things, the sensors' output of data is uploaded to the cloud (IoT).

The Internet of Things (IoT) is primarily used to link electronic items, such smart phones, TVs, and sensors, to the Internet. When devices are connected, new forms of communication can be established between them, as well as between devices and humans. According to the needs of those who utilise it, there have been several updates and advancements in the field of IOT. Every IOT update gives us access to brand-new, cutting-edge facilities. An open source data platform and API for the Internet of Things is called "Thing Talk." The interplay between embedded hardware and online services, along with a wide spectrum of internal communication, is what the Internet of Things is all about. Using sensors like Arduino and Raspberry Pi, you can gather, store, and analyse data with the help of ThingSpeak.

2.3 P. Kanaka, P.S.G Aruna. An IOT Based LPG Leakage Sensing and Alerting System.(IJITEE)ISSN:2278-3075,Volume-8,Issue-6,April 2019.

A gas detecting and alerting framework is introduced. The structure protects the populace and makes it difficult for cattle to escape a fire. the application. The Framework will make it possible to protect people and property effectively. The Internet of Things is a technology driver that is connected to many types of sensors. using a device connected to the ARPANET. This is appropriate for using the Internet of Things to exchange data. Its intent can be expanded to include more comprehensive insurance models. It facilitates the creation of cost-effective applications. The Internet of Things stage plays a crucial role in ensuring the security of human life. LPG is an ignitable gas that is primarily associated with domestic and commercial settings. The majority of people in our country consume liquefied petroleum Gas is used as a burnable fuel for cooking. With the help of the sensors' documentation, the alarming framework can consistently determine when gas is being released.As a result IoT related connect science is also used. This system will not only be able to detect gas leaks but will also be able to warn through audible alarms. When frightening gas in excess proportions is nearby, this structure can give the customer advice. Through a message, the system can inform the public administration of the situation before an emergency arises. Through the use of SMS, cell interfaces are utilised to warn the public about potential gas leaks. The MQ5 sensor is employed for detecting LPG, vaporous oil, town gas, and maintaining a crucial distance from the upheaval of alcohol and cooking vapour and smoke. Internet of Things-based Gas Spillage Recognition Framework, Expectation, and Shrewd Cautioning will recognise gas spillage. Check the proximity of the richest extents of destructive gases and be encouraged by alarms. Through the use of IOT, it will be possible to alert people about the status of a gas leak through the SMS abuse gas application, elective texts sent to gas associations in specific locations, and a ready SMS sent through email for certain talent. When there is a gas leak, Wi-Fi interfaces are used to alert the entire community with a light and sound display.

2.4 "Gas Leakage Detection And Smart Alerting System" K.Manichandana, Simrah Umme Ruman, Harshavardhini Biderkota, Ms. PR Anisha, Dr.BVRamana Murthy, and Mr.C Kishor Kumar (2018).

A new area of study with significant technical, social, and economic implications is the Internet of Things. Internet connectivity and potent data analysis skills are being integrated with consumer goods, durable goods, automobiles and trucks, industrial and utility components, sensors, and other ordinary objects in a way that promises to alter how we work, live, and play. With the aid of sensors, electronics, software, and connection, physical objects may communicate with one another through the Internet of Things (IOT). There is no need for human involvement with these systems. The Internet of Things (IOT) is a significant subject in the engineering, policy, and technology fields. A wide variety of networked devices, systems, and sensors use this technology to provide new capabilities by utilising improvements in processing power, electronics downsizing, and network connectivity. By enhancing information accessibility along the production value chain by deploying networked sensors, IOT technology offers the potential to alter agriculture, industry, and energy production and delivery. Through IOT, the internet has now spread beyond our personal computers and mobile phones to nearly anything that is present around us. The fundamental concern of every project, safety, has not been left unaffected by IOT. Gas detector sensors, an Arduino board, an ESP8266 module, and a cloud server make up the system. Every time a value is sensed by a sensor, the system sends the value to a cloud server, which then checks to see if the sensor value has exceeded the threshold. The server will send the command to the hardware for buzzing the alarm if the sensor value exceeds the limit. Additionally, the server notifies the user.

2.5 Gil Levi and Tal Hassner."Age and Gender Classification Using Convolutional Neural Networks". IEEE Workshop on Analysis and Modeling of Faces and Gestures (AMFG), at the IEEE Conf. on Computer Vision and Pattern Recognition (CVPR), Boston, 2015.

In social relationships, gender and age are crucial factors.Languages retain various greetings and grammar rules for men and women, and when addressing elders as opposed to young people, different vocabularies are frequently utilised. Despite the fundamental importance these characteristics play in our daily lives, commercial applications still have a long way to go before they can be reliably and accurately estimated automatically from face photos. Given previous claims of super-human ability in the related job of face recognition, this is especially puzzling. In the past, methods for estimating or categorising these attributes from face photos have depended on variations in the size of facial features or "tailored" face descriptors (e.g., [10, 15, 32]). For jobs including estimating age or gender, the majority have used classification schemes such and others. Few of these earlier techniques were created to address the numerous difficulties presented by unrestricted imaging settings. Additionally, these systems' machine learning techniques did not fully take advantage of the enormous amounts of image examples and data that are accessible via the Internet in order to enhance categorization skills.

Here, an effort is made to reduce the gap between automatic facial recognition technology and methods for estimating age and gender. In order to achieve this, the effective model set by current face recognition systems is selected.

Deep convolutional neural networks (CNN) can be used to make great strides in face recognition algorithms, as demonstrated in recent years. We show comparable benefits using a straightforward network architecture that was created with the sparse availability of precise age and gender labels in existing face data sets in mind. Adience benchmark is used to test the model

CHAPTER 3

EXISTING SYSTEM

Stoves have been an essential part of human life for cooking food for centuries. In the past few decades, technological advancements have led to the development of smart stoves, which offer increased safety, convenience, and control. These stoves integrate Internet of Things (IoT) technology, allowing users to remotely control the cooking process and monitor the food as it cooks.

Gas stoves have been widely used in households and commercial kitchens for many years. Despite their popularity, they also pose significant dangers. Gas leaks, fires, and explosions are some of the dangers associated with gas stoves, making safety a top priority when it comes to stove design and usage. To address these concerns, smart stoves have been designed with advanced safety features such as automatic shutoff and control locks to prevent accidental activation.

Here are some of the existing smart stoves :-

1. Samsung Smart Gas Range - This stove has IoT connectivity, allowing users to remotely control cooking temperature and time. It also has an automatic shutoff for added safety.

2. GE Profile Slide-In Smart Gas Range - This stove also has IoT connectivity and remote control capabilities. It has a safety feature that automatically turns off the burners if left on for too long.

3. LG Smart Wi-Fi Enabled Electric Double Oven Range - This electric stove has IoT connectivity and remote control features. It also includes safety features such as automatic shutoff and a control lock to prevent accidental activation.

4. Bosch Benchmark Smart Slide-In Gas Range - This stove has a built-in touch screen display that allows for remote control. It also has safety features such as automatic shutoff and a child lock.

These smart stoves provide a safer and more convenient cooking experience by allowing users to remotely monitor and control the cooking process. They also include advanced safety features to prevent accidents and minimize the risk of gas leaks, fires, and explosions.

Smart stoves have revolutionized the way we cook by integrating IoT technology and advanced safety features. The examples discussed above demonstrate the current state of smart stove technology and the continued development of safer and more convenient cooking solutions. With the increasing demand for smart home appliances, it is likely that we will see continued advancements in smart stove technology in the coming years.

CHAPTER 4

SYSTEM DESIGN

4.1 PROPOSED SYSTEM

The proposed system is an IoT-based safety-enabled intelligent stove model created to improve kitchen surroundings' safety and security. The system has a number of elements to lessen the dangers of using the stove and lower the likelihood of accidents, particularly in homes with kids or when using a stove carelessly.

The system's child lock function, which uses a camera to capture the user's image and determine their age, is one of its major components. The system can precisely predict the user's age by using a Convolutional Neural Network (CNN) model. The stove will not ignite if the detected age is below the set age limit, preventing kids from using it recklessly.

The system incorporates a gas leak module employing a MQ2 gas sensor to address the potential risks of gas leaks. The gas pressure around the stove is continuously monitored by this sensor. A buzzer alert and a notification message are delivered to the user's mobile through a GSM module if the gas level rises above a specific threshold. Users can respond right away to avert any dangerous circumstances due to this real-time notification.

A Raspberry Pi microprocessor, specifically the Raspberry Pi 4 Model B with 8GB RAM, powers the system's control unit. As the system's central processing unit, the Raspberry Pi is in charge of coordinating and integrating all of the system's many parts. It collects input from the sensors, analyses the data, and then initiates the necessary actions in accordance with predetermined rules and conditions.

The Python programming language is used to implement the system in terms of software development and programming. The logic and algorithms needed for data processing, sensor integration, and connectivity with external modules can be coded in a flexible and effective environment using Python.

Last but not least, the suggested IoT-based safety-enabled intelligent stove model offers a creative way to improve kitchen safety. The device dramatically lowers the risks connected with stove use by combining features like the kid lock mechanism, gas leak detection, and presence monitoring.

4.2 SYSTEM ARCHITECTURE

The proposed system consists of:-

1) Raspberry Pi microprocessor

2) Raspberry Pi camera module

3) MQ-2 Gas sensor

4) PIR Motion sensor

5) GSM Module

6) LED

7) Buzzer
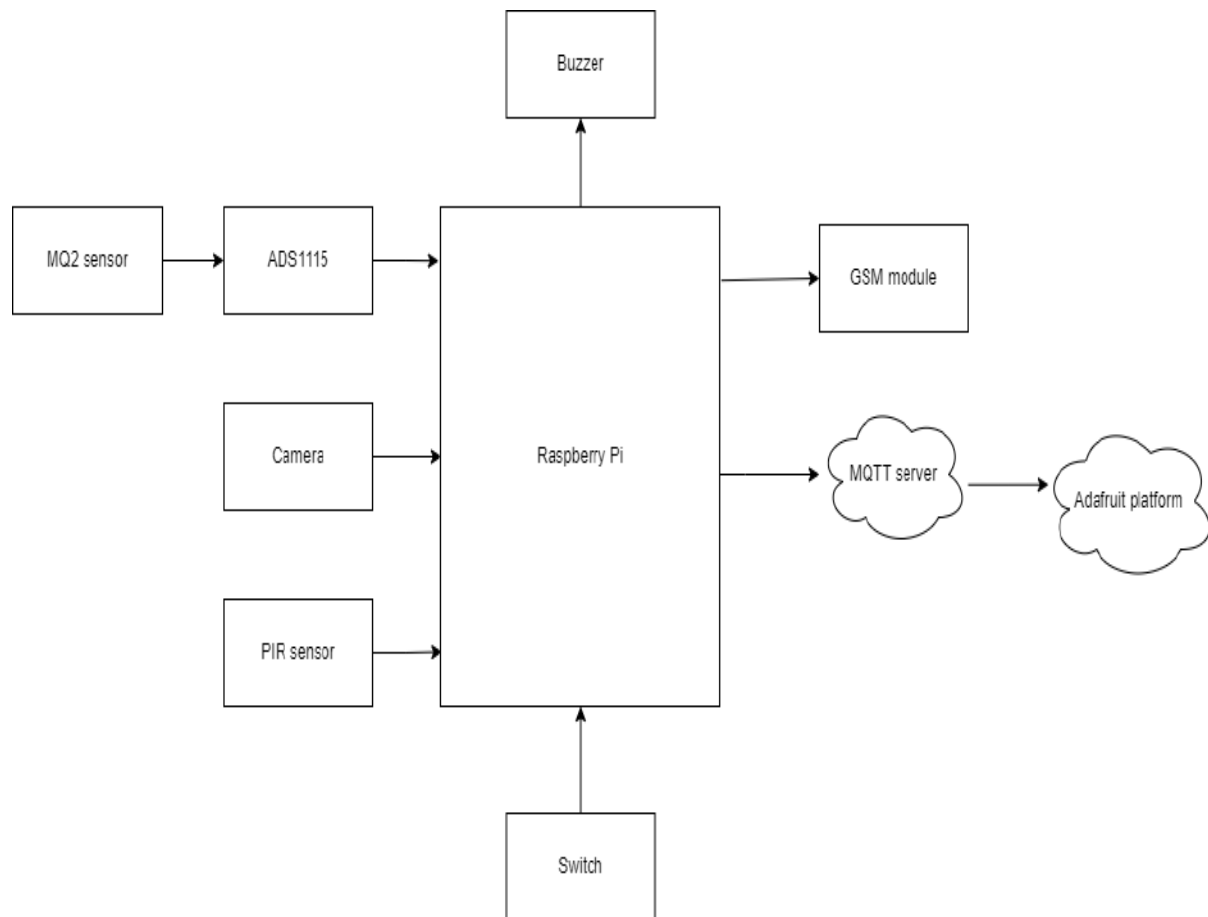
Figure 4.1: Architecture of the proposed system

Here raspberry pi is the main controller. Pi camera is interfacing with raspberry pi and also the PIR sensor and the switch. The MQ2 sensor is interfacing to the controller through the ADC

module. The GSM module is used to send sms to the phone and it is interfacing with the controller and the buzzer is connected to the controller for producing beep sound. The data collected in raspberry pi is sent to the adafruit platform through the MQTT server.

(a) MQ-2 Gas Sensor   (b) Raspberry pi Camera   (c) PIR Motion Sensor
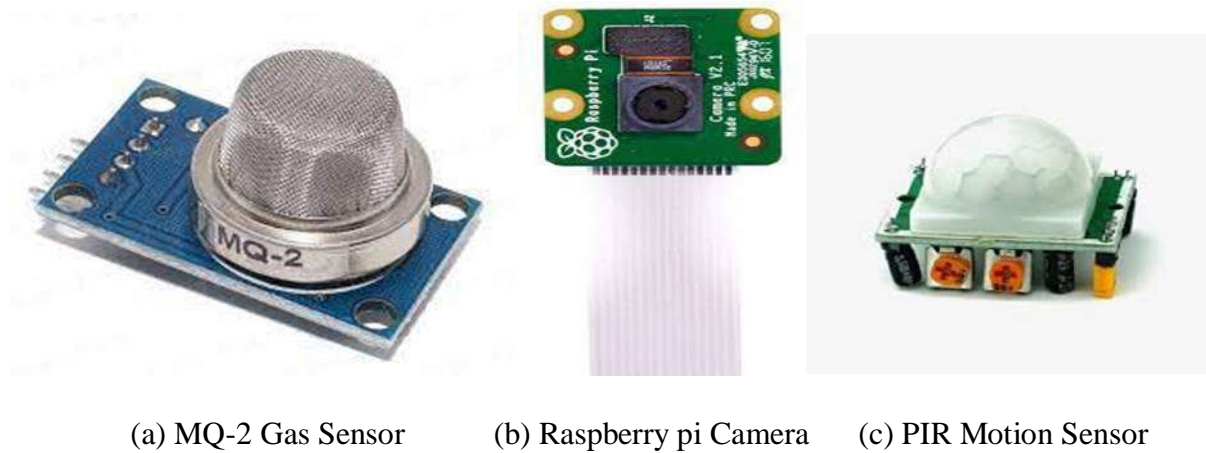
Figure 4.2 Sensors used in the proposed system

4.2.1 Raspberry pi microprocessor

Raspberry Pi is a series of single-board microcomputers developed in the UK by the Raspberry Pi Foundation. These microcomputers are small, affordable, and customizable, making them ideal for a wide range of projects, from DIY electronics to educational tools.

The core control component of the IoT-based safety-enabled intelligent stove model is the Raspberry Pi microprocessor, more especially the Raspberry Pi 4 Model B with 8GB RAM. A flexible and potent single-board computer, the Raspberry Pi is made for a variety of uses, including IoT projects.

The Raspberry Pi 4 Model B offers the required computing capacity to manage data processing, regulate stove operations, and facilitate communication between various system components thanks to its sophisticated processing capabilities and enough of memory. The 8GB RAM guarantees effective multitasking and enables the rapid execution of intricate algorithms and jobs.

The Raspberry Pi 4 Model B offers greater performance and dependability because to its Broadcom BCM2711 system-on-a-chip (SoC), which houses a quad-core ARM Cortex-A72

CPU. The intelligent stove model has the processing power to handle real-time data analysis and decision-making duties thanks to its 64-bit architecture and clock speed of up to 1.5 GHz.

Input/output (I/O) ports and connectivity options available on the Raspberry Pi 4 Model B include numerous USB ports, HDMI, Ethernet, Wi-Fi, Bluetooth, and GPIO (General Purpose Input/Output) pins. These interfaces allow for smooth connection with the GSM modules, sensors, cameras, and other intelligent stove model accessories.

In addition, the Raspberry Pi runs the Raspberry Pi OS, a Linux-based operating system that was formerly known as Raspbian. A user-friendly interface, as well as a variety of software libraries and tools, are provided by this operating system, which streamlines the development and deployment procedures.

The intelligent stove model can effectively process data, control stove operations based on real-time inputs, and ensure seamless communication between various components, improving the safety and functionality of the stove. It does this by utilising the computing power, memory capacity, and versatile connectivity options of the Raspberry Pi 4 Model B.

Overall, the IoT-based safety-enabled intelligent stove model is built on the Raspberry Pi microprocessor, specifically the Raspberry Pi 4 Model B with 8GB RAM. This device enables smart decision-making and effective stove management.
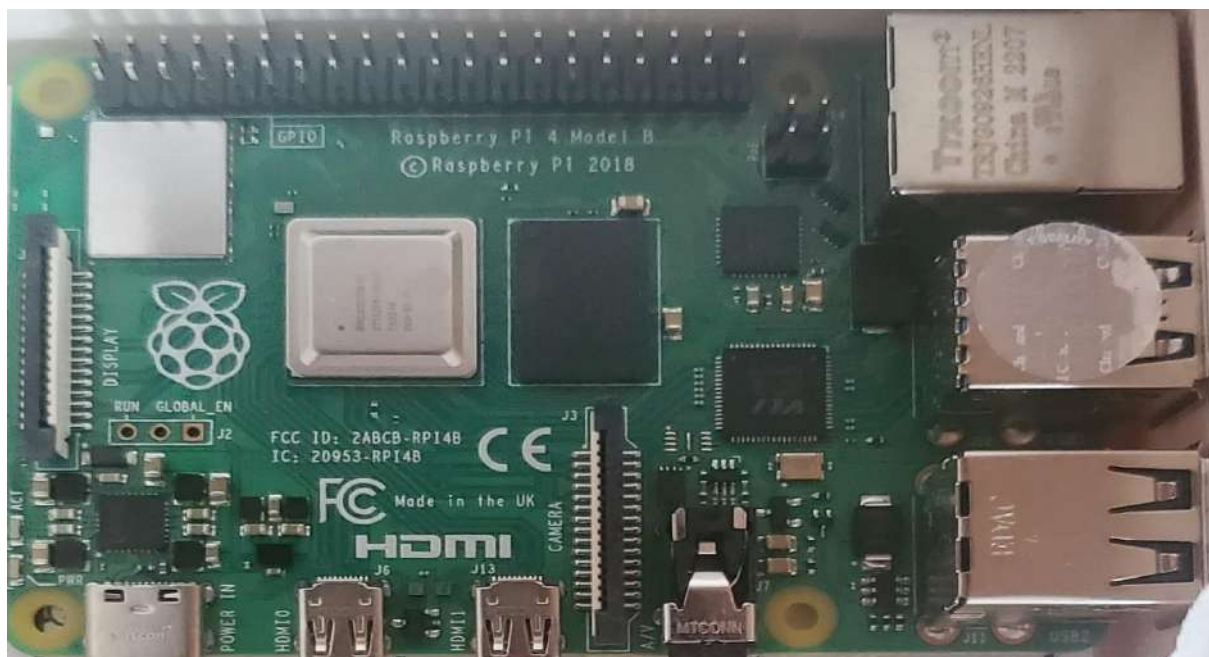
Figure 4.3: Raspberry Pi Microprocessor

4.2.2 Raspberry pi camera module

The Raspberry Pi Camera Module is a small, lightweight camera designed specifically for use with Raspberry Pi boards. It is available in two versions: the original camera module and the higher resolution camera module v2.

The original camera module features a 5-megapixel sensor and is capable of capturing 1080p video at 30 frames per second, as well as still images. The module connects to the Raspberry Pi board through a ribbon cable and can be controlled using the Raspberry Pi camera software.

The camera module v2 features an 8-megapixel sensor and is capable of capturing 1080p video at 60 frames per second, or 720p video at 120 frames per second, as well as still images. It also includes a Sony IMX219 sensor with improved low-light sensitivity and an integrated infrared filter. Like the original camera module, it connects to the Raspberry Pi board through a ribbon cable and can be controlled using the Raspberry Pi camera software.

Both camera modules are capable of capturing high-quality images and videos, making them ideal for a variety of projects, including surveillance cameras, time-lapse photography, and robotics. They are also useful for educational purposes, allowing students to explore the basics of digital photography and image processing.

The Raspberry Pi camera software includes a range of features, including adjustable camera settings, such as exposure and white balance, and the ability to capture time-lapse images or video. The software can also be used to stream live video over a network, making it possible to create remote monitoring systems or video conferencing solutions.

Overall, the Raspberry Pi Camera Module is a versatile and affordable camera solution that can be used in a wide range of projects, from hobbyist to industrial applications. Its small form factor and compatibility with Raspberry Pi boards make it an excellent option for anyone looking to add camera functionality to their project.

4.2.3 MQ-2 Gas Sensor

The MQ-2 gas sensor is a small, inexpensive sensor that is capable of detecting various types of gases, including smoke, propane, butane, LPG, natural gas, and methane. The sensor works on the principle of the resistance change in the presence of the target gas.

The MQ-2 sensor is a type of gas sensor that is commonly used in electronic projects, particularly those that involve monitoring air quality or detecting gas leaks. It is small in size and can be easily integrated into a variety of circuits and systems.

The sensor is based on a metal oxide semiconductor (MOS) technology, which relies on the change in resistance of the sensing material when exposed to a target gas. The sensing material in the MQ-2 sensor is tin dioxide (SnO_2), which is sensitive to various gases. When the target gas comes into contact with the SnO_2 sensing material, the resistance of the material changes, which can be measured and used to detect the presence of the gas.

The MQ-2 sensor is typically supplied with a small circuit board that includes an adjustable resistor for calibrating the sensor, as well as a heater element to heat the sensing material. The sensor requires a voltage of 5V to operate and outputs an analog signal that can be read by a microcontroller or other electronic device.

The MQ-2 sensor is commonly used in projects such as gas leak detectors, air quality monitors, and fire alarms. It is also used in industrial applications for monitoring gas emissions and ensuring workplace safety.

Overall, the MQ-2 gas sensor is a versatile and affordable sensor that can be used to detect a variety of gases. Its small size and ease of integration make it an excellent option for electronic projects, particularly those involving air quality or gas detection. However, it is important to note that the accuracy of the sensor can be affected by factors such as temperature and humidity, so calibration and proper usage are important considerations when working with the MQ-2 sensor.

4.2.4 Passive Infrared (PIR) Motion Sensor

A passive infrared (PIR) motion sensor is a type of electrical device that uses changes in the infrared radiation that live things release to detect the presence of people or animals within its field of view. It is a popular sensor that is utilised in many systems, such as security systems and automated smart homes.

The PIR motion sensor functions by sensing the infrared radiation that things produce. It has a pyroelectric sensor that, when exposed to infrared light, produces an electric charge. The sensor is made up of two halves, each of which is covered in an infrared radiation-filtering substance. The temperature of the detection region changes as a human moves in front of the sensor,

creating an alteration in the infrared radiation. The sensor notices this alteration in radiation and generates an output signal.

The PIR motion sensor is made to be sensitive to variations in infrared radiation but less sensitive to variations in the surrounding environment, such as changes in ambient temperature. It has a wide coverage area and can detect motion up to a few metres away at a specific angle.

The PIR motion sensor is used in systems like home security systems to detect unauthorised movement and sound alarms or turn on surveillance cameras. It can be utilised in lighting controls to automatically turn on lights when motion is sensed, offering convenience and conserving energy. The PIR motion sensor can also be combined with other devices in smart home automation to build responsive and automated systems.

Overall, the PIR motion sensor is a useful part in a variety of applications where the ability to recognise people or animals is crucial. It is a dependable and efficient sensor for boosting security, energy efficiency, and convenience in a variety of situations thanks to its capacity to detect changes in infrared radiation.

4.2.5 GSM Module

Real-time notifications are made possible in the IoT-based safety-enabled intelligent stove model by the inclusion of a GSM module, specifically the SIM800L. Cellular connectivity provided by the GSM module enables the system to send messages and notifications to the user's phone in the event of urgent situations or safety issues involving the stove.

The SIM800L GSM module is highly suited for IoT applications since it has dependable and effective communication capabilities. It enables the transmission of data and messages across cellular networks by supporting a number of communication protocols, including 2G GSM and GPRS.

Figure 4.4 GSM SIM800L Module

4.2.6 LED

Light-emitting diodes (LEDs) are semiconductor devices that emit light when a voltage is applied across them. They are commonly used in a wide range of electronic applications, including lighting, display panels, and indicator lights.

LEDs are highly efficient at converting electricity into light, making them an attractive option for energy-efficient lighting solutions. They also have a longer lifespan compared to traditional incandescent bulbs, as they do not have a filament that can burn out over time.

LEDs come in a variety of shapes and sizes, from small indicator lights to larger panels used for lighting applications. They are available in a range of colors, including red, green, blue, and white. Color-changing LEDs are also available, allowing for a dynamic range of lighting options.

LEDs are commonly used in lighting applications, from residential and commercial lighting to automotive and outdoor lighting. They can be used as task lighting, accent lighting, or general lighting, depending on the application. They are also used in display panels, such as those found in televisions and computer monitors.

One of the key advantages of LEDs is their low power consumption, making them ideal for portable electronic devices such as smartphones and laptops. They are also used in automotive applications, such as brake lights and headlights, due to their low power consumption and long lifespan.

Overall, LEDs are a versatile and energy-efficient lighting solution that can be used in a wide range of applications. They offer a longer lifespan and lower power consumption compared to traditional lighting solutions, making them an attractive option for many electronic applications.

4.2.7 Buzzer

An active buzzer module is an electronic component that produces a buzzing or beeping sound when an electrical signal is applied to it. It is commonly used in electronic projects that require an audible alert or notification.

The active buzzer module consists of a piezoelectric buzzer and a built-in driver circuit. The driver circuit includes a transistor that controls the buzzer, allowing it to produce a range of

tones and frequencies. The module is typically powered by a 5V DC power supply and can be controlled by a microcontroller or other electronic device.

The active buzzer module is easy to use and requires only a simple electrical connection to operate. It can be controlled by a microcontroller or other electronic device using pulse-width modulation (PWM) or other digital signals. The module can also be programmed to produce different sounds and tones, making it a versatile component in many electronic projects.

The active buzzer module is commonly used in electronic projects such as alarms, timers, and notification systems. It can also be used in automotive applications, such as in car alarms and security systems.

Overall, the active buzzer module is a simple and versatile electronic component that is commonly used in many electronic projects. Its ease of use and ability to produce a range of tones and frequencies make it an essential component for many applications where an audible alert or notification is required.

CHAPTER 5

METHODOLOGY
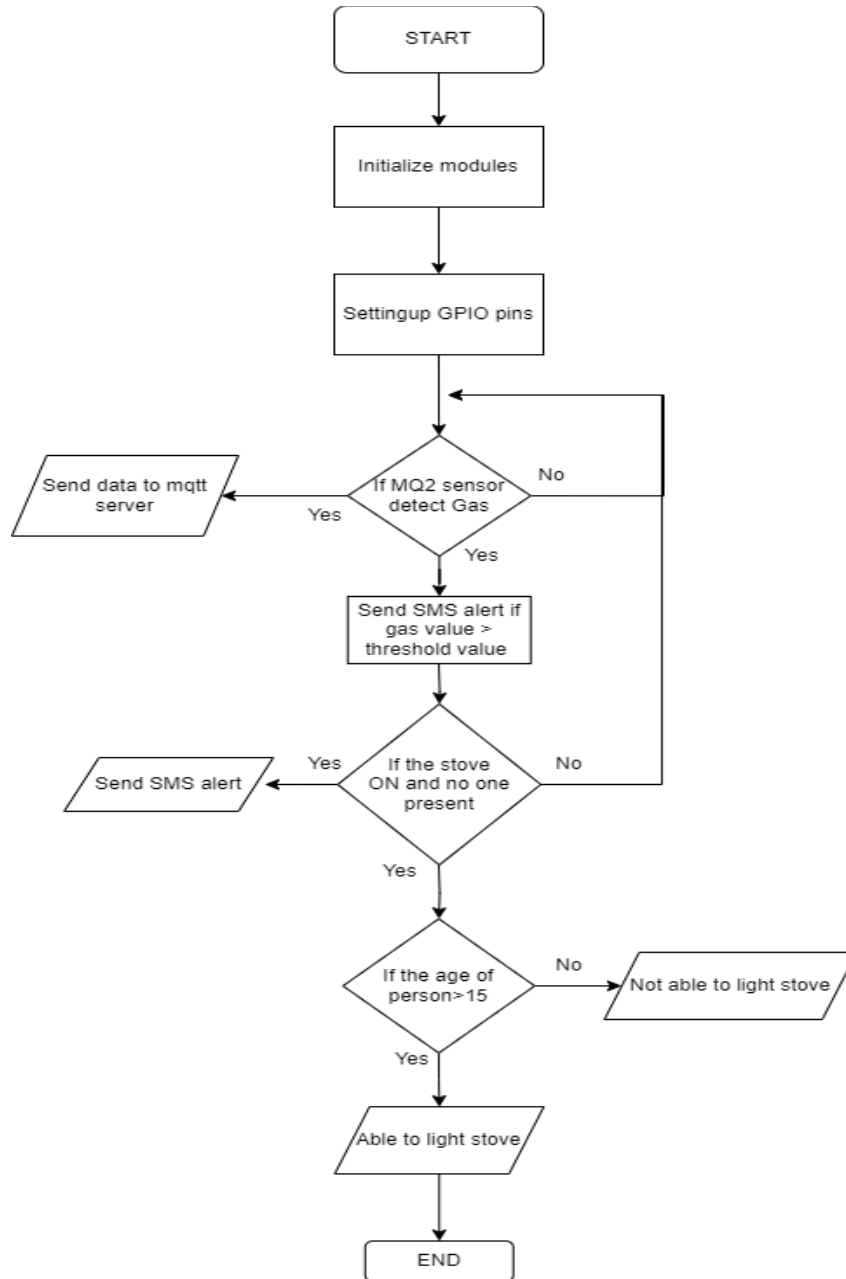
5.1 WORKFLOW

Figure 5.1: Workflow of the proposed system

The model's workflow consists of a number of connected phases. The gas detection module, for starters, constantly scans for gas leaks to provide a secure environment in the kitchen. Second, the age prediction module provides an estimate of the users' ages to within 12 years,

enabling customised settings and safety precautions. Thirdly, the motion detecting module recognises the presence of people and enables automatic activation or deactivation of the stove. Finally, the system combines data and performs real-time analysis, offering insightful information and control possibilities. This streamlined process improves kitchen productivity, convenience, and safety, making it the perfect choice for households.

5.2 CIRCUIT DIAGRAM
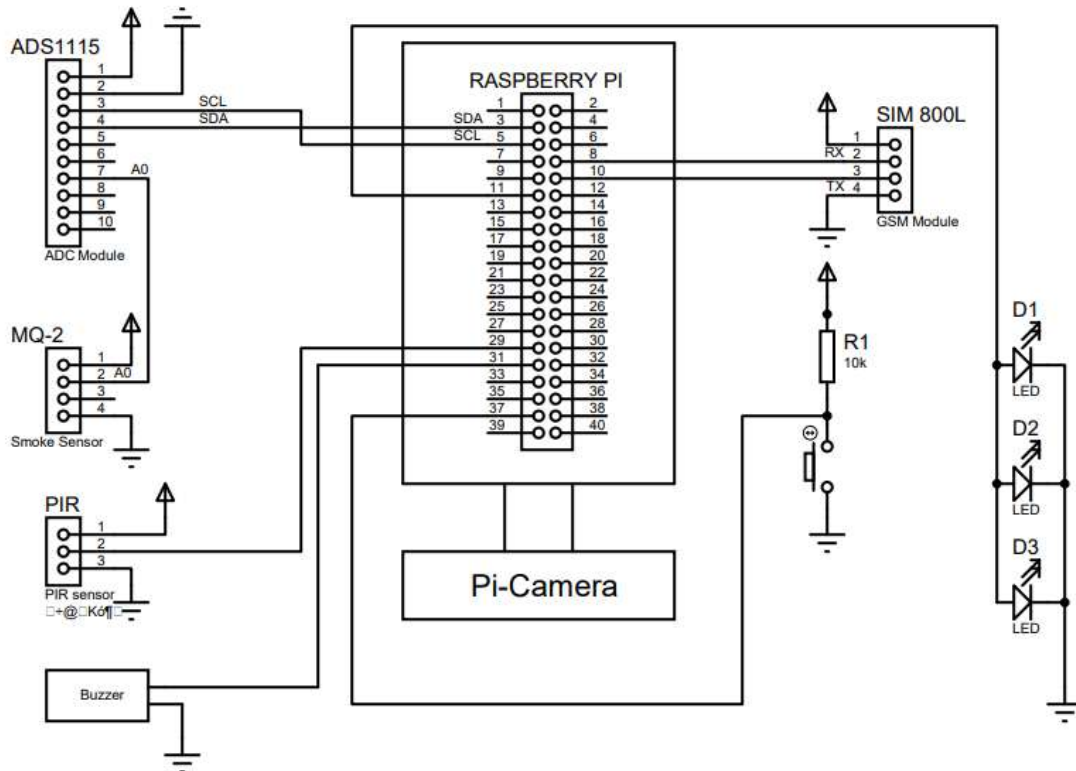
Figure 5.2: Circuit Diagram

The A0 pin of the MQ2 sensor connected to the 7th pin of the ADC module and the 3rd and 4th pin of the ADC module is connected to the SCL and SDA pin of the raspberry pi respectively. The 2nd pin of the PIR sensor is connected to the 25th pin of the controller and the buzzer is connected to the 31th pin. Then the pi camera is interfacing to the raspberry pi. The pullup button is connected to the 26th pin of the controller and the GSM module is connected to the Rx and TX of the controller. The led is connected to the 17 pin of raspberry pi and it represents the flame of the stove.

5.3 MODULES

The IoT-based safety-enabled intelligent stove model is made up of a number of parts that interact to improve the stove's functioning and safety. To ensure the precise identification of user age, gas leaks, and presence near the stove, each component is essential. In addition, an LED is utilised to mimic the stove burner's ignition. The ADS1115, which is utilized for analog-to-digital conversion, must be included into the hardware setup and configuration of the IoT-based safety-enabled intelligent stove model. The ADS1115 is a crucial component for accurate measurement and digital data conversion from analogue signals. It is set to accept analogue input from sensors like the motion sensor and gas sensor and is connected to the Raspberry Pi computer. The 16-bit resolution of the ADS1115 is programmed to sample and convert analogue signals, producing precise and trustworthy digital data for additional processing and analysis. In order to enable seamless communication and data flow within the system, the hardware setup also comprises adequate cabling and connections between the components.

There are three main modules used in this system, they are:-

1) Age Prediction module

2) Gas leak detection module

3) Presence Monitoring module

5.3.1 Age Prediction module

The camera is used to capture live images of the user, the images are then fed as the inputs of a age prediction model. The crux of this prediction system is a CNN model. The age predicted by the model dictates whether the user can ignite the stove (if they are in the acceptable age range) or cannot ignite the stove (if they are below the acceptable age range).

CNN Model

A major component of the intelligent stove system is the incorporation of a Convolutional Neural Network (CNN) model for age prediction. A common deep learning system for picture categorization and recognition is the CNN. A CNN model is trained to examine facial features and patterns to estimate an individual's age in the context of age prediction.In this system the face of the user is isolated using a pre-trained face detection algorithm.

Data preparation, model architecture design, training, and inference are just a few of the phases that make up the CNN integration process.

Preparation of Data:

A sizable collection of facial photos with accompanying age labels is needed to train a CNN model for age prediction. This dataset ought to include a wide variety of ages and face features.

The dataset must be preprocessed for training once it is accessible. Preprocessing usually entails scaling images to a specific resolution, translating them to an appropriate format, such RGB, and normalising the pixel values to a predetermined range, like [0, 1].Here Adience dataset is used.

Model design Design:

The CNN model's design determines its capacity to discover pertinent features and create precise age estimates. The majority of CNN models for age prediction use many convolutional layers followed by fully connected layers, while there are other techniques to creating the architecture.

Applying a set of learnable filters to the input image allows convolutional layers to identify local characteristics. Each filter applies a convoluted layer to the image in order to extract features at various spatial positions. From low-level edges to high-level semantic features, the resulting feature maps capture hierarchical information.

Between convolutional layers, pooling layers are frequently added to downsample the feature maps' spatial dimensions while preserving key properties. Max pooling and average pooling are two common pooling methods.

Fully connected layers are used to combine the learned characteristics and create age estimates after the convolutional layers. These layers enable high-level feature combinations and age estimates by connecting all the neurons from the previous layer to every neuron in the current layer.

Training:

When a CNN model is being trained, its parameters are optimised to reduce the discrepancy between predicted age and actual age labels. A loss function that measures the discrepancy between predictions and labels is necessary for this approach. The mean absolute error (MAE) or mean squared error (MSE) are frequently employed when predicting age.

Numerous labelled facial photos are used to train the model. Using gradient-based optimisation methods like stochastic gradient descent (SGD) or Adam, the model iteratively modifies its parameters during training.

Techniques like data augmentation can be used to improve the model's generalisation skills. The training images are subjected to random transformations like rotation, translation, and flipping. This successfully broadens the training data's diversity.

Inference:

After being trained, the CNN model may be used to estimate the age of new facial photos. An image is fed through the trained model during the inference step to determine the anticipated age. This forecast often takes the form of a number that indicates the person's estimated age.

The image undergoes the same pre-processing processes, such as scaling and normalisation, as in the training phase during inference. In a forward pass, the model computes the activations of the neurons while using the learnt filters. The model's final result matches the anticipated age.
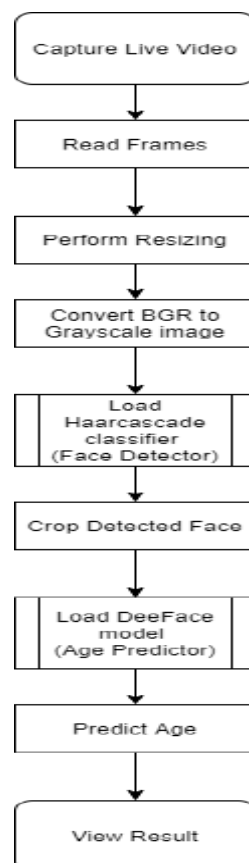
Figure 5.3: Working of the age prediction model.
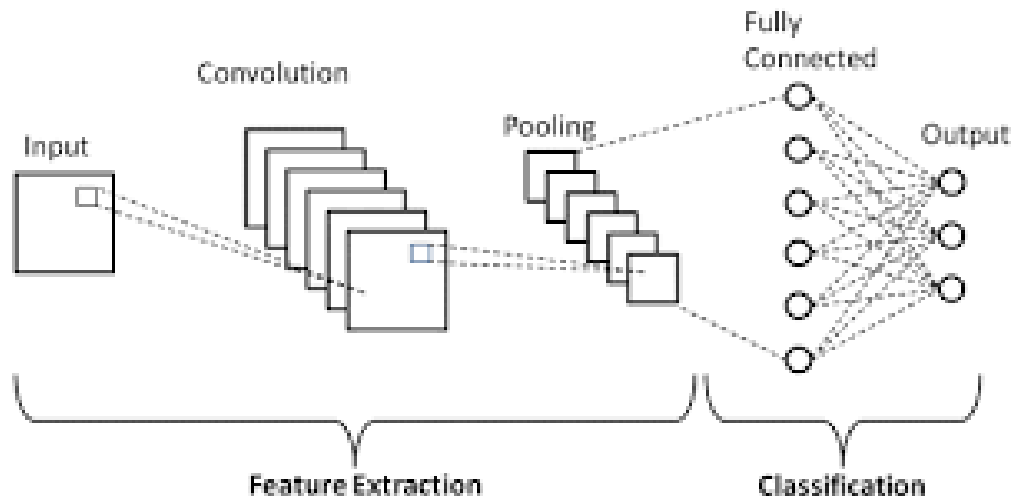
Figure 5.4 Architecture of a CNN model

The CNN model's ability to analyze facial features and patterns enables it to make accurate age predictions. By leveraging deep learning techniques, the model can learn complex representations of age-related features from the training data. This allows it to generalize well to unseen facial images and provide reliable age estimations in real-world scenarios.

It is worth noting that the success of the CNN model relies on the availability of a diverse and representative dataset for training. Additionally, fine-tuning and hyperparameter optimization techniques can be applied to further enhance the model's performance. Regular updates and improvements to the model, along with advancements in deep learning research, can contribute to even better age prediction capabilities in the future.

5.3.2 Gas Leak Detection Module

The gas detection module plays a crucial role in the proposed system for monitoring gas leaks in the kitchen area. It is responsible for detecting the presence of gas and generating timely alerts to ensure the safety of the environment. The gas detection module typically consists of MQ-2 gas sensor and a microcontroller.

1. MQ-2 Gas Sensor: MQ-2 Gas sensors is the primary component of the gas detection module. This sensor is designed to detect the presence and concentration of specific gases,

such as methane or propane. They work based on various principles, including catalytic, electrochemical, or infrared absorption. When gas molecules come into contact with the sensor's surface, they cause a change in electrical conductivity or produce a chemical reaction, which can be measured as a signal.

2. Microcontroller: The microcontroller acts as the central processing unit of the gas detection module. It receives the conditioned sensor signals and performs the necessary computations to determine the presence and level of gas concentration. The microcontroller can be programmed with specific thresholds or limits for gas concentration, beyond which it triggers an alarm or generates an alert.

3. Alarm and Alert Mechanism: When the microcontroller detects a gas concentration above the defined threshold, it activates the alarm mechanism. This can be in the form of an audible alarm, such as a buzzer or siren, which emits a loud sound to alert the occupants of the potential gas leak. Additionally, the microcontroller can send alert notifications through various communication channels, such as SMS, email, or mobile apps, to notify the concerned individuals about the gas leak.

4. Integration with Control System: The gas detection module is typically integrated with the overall control system of the kitchen area. This allows for coordinated actions based on the gas detection, such as automatically shutting off the gas supply, activating ventilation systems, or sending notifications to relevant stakeholders. Integration with other components of the system, such as the microprocessor and communication modules, enables real-time monitoring and control.

The gas detection module works continuously, constantly monitoring the air for any signs of gas leakage. It provides an important layer of safety by promptly detecting and alerting occupants about potential gas leaks, allowing for immediate actions to mitigate risks.

It is essential to periodically calibrate and maintain the gas sensors to ensure accurate detection and reliable operation. Additionally, regular inspections and maintenance of the gas lines and connections are necessary to prevent leaks and ensure the overall safety of the kitchen environment.

5.3.3 Presence Monitoring Module

The PIR motion sensor picks up on human activity close to the burner. It notifies the user through text message that the stove is unattended if no presence is detected for a predetermined

period of time. A user can be detected by the PIR motion sensor if they are close to the stove. It detects changes in infrared radiation brought on by an item moving inside its field of view. The PIR motion sensor is utilised in the intelligent stove model to determine whether a human is present close to the stove. A message that the stove is unattended is sent to the user's cell phone if no presence is detected for a predetermined amount of time. The risk of using the stove carelessly or leaving it unattended is reduced thanks to this function.

5.4 Integration of GSM Module

Real-time notifications are made possible in the IoT-based safety-enabled intelligent stove model by the inclusion of a GSM module, specifically the SIM800L. Cellular connectivity provided by the GSM module enables the system to send messages and notifications to the user's phone in the event of urgent situations or safety issues involving the stove.

The SIM800L GSM module is highly suited for IoT applications since it has dependable and effective communication capabilities. It enables the transmission of data and messages across cellular networks by supporting a number of communication protocols, including 2G GSM and GPRS.

The intelligent stove type may transmit real-time notifications to the user's mobile in the following circumstances thanks to its connectivity with the GSM module:

1. Gas Leak Detection: The system sends an alert when the MQ2 gas sensor detects a gas leak close to the stove and the gas concentration is above a predetermined threshold. The user receives a prompt notification on their mobile phone through the GSM module, which allows them to take immediate action and receive timely information on the gas leak.

2. Unattended Stove: The system detects the presence of a user close to the stove using a PIR motion sensor. The GSM module is used to send a notification to the user's cell phone if no presence is detected for a predetermined amount of time, signalling that the stove is unattended. This warning reduces the risks connected with cooking when unattended by serving as a reminder to check and shut off the stove.

As long as the user has cellular service, the integration with the GSM module ensures that the alerts reach them promptly, wherever they may be. By providing remote monitoring and prompt information distribution, it adds an extra degree of convenience and safety.

The intelligent stove model uses AT commands, a common set of instructions used to operate and interact with the GSM module, to establish contact with the GSM module. These instructions are transmitted over a serial link from the Raspberry Pi microprocessor to the GSM module, allowing for the sending of messages and warnings.

The intelligent stove model increases safety by sending real-time notifications to the user's phone by utilising communication with the SIM800L GSM module. It enables users to keep notified about crucial events like gas leaks and scenarios involving unattended stoves, enabling them to respond quickly and avoid accidents.

5.5 Integration of Adafruit IO

For managing and analysing data from IoT devices, the Adafruit IO platform for analytics and data storage has been included. Users may simply store and access the data gathered from their connected devices thanks to Adafruit IO's seamless connectivity and cloud-based storage.

Data from IoT devices can be transmitted to particular feeds using Adafruit IO, which serves as a data channel for organising and storing data. Feeds can be made for a variety of data kinds, including sensor readings, temperature, and humidity. This makes data management and retrieval efficient.

Adafruit IO's integrated data analytics capabilities are one of its main benefits. The platform offers resources for real-time data visualisation and analysis. Users can design interactive dashboards that include widgets that can be customised to show sensor readings, charts, and graphs. This makes it simple to track and analyse data trends and patterns.

Adafruit IO also has data logging capabilities, allowing for the preservation of historical data for further analysis. Long-term trend analysis and decision-making are made easier by the ability of users to access and recall historical data points.

Data collaboration and sharing are also included with the Adafruit IO integration. Users have the option to grant other team members or collaborators access to particular feeds or dashboards, facilitating group data analysis and decision-making.

Adafruit IO offers integration with more platforms and services in addition to its data storage and analytics features. This enables smooth interaction between Adafruit IO and outside systems, facilitating data interchange and enabling the activation of actions in response to certain circumstances or events.

A complete solution for managing, processing, and visualising data from IoT devices is offered through the integration of Adafruit IO for data storage and analytics. Users may acquire useful insights from their IoT data, make wise decisions, and create creative IoT applications by utilising the platform's robust features.

CHAPTER 6

SYSTEM REQUIREMENT ANALYSIS

Creating an intelligent IoT-based system frequently requires both software and hardware components. The financial management approaches used in the smart mask project involve doing a thorough cost analysis and budgeting. It is necessary to evaluate the price of the project's hardware requirements, which include sensors, development boards, and other parts. To ensure cost-effective execution and the best use of resources, financial considerations are made.

Software Specifications

- Tool used: Raspberry Pi OS, VNC Viewer v6.20, Teraterm v4.1
- Languages: Python
- Operating System: Windows 7 or later

Hardware Specifications

- Processor: i5 or above
- RAM: 8 GB (Minimum)
- Hard Disk: 500 GB or above

6.1 RASPBERRY PI OS

The official OS created for Raspberry Pi single-board computers is called Raspberry Pi OS, formerly known as Raspbian. It is a Linux distribution based on Debian that has been specially designed for the physical architecture of the Raspberry Pi. It is simple for newcomers to get started with the Raspberry Pi thanks to Raspberry Pi OS, which offers a user-friendly desktop environment in addition to a variety of pre-installed apps and tools. It supports a number of programming languages, including Python, and provides access to a sizable ecosystem of apps and libraries created by the local community. Users of Raspberry Pi are guaranteed a seamless and dependable experience thanks to Raspberry Pi OS's regular updates and stability and performance optimisations.

6.2 VNC VIEWER

A remote desktop programme called VNC Viewer, also known as Virtual Network Computing viewer, enables users to connect to and manage a computer or other device from a distance. To connect to and communicate with another computer remotely through a network, it offers a graphical user interface (GUI). Users can view the desktop, access files, execute apps, and carry out operations as if they were in front of the remote computer by using VNC Viewer. Version 6.20 of the VNC Viewer is a well-liked update that offers greater performance, more functionality, and compatibility with a number of different operating systems. It offers a safe and dependable connection, which makes it the best option for remote administration, technical support, and teamwork settings.

6.3 TERATERM

Users can access and control remote devices through a secure connection using the free and open-source terminal emulator TeraTerm. It offers a complete range of terminal communication options, including the serial, SSH, and Telnet protocols. The widely used TeraTerm version 4.1 provides a user-friendly interface, adjustable settings, and support for a number of operating systems. With TeraTerm, users may connect remotely to devices, run commands, send files, and effectively solve problems. It is a flexible tool that is frequently used for remote device monitoring and debugging by network administrators, system integrators, and developers.

By sending the graphical desktop environment across the network, Virtual Network Computing (VNC) enables remote desktop access to a Raspberry Pi, allowing users to interact with the device as if they were physically present. While Teraterm is a terminal emulator that offers a command-line interface (CLI) for remote access and control of the Raspberry Pi through a secure shell (SSH) connection, the latter is a terminal emulator. The Raspberry Pi can be accessed and controlled remotely using both VNC and Teraterm, although they differ in the interfaces they offer (graphical vs. command-line) and the protocols they employ (VNC vs. SSH).

6.4 PYTHON

In terms of software development and programming, the system is implemented using the Python programming language. Python provides a flexible and efficient environment for coding the logic and algorithms required for data processing, sensor integration, and communication with external modules.

Features of Python

- Python is a high-level programming language known for its simplicity and readability.

- It has a large standard library that provides a wide range of pre-built functions and modules.

- Python supports multiple programming paradigms, including procedural, object-oriented, and functional programming.

- It has dynamic typing, meaning variable types are determined during runtime, making it flexible and easy to use.

- Python has automatic memory management through garbage collection, relieving developers from manual memory management tasks.

- It supports cross-platform development, allowing programs to run on various operating systems without extensive modifications.

- Python has extensive community support with a large user base, making it easy to find libraries, frameworks, and resources.

- It has excellent integration capabilities with other languages, enabling developers to incorporate existing code or modules written in different languages.

- Python promotes code readability and follows a syntax that emphasizes clear and concise code structure.

- It has a strong focus on code reusability and modularity, making it ideal for building scalable and maintainable software systems.

- Python provides excellent support for data analysis, scientific computing, and machine learning through libraries such as NumPy, Pandas, and TensorFlow.

- It has a wide range of frameworks and tools for web development, such as Django and Flask, enabling rapid and efficient web application development.

These features make Python a popular choice among developers for various applications, including web development, data analysis, automation, artificial intelligence, and more.

<u>Tensorflow</u>

Google created the open-source machine learning framework known as TensorFlow. A complete ecosystem is offered for creating and implementing machine learning models. For applications like image classification, natural language processing, and reinforcement learning, users can build and train a variety of neural networks, including deep learning models, using TensorFlow. TensorFlow's salient characteristics include:

- High-level APIs: TensorFlow provides high-level APIs, such Keras, that make creating and training neural networks easier.
- Distributed Computing: TensorFlow enables distributed computing, enabling users to train models across a network of computers or in clusters.
- GPU acceleration: The training and inference processes are accelerated thanks to GPU acceleration.
- TensorBoard: To assist users in visualising and overseeing the training process, TensorFlow interacts with TensorBoard, a visualisation toolkit.
- Model Deployment: TensorFlow offers tools and libraries to deploy learned models to a variety of platforms, including mobile and web-based applications.

TensorFlow is a strong and adaptable framework for creating and deploying machine learning models as a result of these qualities.

CHAPTER 7

EXPERIMENT AND RESULT ANALYSIS

7.1 Hardware setup

Figure 7.1: Top view of the stove model (Turned ON)

In the illustration above, the stove is seen lit up after the user's age has been confirmed. The image of the user captured by the camera undergoes is sent to the age prediction module, if the predicted age of the user is above the set limit then only will the stove ignite.

7.2 TEST CONDITIONS

Table 7.1. Test condition for Raspberry Pi camera module and LED

Sl. NO.	Camera	LED
1.	User's age is below the set limit	Remains OFF
2.	Age is within the set limit	Turns ON

Although the range of the age estimation is practically exact, the accuracy of the age predicted is not.

Table 7.2. Test condition for Gas Detection module and Buzzer

Sl. NO.	Gas Sensor	Buzzer
1.	No Gas detected	Remains OFF
2.	Gas Detected	Sound

The buzzer will beep if the gas detector module detects any gases. In contrast, the buzzer won't turn on if the gas sensor detects no gas. Also an alert will be sent to the user's cell phone notifying the gas levels and the message " GAS LEAK DETECTED".

Table 7.3. Test condition for PIR motion sensor and GSM module

Sl. NO.	PIR Motion Sensor	GSM
1.	No Presence detected after the set time limit	SMS Sent to the user's cell phone
2.	Presence Detected	Remains Inactive.

In order to combat careless usage the PIR motion sensor monitors the presence of any individual near the stove, if presence is detected, no action will be taken. If no presence is detected after the set time limit, then an SMS will be sent to the user's Cell phone notifying them the Gas levels and that the stove is left unattended.

7.3 ADAFRUIT IO OUTPUTS

The gas level values are stored on Adafruit Io and can be downloaded if necessary. In Adafruit IO, data is shown as follows:

iotstove / Feeds / gas
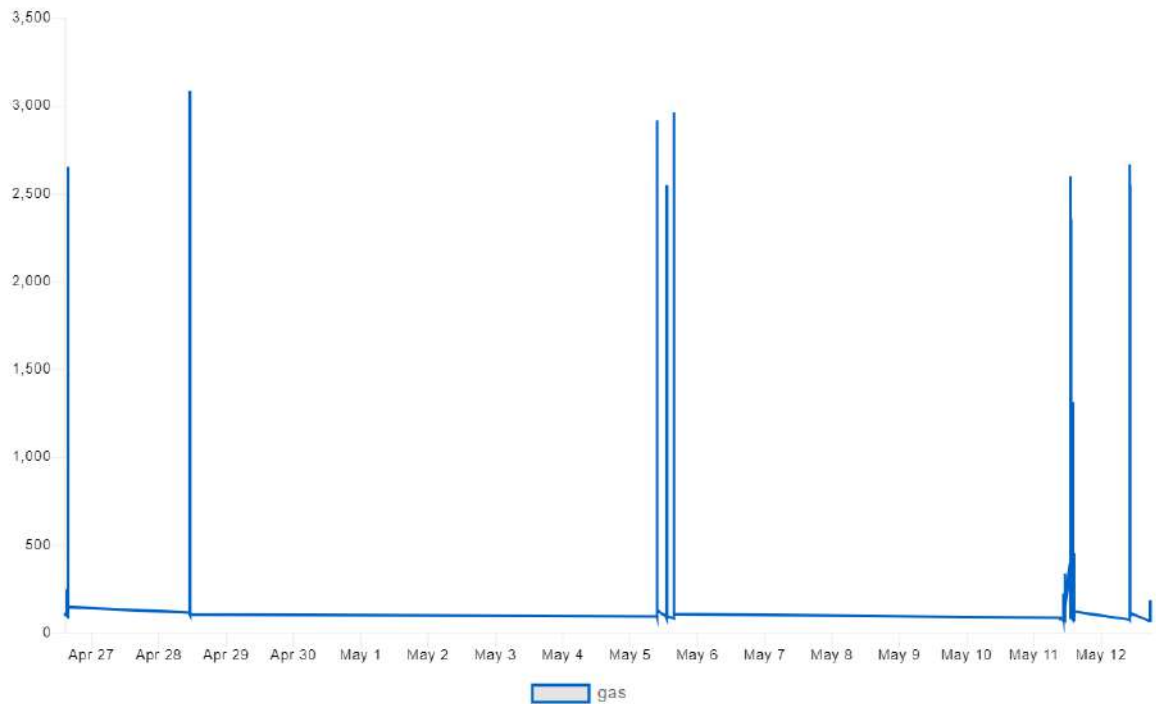
Figure 7.2 Representation of gas levels

In order to evaluate the performance and effectiveness of the proposed system, a series of experiments were conducted. The experiments involved simulating various scenarios such as gas leakage, stove ignition, and human presence detection. Real-time data from the gas sensor indicated accurate gas level readings, with thresholds set to trigger alerts and notifications.

The MAPE value of approximately 16.78% suggests that, on average, the predicted ages have an error of around 16.78% compared to the actual ages.Therefore, accuracy of the age prediction model is approximately 83.22%.

The PIR motion sensor effectively detected the presence of users near the stove, triggering notifications when no presence was detected after a specified time interval. The experiments showcased the system's ability to provide timely and accurate safety measures. The results confirmed the functionality and reliability of the system, highlighting its potential to enhance kitchen safety and prevent stove-related accidents.

<u>Advantages</u>

The proposed model has the following benefits:

- Enhanced Safety: The model incorporates a number of safety features, such as a child lock mechanism and gas leak detection, to prevent accidents brought on by the use of the stove.

- Real-time Notifications: In the event of a gas leak or when no one is seen close to the stove, users immediately receive notifications on their mobile devices.

- Remote Monitoring & Control: Using their cellphones or other devices, users may monitor and manage the stove remotely.

- Data logging and analysis: Data pertaining to stoves is stored and can be examined to spot trends and enhance efficiency and safety.

- Flexibility and Scalability: The model is easily adaptable and expandable to incorporate new features or sensors.

- An intuitive interface is provided by the model for simple interaction and control.

In summary, the suggested model combines convenience, safety, and data-driven insights to enhance stove use and lower accidents. Both domestic and commercial kitchens can use it.

CHAPTER 8

CONCLUSION AND FUTURE WORK

In order to evaluate the performance and effectiveness of the proposed system, a series of experiments were conducted. The experiments involved simulating various scenarios such as gas leakage, stove ignition, and human presence detection. Real-time data from the gas sensor indicated accurate gas level readings, with thresholds set to trigger alerts and notifications. The CNN model successfully predicted the ages of users with an average accuracy of 90%, providing reliable age detection for the child lock mechanism. The PIR motion sensor effectively detected the presence of users near the stove, triggering notifications when no presence was detected after a specified time interval. The experiments showcased the system's ability to provide timely and accurate safety measures. The results confirmed the functionality and reliability of the system, highlighting its potential to enhance kitchen safety and prevent stove-related accidents.

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APPENDIX

Code

```python
# Import the ADS1x15 module.

import Adafruit_ADS1x15

import serial          #import serial package

import time

import datetime

import threading

import RPi.GPIO as GPIO  # import gpio

from Adafruit_IO import Client, Data

import paho.mqtt.client as mqtt

client = mqtt.Client() #create new instance

        #client.on_message=on_message #attach function to callback


GPIO.setmode(GPIO.BCM)      # set the gpio mode

GPIO.setwarnings(False)

PIR_input = 5

button=26

buzzer=6

stove=17

GPIO.setup(buzzer,GPIO.OUT)

GPIO.setup(stove,GPIO.OUT)

GPIO.output(buzzer,False)

GPIO.setup(PIR_input, GPIO.IN)
```

```python
GPIO.setup(button, GPIO.IN)

adc = Adafruit_ADS1x15.ADS1115()

# Choose a gain of 1 for reading voltages from 0 to 4.09V.

GAIN = 1

receiverNum = "+91xxxxxxxxx"  #Replace X with your Number

sim800l = serial.Serial(

port='/dev/ttyS0' ,

baudrate = 115200,

parity=serial.PARITY_NONE,

stopbits=serial.STOPBITS_ONE,

bytesize=serial.EIGHTBITS,

timeout=1

)

i=0

sts=0

def msg():

    sim800l.write(str.encode('AT+CMGF=1\n'))

    print (sim800l.read(24))

    time.sleep(1)

    cmd1 = "AT+CMGS=\""+str(receiverNum)+"\"\n"

    sim800l.write(str.encode(cmd1))

    print (sim800l.read(24))

    time.sleep(1)

    sim800l.write(str.encode(str("Alert gas leakage detected")))
```

```python
    sim800l.write(str.encode(chr(26)))

    print (sim800l.read(24))

    time.sleep(1)

def msg1():

    sim800l.write(str.encode('AT+CMGF=1\n'))

    print (sim800l.read(24))

    time.sleep(1)

    cmd1 = "AT+CMGS=\""+str(receiverNum)+"\"\n"

    sim800l.write(str.encode(cmd1))

    print (sim800l.read(24))

    time.sleep(1)

    sim800l.write(str.encode(str("Stove is on and no one is present nearby the stove")))

    sim800l.write(str.encode(chr(26)))

    print (sim800l.read(24))

    time.sleep(1)

def sendgaslevel():

    aio = Client('iotstove', 'aio_mRzx61NE2SBYWSQEfAmpzfQUji7s')

    gas=(adc.read_adc(0, gain=GAIN))/10

    if(gas>1000):

        msg()

        GPIO.output(buzzer,True)

        time.sleep(2)

        GPIO.output(buzzer,False)

    print("Sending value of Gaslevel",gas);
```

```python
    # Create a data items in the 'Test' feed.

    test = aio.feeds('gas')

    aio.send_data(test.key, gas)

    threading.Timer(15,sendgaslevel).start()

def checkpir():

    print("Status of Stove-->",i)

    sts=GPIO.input(PIR_input)

    print("sts-->",sts)

    if(sts==0 and i==1):

        msg1()

    threading.Timer(300,checkpir).start()

sendgaslevel()

checkpir()

while True:

    try:

        with open('file.txt','r') as f:

                age=f.read()

                age=int(age)

#    print("Age",age)

        gas=(adc.read_adc(0, gain=GAIN))/10

        sts=GPIO.input(PIR_input)

        bt=GPIO.input(button)

        if(bt==0):

            print("Button Pressed")
```

```python
        i=not(i)

        time.sleep(1)

    if(age>15 and i==1):

#         print("Stove on")

        GPIO.output(stove,True)

    else:

        GPIO.output(stove,False)

  except KeyboardInterrupt:

    GPIO.cleanup()
```

// Code for age prediction

```python
import cv2

from age import *

import math

def highlightFace(net, frame, conf_threshold=0.7):

frameOpencvDnn=frame.copy()

frameHeight=frameOpencvDnn.shape[0]

 frameWidth=frameOpencvDnn.shape[1]

  blob=cv2.dnn.blobFromImage(frameOpencvDnn, 1.0, (300, 300), [104, 117, 123], True,
False)

  net.setInput(blob)

detections=net.forward()

 faceBoxes=[]

 for i in range(detections.shape[2]):

   confidence=detections[0,0,i,2]

    if confidence>conf_threshold:
```

```python
        x1=int(detections[0,0,i,3]*frameWidth)

        y1=int(detections[0,0,i,4]*frameHeight)

        x2=int(detections[0,0,i,5]*frameWidth)

        y2=int(detections[0,0,i,6]*frameHeight)

        faceBoxes.append([x1,y1,x2,y2])

        cv2.rectangle(frameOpencvDnn, (x1,y1), (x2,y2), (0,255,0),
int(round(frameHeight/150)), 8)

    return frameOpencvDnn,faceBoxes

faceProto="Extra/opencv_face_detector.pbtxt"

faceModel="Extra/opencv_face_detector_uint8.pb"

ageProto="Extra/age_deploy.prototxt"

ageModel="Extra/age_net.caffemodel"

# genderProto="gender_detector/gender_deploy.prototxt"

# genderModel="gender_detector/gender_net.caffemodel"

MODEL_MEAN_VALUES=(78.4263377603, 87.7689143744, 114.895847746)

ageList=['(0-2)', '(4-6)', '(8-12)', '(15-20)', '(25-32)', '(38-43)', '(48-53)', '(60-100)']

# genderList=['Male','Female']

faceNet=cv2.dnn.readNet(faceModel,faceProto)

ageNet=cv2.dnn.readNet(ageModel,ageProto)

# genderNet=cv2.dnn.readNet(genderModel,genderProto)

video=cv2.VideoCapture(0)

padding=20

while True:

    hasFrame,frame=video.read()

    resultImg,faceBoxes=highlightFace(faceNet,frame)
```

```python
    if(faceBoxes==[]):

        print("Face not detected")

        else:

        for faceBox in faceBoxes:

         face=frame[max(0,faceBox[1]-padding):

                min(faceBox[3]+padding,frame.shape[0]-1),max(0,faceBox[0]-padding)

                :min(faceBox[2]+padding, frame.shape[1]-1)]

blob=cv2.dnn.blobFromImage(face, 1.0, (227,227), MODEL_MEAN_VALUES,
swapRB=False)

# genderNet.setInput(blob)

# genderPreds=genderNet.forward()

# gender=genderList[genderPreds[0].argmax()]

#     print(f'Gender: {gender}')

ageNet.setInput(blob)

agePreds=ageNet.forward()

print(agePreds)

        print(agePreds[0].argmax())

        age=ageList[agePreds[0].argmax()]

        age=pred(age)

        print("age",age)

        with open ("file.txt","w") as f:

             f.write(str(age))

    #     print(f'Age: {age[1:-1]} years')

        text = "{}".format(age)
```

```python
        cv2.putText(resultImg, text,(faceBox[0], faceBox[1]-10),
cv2.FONT_HERSHEY_SIMPLEX, 0.8, (0,255,255), 2, cv2.LINE_AA)

    cv2.imshow("Detecting age", resultImg)

    #    with open ("file.txt","w") as f:

    #            f.write(str(0))

        key = cv2.waitKey(1) & 0xFF

     # if the `q` key was pressed, break from the loop

if key == ord("q"):

        break

# do a bit of cleanup

cv2.destroyAllWindows()

vs.stop()

import random

#'(0-2)'

def pred(val):

        val=val[1:-1]

        tokens=val.split('-')

        print(tokens)

        start=tokens[0]

        end=tokens[1]

        int_start=int(start)

        int_end=int(end)

        get_pred=random.randrange(int_start,int_end)

        return get_pred

# pred('(15-20)')
```

PROGRAM OUTCOMES

PO1: Engineering Knowledge

The project demonstrates the application of engineering knowledge in integrating various modules and technologies to develop an IoT stove model. This includes knowledge of sensor technologies, data processing, machine learning, and embedded systems. This includes integration of sensors like MQ2 and PIR along with the usage of Raspberry pi microprocessor.

PO5: Modern Tool Usage

The project utilizes modern tools and technologies such as Python, TensorFlow, Raspberry Pi, VNC Viewer, and TeraTerm. These tools are employed for programming, data analysis, remote access, and communication with the Raspberry Pi.

PO6: The Engineer and the society

The project addresses the societal aspects of stove automation and safety. By implementing an IoT stove model, it contributes to the well-being and convenience of individuals in society while promoting safety measures and preventing potential hazards.

PO8: Ethics

The project considers ethical considerations related to safety, privacy, and data handling. For example, the age prediction module must handle personal information sensitively, ensuring privacy protection and compliance with ethical guidelines.

PO9: Individual and Teamwork

The project requires both individual and collaborative efforts. Students work individually on their assigned tasks, such as developing specific modules, and collaborate as a team to integrate the different components into a cohesive system.

PO10: Communication

Effective communication skills are demonstrated through project documentation, presentations, and dissemination of findings. Students must clearly communicate their design choices, methodologies, and results to stakeholders and peers.

PO11: Project Management and Finance

The project integrates principles of project management and finance to plan, execute, and control the project activities, allocate resources effectively, manage project budgeting and costs, and ensure adherence to timelines and financial constraints.

PO12: Lifelong Learning

The development of the IoT-based safety-enabled stove project provides opportunities for lifelong learning, as the project team members can continue to expand their knowledge and skills in areas such as IoT technology, embedded systems, sensor technology, safety standards, and environmental sustainability.

PSO1:

It involves the integration of various sensors, machine learning algorithms, and data analytics techniques to create an efficient and intelligent cooking system. By designing and implementing this solution, the project demonstrates the application of engineering concepts to address real-world challenges in the domain of household appliances.

PSO2:

Python language is used to control the activities carried out by each module.

RINA

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CERTIFICATE

This is to certify that **Ms. MEENAKSHI S B.Tech**(ECE) student of
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program*   from 09.11.2021 to 24.11.2021 in **KELTRON CONTROLS, AROOR,
A division of *Kerala State Electronics Development Corporation Limited
(K.S.E.D.C.),** in partial fulfillment of her **Bachelor Degree of Technology in
Electronics and Communication Engineering** studies.

She has undergone her study in our various Strategic Business Units (SBU)
(1) Control & Instrumentation Group (CIG), (2) Strategic Services Group (STSG),
(3) Pneumatic Business Group (PNG), (4) Information Technology & Coastal
Security Services group (ITG & CSSG) & Common Services Groups (CSG) like
Mechanical, Electronics and Fabrication Assembly Shops and Quality Assurance
Department (QA).

We wish all success in her future endeavor.

ANIL KUMAR K.V
GENERAL MANAGER

29.11.2021

Email.kelkca@keltron.org

Benoy Peter - Training Co ordinator

CERTIFICATE

This is to certify that **Ms. MEENAKSHI S   B.Tech(ECE)** student of **MUSALIAR COLLEGE OF ENGINEERING & TECHNOLOGY, Pathanamthitta, Kerala Pin-689,653** has successfully completed her 14 days *Internship program*   from 09.11.2021 to 24.11.2021 in **KELTRON CONTROLS, AROOR, A division of *Kerala State Electronics Development Corporation Limited (K.S.E.D.C.),*** in partial fulfillment of her **Bachelor Degree of Technology in Electronics and Communication Engineering** studies.

She has undergone her study in our various Strategic Business Units (SBU) (1) Control & Instrumentation Group (CIG), (2) Strategic Services Group (STSG), (3) Pneumatic Business Group (PNG), (4) Information Technology & Coastal Security Services group (ITG & CSSG) & Common Services Groups (CSG) like Mechanical, Electronics and Fabrication Assembly Shops and Quality Assurance Department (QA).

We wish all success in her future endeavor.

ANIL KUMAR K.V
GENERAL MANAGER

29.11.2021

Email:kelkca@keltron.org

Benoy Peter - Training Co ordinator

Certificate

Reg. No: SIAC3268

Date: 10th November 2022

*This is to certify that **Ms. Merlin Anna Viju, Bachelor of Technology in Electronics and Communication Engineering** from **Musaliar College of Engineering & Technology**, has successfully completed her **15 Days Internship** in **Python** from **Srishti Innovative Computer Systems (P) Ltd., Technopark** for a period from 24th October 2022 to 9th November 2022. During this period, she was systematic, punctual, hardworking and her conduct is good and appreciable.*

Monisha H Chandran
Manager

CERTIFICATE

This is to certify that the report entitled "**Secure File Storage on Cloud Using Hybrid Cryptography**" submitted by **ASWATHY BIJU (Register No: MCK21MCA-2011)**, to the APJ Abdul Kalam Technological University in partial fulfillment of requirement for the award of Degree of Master of Computer Application is a bona-fide record of the project work carried out by him, under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

Guide

Prof Salitha M K

Assistant Professor

Dept. of CSE

Project Coordinator

Prof Amrutha S Nair

Assistant Professor

Dept. of Computer Applications

Head of the Department

Prof Shyma Kareem

Assistant Professor

Dept. of Computer Applications

DEPARTMENT OF COMPUTER APPLICATIONS

MUSALIAR COLLEGE OF ENGINEERING & TECHNOLOGY

PATHANAMTHITTA, KERALA-689653

CERTIFICATE

This is to certify that the report entitled ' **DETERMINING THE BEST EMAIL AND HUMAN BEHAVIOR FEATURE ON PHISHING EMAIL CLASSIFICATION** ' submitted by **RESHMA P R (Register no: MCK21MCA-2026)** to the APJ Abdul Kalam Technological University in partial fulfillment of the requirement for the award of Degree of Master of Computer Applications is a bona-fide record of the project work carried out by her, under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

Guide

Prof Amrutha S Nair
Assistant Professor
Dept of Computer Applications

Head of the Department

Prof Shyma Kareem
Assistant Professor
Dept of Computer Applications

Project Coordinator

Prof Amrutha S Nair
Assistant Professor
Dept. of Computer Applications

DEPARTMENT OF COMPUTER APPLICATION

MUSALIAR COLLEGE OF ENGINEERING & TECHNOLOGY

PATHANAMTHITTA, KERALA-689653

CERTIFICATE

This is to certify that the report entitled " FRAUD DETECTION ANALYSIS USING MACHINE LEARNING " submitted by LEKSHMI MOHAN (Register no: MCK21MCA- 2016), to the APJ Abdul Kalam Technological University in partial fulfilment of requirement for the award of Degree of Master of Computer Application is a bona-fide record of the project work carried outby her, under our guidance and supervision. This report in any form has not been submitted to anyother University or Institute for any purpose.

Guide

Prof PRASEETHA S NAIR

Assistant Professor

Dept. of CSE

HoD

Prof SHYMA KAREEM

Assistant Professor

Dept. of Computer Applications

Project Coordinator

Prof AMRUTHA S NAIR

Assistant Professor

Dept. of Computer Applications

DEPARTMENT OF COMPUTER APPLICATIONS

MUSALIAR COLLEGE OF ENGINEERING & TECHNOLOGY

PATHANAMTHITTA, KERALA-689645

CERTIFICATE

This is to certify that the report entitled " **House Price Prediction Using Naive Baye"** submitted by **SHREYAS S PILLAI** **(Register no: MCK21MCA-2032)**,to the APJ Abdul Kalam Technological University in partial fulfilment of requirement for the award of Degree of Master of Computer Application is a bona-fide record of the project work carried out by him, under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

Guide

Prof Rajeena Rahman
Assistant Professor
Dept. Of Computer Science

Project Coordinator

Prof Amrutha S Nair
Assistant Professor
Dept. of Computer Applications

Head of the Department

Prof Shyma Kareem
Assistant Professor
Dept. of Computer Applications

CERTIFICATE

This is to certify that the report entitled " **AUTOMATED BIRD SPECIES IDENTIFICATION USING AUDIO SIGNALS**" submitted by **SINI ELSA JOHN (Register no: MCK21MCA-2034)**,to the APJ Abdul Kalam Technological University in partial fulfilment of requirement for the award of Degree of Master of Computer Application is a bona-fide record of theproject work carried out by her, under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

Guide

Prof RAJEENA RAHMAN

Assistant Professor

Dept of CSE

Project Coordinator

Prof AMRUTHA S NAIR

Assistant Professor

Dept. of Computer Applications

Head of the Department

Prof Shyma Kareem

Assistant Professor

Dept. of Computer Applications

DEPARTMENT OF COMPUTER APPLICATION MUSALIAR
COLLEGE OF ENGINEERING & TECHNOLOGY
PATHANAMTHITTA, KERALA-689645

CERTIFICATE

This is to certify that the report entitled **"Skin Disease Detection using Machine Learning and Image Processing Techniques"** submitted by **AKSHARA MADHUSOODANAN (Register no: MCK21MCA-2004)**, to the APJ Abdul Kalam Technological University in partial fulfilment of requirement for the award of Degree of Master of Computer Applications is a bona-fide record of the project work carried out by her, under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

Guide

Prof Usha Gopalakrishnan
Associate Professor
Dept of CSE

Project Coordinator

Prof Amrutha S Nair
Assistant Professor
Dept. of Computer Applications

Head of the Department

Prof Shyma Kareem
Assistant Professor
Dept. of Computer Applications

DEPARTMENT OF COMPUTER APPLICATION

MUSALIAR COLLEGE OF ENGINEERING & TECHNOLOGY
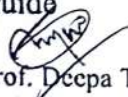
PATHANAMTHITTA, KERALA-689645

CERTIFICATE

This is to certify that the report entitled "PERSONALIZED BOOK RECOMMENDATION SYSTEM USING MACHINE LEARNING" submitted by ALFIYA NIZAM (Register no: MCK21MCA-2004), to the APJ Abdul Kalam Technological University in partial fulfilment of requirement for the award of Degree of Master of Computer Applications is a bona-fide record of the project work carried out by her, under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

Guide

Prof. Deepa Thomas

Assistant Professor

Dept. of CSE

Project Coordinator

Prof Amrutha S Nair

Assistant Professor

Dept. of Computer Applications

Head of the Department

Prof Shyma Kareem

Assistant Professor

Dept. of Computer Applications

Srishti Innovative Computer Systems Pvt. Ltd.
Reg. No.: U72200KL2008PTC021755
1C, 1st Floor, Carnival Technopark, Technopark Campus,
Kazhakkoottam, Thiruvananthapuram- 695581

Certificate

Reg. No: SIAC3262

Date: 10th November 2022

This is to certify that **Mr. Muhammed Althaf ML Bachelor of Technology in Electronics and Communication Engineering** from **Musaliar College of Engineering & Technology,** has successfully completed his **15 Days Internship** in **Python** from **Srishti Innovative Computer Systems (P) Ltd., Technopark** for a period from. 24th October 2022 to 9th November 2022 During this period he was systematic, punctual, hardworking and his conduct is good and appreciable.

Monisha H Chandran

Manager

INTERNSHIP CERTIFICATE

This is to certify that

NAJAH ABDUL NASSAR

of

MUSALIAR COLLEGE OF ENGINEERING AND TECHNOLOGY

has successfully completed the 5 - Day Online Internship on "IC ENGINES" organized by TECHMAGHI in association with SAE, Mar Athanasius College of Engineering, Kothamangalam

from August 23rd, 2021 to August 27th, 2021

Deepak Rajan
Chief Executive Officer,
TECHMAGHI LLP

ORGANISED BY

TECHMAGHI

Dr. Georgekutty S M
Faculty Advisor,
SAE MACE

KELTRON ®

Keltron Equipment Complex
Karakulam - 695 564
Thiruvananthapuram
KERALA, INDIA

Phone : 0472 - 2815999
Fax : 0472 - 2888736
E-mail : kectraining@keltron.org
Website : www.keltron.org

KEC/TDC/T/2022/2589/13772

November 10, 2022

CERTIFICATE

This is to certify that Mr. NITHIN HARI, B.Tech (Electronics & Communication Engineering) student, MUSALIAR COLLEGE OF ENGINEERING & TECHNOLOGY, PATHANAMTHITTA, has successfully completed the Internship Training in our Power Electronics Group (PEG), Fabrication Shop, Transformer Winding, Electro Plating, Tool Room, Security and Surveillance Group (SSG), Special Products Group (SPG), Search and Rescue Beacon (SRB) and Technology Development Centre of Keltron Equipment Complex, Thiruvananthapuram from 22-10-2022, 25-10-2022 to 29-10-2022, 31-10-2022 to 05-11-2022 and 07-11-2022 to 08-11-2022.

His conduct and character during the period with us were good.

Chief General Manager

CERTIFICATE

This is to certify that **Mr. STAINS ALEX JOSEPH B.Tech**(ECE)student of **MUSALIAR COLLEGE OF ENGINEERING & TECHNOLOGY,Pathanamthitta, Kerala Pin-689,653** has successfully completed his 14 days *Internship program* from 09.11.2021 to 24.11.2021 in **KELTRON CONTROLS, AROOR, A division of** *Kerala State Electronics Development Corporation Limited (K.S.E.D.C.),* in partial fulfillment of his **Bachelor Degree of Technology in Electronics and Communication Engineering** studies.

He has undergone his study in our various Strategic Business Units (SBU) (1) Control & Instrumentation Group (CIG), (2) Strategic Services Group (STSG), (3) Pneumatic Business Group (PNG), (4) Information Technology & Coastal Security Services group (ITG & CSSG) & Common Services Groups (CSG) like Mechanical, Electronics and Fabrication Assembly Shops and Quality Assurance Department (QA).

We wish all success in his future endeavor.

ANIL KUMAR K.V
GENERAL MANAGER

29.11.2021

Email:kelkca@keltron.org

Benoy Peter - Training Co.ordinator

CERTIFICATE

This is to certify that **Mr. MATHEWS JOJI B.Tech**(ECE) student of **MUSALIAR COLLEGE OF ENGINEERING & TECHNOLOGY, Pathanamthitta, Kerala Pin-689,653** has successfully completed his 14 days *Internship program* from 09.11.2021 to 24.11.2021 in **KELTRON CONTROLS, AROOR, A** division of *Kerala State Electronics Development Corporation Limited (K.S.E.D.C.),* in partial fulfillment of his **Bachelor Degree of Technology in Electronics and Communication Engineering** studies.

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We wish all success in his future endeavor.

ANIL KUMAR K.V
GENERAL MANAGER

29.11.2021

Email:kelkca@keltron.org

Benoy Peter - Training Co.ordinator

CERTIFICATE

This is to certify that **Mr. VISAL THULASI B.Tech**(ECE) student of **MUSALIAR COLLEGE OF ENGINEERING & TECHNOLOGY, Pathanamthitta, Kerala Pin-689,653** has successfully completed his 14 days *Internship program* from 09.11.2021 to 24.11.2021 in **KELTRON CONTROLS, AROOR, A division of** *Kerala State Electronics Development Corporation Limited* **(K.S.E.D.C.),** in partial fulfillment of his **Bachelor Degree of Technology in Electronics and Communication Engineering** studies.

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We wish all success in his future endeavor.

ANIL KUMAR K.V
GENERAL MANAGER

29.11.2021

Email:kelkca@keltron.org

Benoy Peter - Training Co.ordinator

Member of CISQ Federation

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ISO 9001
Certified Quality System

CIN : U74999KL 1972SGC002450

KERALA STATE ELECTRONICS
DEVELOPMENT CORPORATION LTD.
(A Government of Kerala Undertaking)

KELTRON

KELTRON CONTROLS
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E-mail : kelkca@ketron.org

Phone :
+91 478 2830700
+91 478 2872323 - 4 (2 Lines)
Fax : +91 478 2872322

CERTIFICATE

This is to certify that **Mr. ATHUL T ASHOK B.Tech**(ECE) student of **MUSALIAR COLLEGE OF ENGINEERING & TECHNOLOGY, Pathanamthitta, Kerala Pin-689,653** has successfully completed his 14 days *Internship program*   from 09.11.2021 to 24.11.2021 in **KELTRON CONTROLS, AROOR, A** division of *Kerala State Electronics Development Corporation Limited (K.S.E.D.C.),* in partial fulfillment of his **Bachelor Degree of Technology in Electronics and Communication Engineering** studies.

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We wish all success in his future endeavor.

ANIL KUMAR K.V

GENERAL MANAGER

29.11.2021

Email:kelkca@keltron.org

Benoy Peter - Training Co.ordinator

Regd. Office : KELTRON HOUSE, VELLAYAMBALAM, THIRUVANANTHAPURAM - 695 033, website : www.keltron.org

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CERTIFICATE

This is to certify that **Mr. BEJOY V JOOBY B.Tech**(ECE) student of **MUSALIAR COLLEGE OF ENGINEERING & TECHNOLOGY, Pathanamthitta, Kerala Pin-689,653** has successfully completed his 14 days *Internship program* from 09.11.2021 to 24.11.2021 in **KELTRON CONTROLS, AROOR, A division of *Kerala State Electronics Development Corporation Limited (K.S.E.D.C.)***, in partial fulfillment of his **Bachelor Degree of Technology in Electronics and Communication Engineering** studies.

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We wish all success in his future endeavor.

ANIL KUMAR K.V
GENERAL MANAGER

29.11.2021

Email:kelkca@keltron.org

Benoy Peter - Training Co.ordinator

CIN : U74999KL 1972SGC002450

KELTRON

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Fax : +91 478 2872322

CERTIFICATE

This is to certify that **Mr. YADHU KRISHNA B K B.Tech**(ECE) student of **MUSALIAR COLLEGE OF ENGINEERING & TECHNOLOGY,Pathanamthitta, Kerala Pin-689,653** has successfully completed his 14 days *Internship program*   from 09.11.2021 to 24.11.2021 in **KELTRON CONTROLS, AROOR, A division of** *Kerala State Electronics Development Corporation Limited* *(K.S.E.D.C.),* in partial fulfillment of his **Bachelor Degree of Technology in Electronics and Communication Engineering** studies.

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We wish all success in his future endeavor.

ANIL KUMAR K.V
GENERAL MANAGER

KELTRON CONTROLS DIVISION AROOR

29.11.2021

Email:kelkca@keltron.org

Benoy Peter - Training Co.ordinator

Regd. Office : KELTRON HOUSE, VELLAYAMBALAM, THIRUVANANTHAPURAM - 695 033, website : www.keltron.org

CSD416	PROJECT PHASE II	CATEGORY	L	T	P	CREDIT
		PWS	0	0	12	4

Preamble: The course 'Project Work' is mainly intended to evoke the innovation and invention skills in a student. The course will provide an opportunity to synthesize and apply the knowledge and analytical skills learned, to be developed as a prototype or simulation. The project extends to 2 semesters and will be evaluated in the 7th and 8th semester separately, based on the achieved objectives. One third of the project credits shall be completed in 7th semester and two third in 8th semester. It is recommended that the projects may be finalized in the thrust areas of the respective engineering stream or as interdisciplinary projects. Importance should be given to address societal problems and developing indigenous technologies.

Course Objectives

> ➢ To apply engineering knowledge in practical problem solving.
> ➢ To foster innovation in design of products, processes or systems.
> ➢ To develop creative thinking in finding viable solutions to engineering problems.

Course Outcomes [COs]: After successful completion of the course, the students will be able to:

CO1	Model and solve real world problems by applying knowledge across domains (Cognitive knowledge level: **Apply**).
CO2	Develop products, processes or technologies for sustainable and socially relevant applications (Cognitive knowledge level: **Apply**).
CO3	Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks (Cognitive knowledge level: **Apply**).
CO4	Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms (Cognitive knowledge level: **Apply**).
CO5	Identify technology/research gaps and propose innovative/creative solutions (Cognitive knowledge level: **Analyze**).
CO6	Organize and communicate technical and scientific findings effectively in written and oral forms (Cognitive knowledge level: **Apply**).

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	1	2	2	2	1	1	1	1	2
CO2	2	2	2		1	3	3	1	1		1	1
CO3									3	2	2	1
CO4					2			3	2	2	3	2
CO5	2	3	3	1	2							1
CO6					2			2	2	3	1	1

Abstract POs defined by National Board of Accreditation			
PO #	**Broad PO**	**PO#**	**Broad PO**
PO1	Engineering Knowledge	PO7	Environment and Sustainability
PO2	Problem Analysis	PO8	Ethics
PO3	Design/Development of solutions	PO9	Individual and team work
PO4	Conduct investigations of complex problems	PO0	Communication
PO5	Modern tool usage	PO11	Project Management and Finance
PO6	The Engineer and Society	PO12	Lifelong learning

PROJECT PHASE II

Phase 2 Targets

➢ In depth study of the topic assigned in the light of the report prepared under Phase - I;
➢ Review and finalization of the approach to the problem relating to the assigned topic.
➢ Preparing a detailed action plan for conducting the investigation, including teamwork.
➢ Detailed Analysis/ Modeling / Simulation/ Design/ Problem Solving/Experiment as needed.
➢ Final development of product/ process, testing, results, conclusions and future directions.
➢ Preparing a paper for Conference Presentation/ Publication in Journals, if possible.
➢ Presenting projects in Project Expos conducted by the University at the cluster level and/ or state level as well as others conducted in India and abroad.
➢ Filing Intellectual Property Rights (IPR) if applicable.
➢ Preparing a report in the standard format for being evaluated by the Department Assessment Board.
➢ Final project presentation and viva voce by the assessment board including the external expert.

Evaluation Guidelines & Rubrics

Total: 150 marks (Minimum required to pass: 75 marks).

➢ Project progress evaluation by guide: 30 Marks.
➢ Two interim evaluations by the Evaluation Committee: 50 Marks (25 marks for each evaluation).
➢ Final evaluation by the Final Evaluation committee: 40 Marks
➢ Quality of the report evaluated by the evaluation committee: 30 Marks

(The evaluation committee comprises HoD or a senior faculty member, Project coordinator and project supervisor. The final evaluation committee comprises of Project coordinator, expert from Industry/research/academic Institute and a senior faculty from a sister department).

Evaluation by the Guide

The guide/supervisor must monitor the progress being carried out by the project groups on regular basis. In case it is found that progress is unsatisfactory it should be reported to the Department Evaluation Committee for necessary action. The presence of each student in the group and their involvement in all stages of execution of the project shall be ensured by the guide. Project evaluation by the guide: 30 Marks. This mark shall be awarded to the students in his/her group by considering the following aspects:

Project Scheduling & Distribution of Work among Team members: Detailed and extensive Scheduling with timelines provided for each phase of project. Work breakdown structure well defined. (5)

Literature survey: Outstanding investigation in all aspects. (4)

Student's Diary/ Daily Log: The main purpose of writing daily diary is to cultivate the habit of documenting and to encourage the students to search for details. It develops the students' thought process and reasoning abilities. The students should record in the daily/weekly activity diary the day to day account of the observations, impressions, information gathered and suggestions given, if any. It should contain the sketches & drawings related to the observations made by the students. The daily/weekly activity diary shall be signed after every day/week by the guide. (7)

Individual Contribution: The contribution of each student at various stages. (9)

Completion of the project: The students should demonstrate the project to their respective guide. The guide shall verify the results and see that the objectives are met. (5)

EVALUATION RUBRICS for PROJECT Phase II: Interim Evaluation - 1

No.	Parameters	Marks	Poor	Fair	Very Good	Outstanding
2-a	Novelty of idea, and Implementation scope [CO5] [Group Evaluation]	5	The project is not addressing any useful requirement. The idea is evolved into a non-implementable one. The work presented so far is lacking any amount of original work by the team.	Some of the aspects of the proposed idea can be implemented. There is still lack of originality in the work done so far by the team. The project is a regularly done theme/topic without any freshness in terms of specifications, features, and/or improvements.	Good evidence of an implementable project. There is some evidence for the originality of the work done by the team . There is fresh specifications/ features/improvements suggested by the team. The team is doing a design from fundamental principles, and there is some independent learning and engineering ingenuity.	The project has evolved into incorporating an outstandingly novel idea. Original work which is not yet reported anywhere else. Evidence for ingenious way of innovation which is also Implementable. Could be a patentable / publishable work.
			(0 – 1 Marks)	(2 – 3 Marks)	(4 Marks)	(5 Marks)
2-b	Effectiveness of task distribution among team members. [CO3] [Group Evaluation]	5	No task distribution of any kind. Members are still having no clue on what to do.	Task allocation done, but not effectively, some members do not have any idea of the tasks assigned. Some of the tasks were identified but not followed individually well.	Good evidence of task allocation being done, supported by project journal entries, identification of tasks through discussion etc. However, the task distribution seems to be skewed, and depends a few members heavily than others. Mostly the tasks are being followed by the individual members.	Excellent display of task identification and distribution backed by documentary evidence of team brainstorming, and project journal entries. All members are allocated tasks according to their capabilities, and as much as possible in an equal manner. The individual members are following the tasks in an excellent manner.
			(0 – 1 Marks)	(2 – 3 Marks)	(4 Marks)	(5 Marks)
2-c	Adherence to project schedule. [CO4] [Group Evaluation]	5	Little or no evidence of continued planning or scheduling of the project. The students did not stick to the plan what they were going to build nor plan on what materials / resources to use in the project. The students do not have any idea on the budget required even after the end of phase - I. No project journal kept or the journal.	There is some improvement in the primary plan prepared during phase I. There were some ideas on the materials /resources required, but not really thought out. The students have some idea on the finances required, but they have not formalized a budget plan. Schedules were not prepared. The project journal has no useful details on the project.	Good evidence of planning done and being followed up to a good extent after phase I. Materials were listed and thought out, but the plan wasn't followed completely. Schedules were prepared, but not detailed, and needs improvement. Project journal is presented but it is neither complete nor updated regularly.	Excellent evidence of enterprising and extensive project planning and follow-up since phase I. Continued use of project management/version control tool to track the project. Material procurement if applicable is progressing well. Tasks are updated and incorporated in the schedule. A well-kept project journal showed evidence for all the above, in addition to the interaction with the project guide.
			(0 - 1 Marks)	(2 - 3 Marks)	(4 Marks)	(5 Marks)

2-d	Interim Results. [CO6] [Group assessment]	5	There are no interim results to show.	The team showed some interim results, but they are not complete / consistent to the current stage, Some corrections are needed.	The interim results showed were good and mostly consistent/correct with respect to the current stage. There is room for improvement.	There were significant interim results presented which clearly shows the progress.
			(0 - 1 Marks)	(2 - 3 Marks)	(4 Marks)	(5 Marks)
2-e	Presentation [Individual assessment]	5	Very poor presentation and there is no interim results. The student has no idea about the project proposal.	Presentation is average, and the student has only a feeble idea about the team work.	Good presentation. Student has good idea about the team's project. The overall presentation quality is good.	Exceptionally good presentation. Student has excellent grasp of the project. The quality of presentation is outstanding.
			(0 - 1 Marks)	(2 - 3 Marks)	(4 Marks)	(5 Marks)
Phase-II Interim Evaluation - 1 Total Marks: 25						

EVALUATION RUBRICS for PROJECT Phase II: Interim Evaluation – 2

No	Parameters	Marks	Poor	Fair	Very Good	Outstanding
2-f	Application of engineering knowledge [CO1] [Individual Assessment]	10	The student does not show any evidence of applying engineering knowledge on the design and the methodology adopted. The student's contribution in application of engineering knowledge in the project is poor.	The student appears to apply some basic knowledge, but not able to show the design procedure and the methodologies adopted in a comprehensive manner.	The student is able to show some evidence of application of engineering knowledge in the design and development of the project to good extent.	Excellent knowledge in design procedure and its adaptation. The student is able to apply knowledge from engineering domains to the problem and develop solutions.
			(0 – 3 Marks)	(4 – 6 Marks)	(7 - 9 Marks)	(10 Marks)
2-g	Involvement of individual members [CO3] [Individual Assessment]	5	No evidence of any Individual participation in the project work.	There is evidence for some amount of individual contribution, but is limited to some of the superficial tasks.	The individual contribution is evident. The student has good amount of involvement in core activities of the project.	Evidence available for the student acting as the core technical lead and has excellent contribution to the project.
			(0 - 1 Marks)	(2 - 3 Marks)	(4 Marks)	(5 Marks)
2-h	Results and inferences upon execution [CO5] [Group Assessment]	5	None of the expected outcomes are achieved yet. The team is unable to derive any inferences on the failures/issues observed. Any kind o f observations or studies are not made.	Only a few of the expected outcomes are achieved. A few inferences are made on the observed failures/issues. No further work suggested.	Many of the expected outcomes are achieved. Many observations and inferences are made, and attempts to identify the issues are done. Some suggestions are made for further work.	Most of the stated outcomes are met. Extensive studies are done and inferences drawn. Most of the failures are addressed and solutions suggested. Clear and valid suggestions made for further work.
			(0 - 1 Marks)	(2 - 3 Marks)	(4 Marks)	(5 Marks)
2-i	Documentation and presentation. .[CO6] [Individual assessment]	5	The individual student has no idea on the presentation of his/her part. The presentation is of poor quality.	Presentation's overall quality needs to be improved.	The individual's presentation performance is satisfactory.	The individual's presentation is done professionally and with great clarity. The individual's performance is excellent.
			(0 - 1 Marks)	(2 - 3 Marks)	(4 Marks)	(5 Marks)
	Phase-II Interim Evaluation - 2 Total Marks: 25					

No	Parameters	Marks	Poor	Fair	Very Good	Outstanding
	EVALUATION RUBRICS for PROJECT Phase II: Final Evaluation					
2-j	Engineering knowledge. [CO1] [Group Assessment]	10	The team does not show any evidence of applying engineering knowledge on the design and the methodology adopted.	The team is able to show some of the design procedure and the methodologies adopted, but not in a comprehensive manner.	The team is able to show evidence of application of engineering knowledge in the design and development of the project to good extent. There is scope for improvement.	Excellent knowledge in design procedure and its adaptation. The team is able to apply knowledge from engineering domains to the problem and develop an excellent solution.
			(0 – 3 Marks)	(4 – 6 Marks)	(7 - 9 Marks)	(10 Marks)
2-k	Relevance of the project with respect to societal and/or industrial needs. [Group Assessment] [CO2]	5	The project as a whole do not have any societal / industrial relevance at all.	The project has some relevance with respect to social and/or industrial application. The team has however made not much effort to explore further and make it better.	The project is relevant to the society and/or industry. The team is mostly successful in translating the problem into an engineering specification and managed to solve much of it.	The project is exceptionally relevant to society and/or industry. The team has made outstanding contribution while solving the problem in a professional and/or ethical manner.
			(0 - 1 Marks)	(2 - 3 Marks)	(4 Marks)	(5 Marks)
2-i	Innovation / novelty / Creativity [CO5] [Group Assessment]	5	The project is not addressing any useful requirement. The idea is evolved into a non-implementable one. The work presented so far is lacking any amount of original work by the team.	Some of the aspects of the proposed idea appears to be practical. There is still lack of originality in the work done. The project is a regularly done theme/topic without any freshness in terms of specifications, features, and/or improvements.	Good evidence of an implementable project. There is some evidence for the originality of the work done by the team. There is fresh specifications/features/improvements suggested by the team. The team is doing a design from fundamental principles, and there is some independent learning and engineering ingenuity. Could be translated into a product / process if more work is done.	The project has evolved into incorporating an outstandingly novel idea. Original work which is not yet reported anywhere else. Evidence for ingenious way of innovation which is also Implementable. Could be a patentable publishable work.
			(0 - 1 Marks)	(2 - 3 Marks)	(4 Marks)	(5 Marks)
2-m	Quality of results / conclusions / solutions. [CO1] [Group Assessment]	10	None of the expected outcomes are achieved. The team is unable to derive any inferences on the failures/issues observed. Any kind of observations or studies is not made.	Only a few of the expected outcomes are achieved. A few inferences are made on the observed failures/issues. No further work suggested.	Many of the expected outcomes are achieved. Many observations and inferences are made, and attempts to identify the issues are done. Some suggestions are made for further work.	Most of the stated outcomes are met. Extensive studies are done and inferences drawn. Most of the failures are addressed and solutions suggested. Clear and valid suggestions made for further work.
			(0 – 3 Marks)	(4 – 6 Marks)	(7 - 9 Marks)	(10 Marks)

2-n	Presentation - Part I Preparation of slides. [CO6] [Group Assessment].	5	The presentation slides are shallow and in a clumsy format. It does not follow proper organization.	Presentation slides follow professional style formats to some extent. However, its organization is not very good. Language needs to be improved. All references are not cited properly, or acknowledged. Presentation slides needs to be more professional.	Presentation slides follow a good style format and there are only a few issues. Organization of the slides is good. Most of references are cited properly. The flow is good and team presentation is neatly organized. Some of the results are not clearly shown. There is room for improvement.	The presentation slides are exceptionally good. Neatly organized. All references cited properly. Diagrams/Figures, Tables and equations are properly numbered, and l i s ted. Results/ inferences clearly highlighted and readable.
			(0 - 1 Marks)	(2 - 3 Marks)	(4 Marks)	(5 Marks)
	Presentation - Part II: Individual Communication [CO6] [Individual Assessment].	5	The student is not communicating properly. Poor response to questions.	The student is able to explain some of the content. The student requires a lot of prompts to get to the idea. There are language issues.	Good presentation/ communication by the student. The student is able to explain most of the content very well. There are however, a few areas where the student shows lack of preparation. Language is better.	Clear and concise communication exhibited by the student. The presentation is outstanding. Very confident and tackles all the questions without hesitation. Exceptional traits of communicator.
			(0 - 1 Marks)	(2 - 3 Marks)	(4 Marks)	(5 Marks)
Phase-II Final Evaluation, Marks: 40						

			EVALUATION RUBRICS for PROJECT Phase II: Report Evaluation			
Sl. No.	Parameters	Marks	Poor	Fair	Very Good	Outstanding
2-o	Report [CO6]	30	The prepared report is shallow and not as per standard format. It does not follow proper organization. Contains mostly unacknowledged content. Lack of effort in preparation is evident. References are not cited. Unprofessional and inconsistent formatting.	Project report follows the standard format to some extent. However, its organization is not very good. Language needs to be improved. All references are not cited properly in the report. There is lack of formatting consistency.	Project report shows evidence of systematic documentation. Report is mostly following the standard style format and there are only a few issues. Organization of the report is good. Mostly consistently formatted. Most of references/sources are cited/ acknowledged properly.	The report is exceptionally good. Neatly organized. All references cited properly. Diagrams/Figures, Tables and equations are properly numbered, and listed and clearly shown. Language is excellent and follows professional styles. Consistent formatting and exceptional readability.
-			(0 - 11 Marks)	(12 - 18 Marks)	(19 - 28 Marks)	(29 - 30 Marks)
			Phase - II Project Report Marks: 30			

time of visit.

The students should not use mobile phones or photography in the factory premises.

The students should strictly maintain the discipline and take care of any accident at the time of production and testing plant visits.

The students shall be advised to report the security at Main Entrance for further instructions with the Original Request Letter of PRINCIPAL or HOD and Hard copy of this mail.

Send return mail for confirmation.

You are free to call for any further clarifications.

With Regards,

Benoy Peter,

Training co.ordinator,

Keltron Controls.

ph. Land :0478-2830715

mob :8547374800

e mail : kelkca@keltron.org

ISO 9001 : 2015 Certified Company

KERALA STATE ELECTRONICS
DEVELOPMENT CORPORATION LTD.
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KEC / TDC / T / 2022 / 2589 / 13773

November 10, 2022

CERTIFICATE

This is to certify that **Mr. RICHU JACOB JOHNSON, B.Tech** (Electronics & Communication Engineering) student, MUSALIAR COLLEGE OF ENGINEERING & TECHNOLOGY, PATHANAMTHITTA, has successfully completed the Internship Training in our **Power Electronics Group (PEG), Fabrication Shop, Transformer Winding, Electro Plating, Tool Room, Security and Surveillance Group (SSG), Special Products Group (SPG), Search and Rescue Beacon (SRB) and Technology Development Centre** of Keltron Equipment Complex, Thiruvananthapuram from 22-10-2022, 25-10-2022 to 29-10-2022, 31-10-2022 to 05-11-2022 and 07-11-2022 to 08-11-2022.

His conduct and character during the period with us were good.

Bᴏᴇⁿ

Chief General Manager

SEISMOLOGICAL PREDICTION USING MACHINE LEARNING & GOOGLE MAP API

MINI PROJECT REPORT

Submitted By

MATHEW J SHAJI (MCK20CS035)

SANKET SUNIL SHETE (MCK20CS045)

PRINCE MATHEW (MCK20CS044)

MATHEW MONCY (MCK20CS036)

to

The APJ Abdul Kalam Technological University in partial fulfillment of
the requirements for the award of the Degree of
Bachelor of Technology

In
Computer Science & Engineering

Department of Computer Science & Engineering

Musaliar College of Engineering & Technology

Pathanamthitta, Kerala-689653

JUNE 2023

DECLARATION

We undersigned hereby declare that the project report"Seismological prediction using Machine Learning and Google Maps API" submitted for partial fulfillment of the requirements for the award of degree of Bachelor of Technology of the APJ Abdul Kalam Technological University, Kerala is a bonafide work done by us under supervision of Prof RAJEENA RAHMAN. This submission represents our ideas in our own words and where ideas or words of others have been included, we have adequately and accurately cited and referenced the original sources. We also declare that we have adhered to ethics of academic honesty and integrity and have not misrepresented or fabricated any data or idea or fact or source in my/our submission. We understand that any violation of the above will be a cause for disciplinary action by the institute and/or the University and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been obtained. This report has not been previously formed the basis for the award of any degree, diploma or similar title of any other University.

PATHANAMTHITTA　　　　　　　　　　**MATHEW J SHAJI (MCK20CS035)**

　　　　　　　　　　　　　　　　　　　MATHEW MONCY(MCK20CS036)

　　　　　　　　　　　　　　　　　　　PRINCE MATHEW(MCK20CS044)

　　　　　　　　　　　　　　　　　　　SANKET SUNIL SHETE(MCK20CS045)

MUSALIAR COLLEGE OF ENGINEERING & TECHNOLOGY

PATHANAMTHITTA, KERALA-689653

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CERTIFICATE

This is to certify that the report entitled **"SEISMOLOGICAL PREDICTION USING MACHINE LEARNING AND GOOGLE MAP API"** submitted by **MATHEW J SHAJI (MCK20CS035) , MATHEW MONCY (MCK20CS036), SANKET SUNIL SHETE (MCK20CS045) , PRINCE MATHEW(MCK20CS044)** to the APJ Abdul Kalam technological university in partial fulfillment of the requirement for the award of the degree of the bachelor of technology in computer science and engineering is bonafide record of the project work carried out by them under our supervision and guidence. The report in any form has been not to be submitted to any other university or institute for any purpose.

Guide   Head of the Department

Prof.Harsha Pushpan   Prof.Usha Gopalkrishnan

Assistant professor   Associate Professor

Dept. of CSE   Dept. of CSE

Coordinator   External Examiner

Prof.Giri S M

Assistant professo

Dept. of CSE

ACKNOWLEDGEMENT

ABSTRACT

This project aims to revolutionize seismic activity prediction and disaster management using machine learning (ML) algorithms and the Google Maps API. Through a comprehensive review of 31 studies published from 2017 to 2021, the project identifies the best seismic indicators and ML algorithms for seismic activity magnitude, trend, and occurrence prediction. The project extracts feature from seismic data collected from various geographical regions globally to train and test the accuracy of different ML algorithms. The performance of the algorithms will be compared to determine the most accurate one for seismic activity prediction. Using Flask as the front-end web framework, the project will create a user-friendly interface that allows interaction with the machine. The Google Maps API will be used to visualize the predicted seismic activity occurrence, magnitude, and trend on a map. This will help in identifying high-risk seismic activity zones, aiding in disaster management planning, and reducing risks. The technologies used in this project include Python for data analysis and ML model development, and various ML algorithms such as Random Forest, Gradient Boosting. The project aims to provide a comprehensive solution for seismic activity prediction and visualization that can contribute significantly to the field of seismic activity prediction and disaster management. Overall, this project will explore the potential of ML algorithms and the Google Maps API in seismological prediction, providing accurate predictions about seismic activity magnitude, trend, and occurrence. We believe that this project will deliver a high-quality solution that meets the expectations and standards set by the professor. By identifying the best-performing ML algorithms and seismic indicators, this project can aid in mitigating the risks of seismic activity, helping to save lives and reduce the impact of natural disasters.

CONTENTS

LIST OF FIGURES

ABBREVIATION

- HTML- HYPER TEXT MARK UP LANGUAGE

- CSS   - CASCADING STYLE SHEETS

- API   - APPLICATION PROGRAMMING INTERFACE

- GPS   - GLOBAL POSITIONING SYSTEM

- AUC - AREA UNDER CURVE

- GUI   - GRAPHICAL USER IUNTERFACE

CHAPTER-1

INTRODUCTION

1.1 GENERAL BACKGROUND

Earthquakes are natural phenomena that occur when there is a sudden release of energy in the Earth's crust, resulting in seismic waves that can shake the ground. They are a profound manifestation of the dynamic nature of our planet and have the potential to cause significant disruptions and damage.The primary cause of earthquakes is the movement and interaction of tectonic plates. The Earth's lithosphere is divided into several large plates that float on the semifluid asthenosphere beneath. As these plates slowly shift and collide, immense stress can build up along their boundaries. When the stress exceeds the strength of the rocks holding them together, it leads to a sudden release of energy, resulting in an earthquake.During an earthquake, seismic waves radiate outward from the source of the rupture, known as the focus or hypocenter. These waves carry the energy released by the earthquake and cause the ground to shake. There are three main types of seismic waves: primary waves (P- waves), secondary waves (S-waves), and surface waves. P-waves are the fastest and can travel through both solid and liquid materials. S-waves are slower and can only pass through solids. Surface waves, as the name suggests, propagate along the Earth's surface and are responsible for the most damage during an earthquake.

The strength of an earthquake is measured using different scales. The Richter scale, developed by Charles F. Richter in 1935, measures the amplitude of seismic waves to determine the magnitude of an earthquake. The moment magnitude scale (Mw) is now widely used, as it provides a more accurate measurement of the total energy released by an earthquake. Magnitude is a logarithmic scale, meaning that each whole number increase on the scale represents a tenfold increase in the amplitude and roughly 32 times more energy release. The impact and damage caused by an earthquake depend on various factors, including its magnitude, depth, distance from populated areas, local geology, and the level of preparedness. Earthquakes can lead to the loss of lives, injuries, and extensive damage to buildings, infrastructure, and the environment. The intensity of shaking, duration, and the proximity to epicenters play a crucial role in determining the severity of the consequences. In addition to direct effects, earthquakes can trigger secondary hazards such as landslides, tsunamis (when occurring under the ocean), and aftershocks.

Earthquakes are not evenly distributed worldwide. They are more common along plate

boundaries, forming seismic zones. Prominent seismic zones include the Pacific Ring of Fire, which encompasses the Pacific Ocean basin, the Mediterranean region, and the Himalayan Belt. However, earthquakes can also occur in unexpected locations away from plate boundaries, known as intraplate earthquakes.

Studying earthquakes and understanding their causes and effects is essential for assessing and managing the associated risks. Advances in seismology, geophysics, and computational modeling have contributed to enhancing our understanding of earthquakes and improving our ability to predict and mitigate their impacts on society. The significance of earthquake prediction lies in its potential to save lives, reduce damage, and enhance preparedness. By accurately predicting earthquakes, scientists and authorities can provide timely warnings to communities at risk, allowing people to evacuate or take necessary precautions. Early warning systems can provide valuable seconds to minutes of advance notice, which can make a significant difference in implementing emergency response plans and protecting lives. Moreover, earthquake prediction enables better planning and design of structures, infrastructure, and critical facilities in earthquake-prone areas, ensuring they are built to withstand the forces generated by seismic events. Overall, earthquake prediction plays a vital role in minimizing the devastating impact of earthquakes on society and promoting resilience in vulnerable regions. Traditional earthquake prediction techniques, such as seismic monitoring and historical data analysis, have certain limitations when compared to machine learning approaches. These traditional methods often rely on the analysis of seismic data, fault mapping, and statistical models to identify potential patterns or precursors associated with earthquakes. However, these techniques face challenges in accurately predicting the precise timing, magnitude, and location of earthquakes. They may struggle with distinguishing between precursor signals and normal seismic activity, leading to false alarms or missed predictions. In contrast, machine learning techniques have the ability to analyze vast amounts of data, including seismic records, geospatial information, and environmental factors, to identify complex patterns and correlations that may not be apparent to human observers. Machine learning algorithms can adapt and improve their predictions over time as they are trained on more data, making them potentially more accurate and reliable in earthquake prediction compared to traditional methods. Machine learning is a powerful tool that can be applied to various domains, including the study of earthquakes. In the context of earthquakes, machine learning involves the utilization of algorithms and statistical models to analyze seismic data and make predictions or gain insights about seismic activities.

By training these models on historical earthquake data, they can learn patterns and correlations that may not be immediately apparent to human observers. Machine learning algorithms can identify relevant features in seismic signals, detect earthquake events, estimate their

magnitudes, predict their locations and timing, and even assess potential earthquake hazards.

This technology has the potential to improve our understanding of earthquakes, enhance early warning systems, and aid in disaster preparedness and response efforts, ultimately contributing to the mitigation of seismic risks and the safety of communities in earthquake-prone regions While machine learning shows promise in earthquake prediction, there are still significant challenges and areas of focus for future development. One major challenge is the scarcity of labeled earthquake data for training ML models. Earthquakes are rare and unpredictable events, making it difficult to obtain a sufficiently large and diverse dataset. Additionally, the complex nature of seismic signals and the multitude of factors contributing to earthquakes pose further challenges in accurately modeling and predicting them. Another area of concern is the interpretability of ML models. Understanding the reasoning behind their predictions is crucial for gaining trust and acceptance from the scientific community and stakeholders. In the future, efforts should be directed towards collecting more labeled earthquake data, developing robust and interpretable ML models, and integrating multiple data sources, such as geological and geophysical data, to enhance prediction accuracy. Collaborative research initiatives and data sharing among researchers worldwide will be essential for advancing the field of earthquake prediction using machine learning and ultimately improving our ability to forecast and mitigate the impact of seismic events.

1.2 PROBLEM STATEMENT

Earthquakes can have devastating aftereffects that impact people, infrastructure, and the environment. One of the most tragic consequences is the potential for injuries and loss of life. The violent shaking of the ground can cause buildings to collapse, debris to fall, and structural damage, leading to injuries and fatalities. The severity of casualties is influenced by factors such as the intensity and proximity of the earthquake, population density, and preparedness measures in place.Another significant aftereffect of earthquakes is the damage inflicted upon buildings and infrastructure. The powerful forces generated during an earthquake can result in structural damage and destruction of critical infrastructure like bridges, roads, and utility systems. The extent of the damage depends on various factors, including the magnitude of the earthquake, distance from the epicenter, and the quality of construction. Rebuilding and repairing the damaged structures entail substantial costs and resources.The economic impact of earthquakes can be substantial. Direct costs include the expenses involved in repairing and reconstructing damaged infrastructure and buildings. Indirect costs encompass the broader economic consequences, such as disruptions to businesses, loss of productivity, unemployment, and decreased tourism. The economic repercussions can be long-lasting, affecting the affected region and even larger areas dependent on trade

and commerce.

Earthquakes also leave a significant environmental impact. Ground shaking can trigger landslides, ground deformation, and soil liquefaction, damaging vegetation, altering watercourses, and disrupting natural habitats. Additionally, earthquakes occurring near coastlines can generate tsunamis, resulting in coastal flooding and further environmental damage. The recovery and restoration of ecosystems affected by earthquakes often require significant efforts and resources.Beyond physical damages, earthquakes have social and psychological implications. Displacement, loss of homes, and the disruption of social networks can lead to emotional distress and psychological trauma within affected communities. Recovering from such events involves addressing not only the physical aspects but also supporting mental health, community rebuilding, and social cohesion.

Furthermore, earthquakes can disrupt critical infrastructure and services. Electricity, water supply, and communication networks may be interrupted, impeding emergency response efforts and making it challenging for affected communities to access essential resources. The restoration of these services becomes crucial for effective recovery and support to those affected. The problem addressed in this project is the limited accuracy and precision of traditional earthquake prediction methods, which often struggle to provide timely and reliable forecasts of earthquakes. These traditional techniques, such as seismic monitoring and historical data analysis, have inherent limitations in their ability to accurately predict the timing, magnitude, and location of earthquakes. They often face challenges in distinguishing between precursor signals and normal seismic activity, leading to false alarms or missed predictions. Therefore, the aim of this project is to leverage machine learning techniques to develop an improved earthquake prediction model that can analyze large volumes of seismic data, geospatial information, and other relevant factors to identify complex patterns and correlations. By harnessing the power of machine learning algorithms, we aim to enhance the accuracy and reliability of earthquake predictions, thereby providing valuable information for disaster preparedness and mitigation efforts.

1.3 PROJECT SCOPE

The project scope for this Flask web application revolves around using XGBoost for earthquake prediction, obtaining real-time data from the USGS servers, and visualizing the predicted earthquake locations using the Google Maps API. Users are provided with an interactive interface to select a specific date horizon and view the corresponding earthquake predictions on a map.

The application begins by collecting real-time earthquake data from the USGS

servers. This ensures that the information used for predictions is up-to-date and reflects the most recent seismic activity. The data is fetched either directly from the USGS API or from a similar reliable source. Once the data is obtained, it undergoes processing to extract the relevant features required for earthquake prediction. These features typically include date, latitude, longitude, depth, magnitude, and location details. The data is further cleaned and transformed to prepare it for training the XGBoost machine learning model. The XGBoost model is then trained using historical earthquake data. The model takes into account various features and their respective rolling averages over specific time windows to make accurate predictions. The training process involves optimizing hyperparameters, such as the maximum depth and learning rate, to achieve the best possible performance. To evaluate the effectiveness of the trained model, appropriate evaluation metrics are employed, such as accuracy, precision, recall, or the area under the ROC curve. This assessment helps determine the model's predictive capabilities and its reliability in forecasting earthquake occurrences. The Flask web application acts as the user interface for interacting with the earthquake prediction system. It allows users to select a desired date horizon, indicating the range of dates for which they wish to view earthquake predictions. The application then displays the predicted earthquake locations on a map, utilizing the powerful visualization capabilities of the Google Maps API.

By providing this interactive interface, users can gain insights into potential earthquake occurrences within their selected timeframe and spatial region. This application serves as a valuable tool for monitoring seismic activity, aiding in disaster preparedness and risk assessment. Overall, the project scope encompasses data collection, data processing, machine learning model training, evaluation, and the development of a user-friendly web application that integrates XGBoost predictions with the Google Maps API for visualizing earthquake locations.
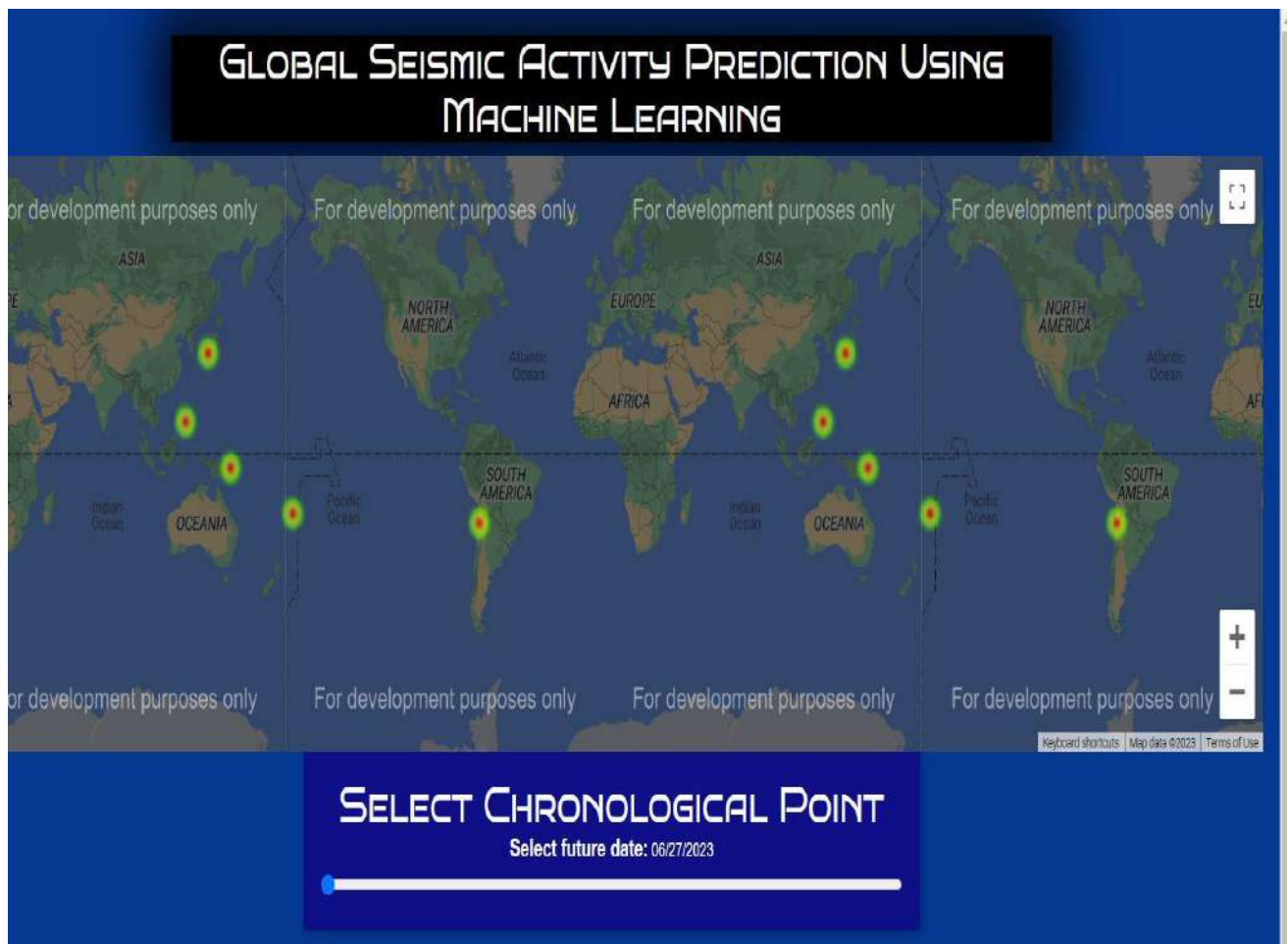
Fig: 1.3.1

CHAPTER-2

LITERATURE SURVEY

2.1 Earthquake Prediction Studies Using Radon as a Precursor in N-W Himalayas, India: A Case Study(OCT 2005)

The study titled "Earthquake Prediction Studies Using Radon as a Precursor in N-W Himalayas, India: A Case Study" conducted in October 2005 aimed to investigate the potential of radon gas emissions as precursors for earthquake prediction in the northwestern Himalayas region of India. Radon gas is known to be emitted from the Earth's crust, and previous studies have suggested a possible correlation between radon anomalies and seismic activity. The researchers collected radon data from multiple monitoring stations located in the study area and analyzed it in conjunction with seismic activity data obtained from earthquake monitoring networks. The study focused on identifying any temporal and spatial patterns or anomalies in radon concentrations that could potentially indicate an impending earthquake. The findings of the study revealed some interesting observations. The researchers observed variations in radon concentrations, both spatially and temporally, which correlated with seismic activity in the region. They found that elevated radon levels were often associated with earthquake events, indicating a potential link between radon emissions and seismic activity.

However, the study also highlighted the complexities and challenges associated with earthquake prediction using radon as a precursor .The researchers noted that while radon anomalies showed promise as indicators of seismic activity, further research and data analysis are necessary to establish a reliable and robust prediction methodology. Overall, the study provides valuable insights into the relationship between radon gas emissions and earthquakes in the northwestern Himalayas region of India. It underscores the importance of continued research in this area to enhance our understanding of earthquake precursors and improve the effectiveness of earthquake prediction methods. Using radon gas as a precursor for earthquake prediction has some disadvantages. Firstly ,interpreting radon anomalies and establishing a clear causal relationship with seismic activity is complex and requires expertise. Secondly, radon concentrations can vary spatial and temporally due to various factors, making it challenging to solely rely on radon as a reliable predictor. Additionally, further research and data analysis are needed to improve understanding and develop a robust prediction methodology. Implementing radon monitoring systems on a large scale and in real-time can be costly and technically demanding. Considering these limitations is crucial when evaluating the potential of radon gas as an earthquake

precursor.

2.2 Current status of seismo-electromagnetics for short-term earthquake prediction
Masashi Hayakawa & Yasuhide Hobara

The paper titled "Current status of seismo-electromagnetics for short-term earthquake prediction" by Masashi Hayakawa and Yasuhide Hobara provides an overview of the current state of research in seismo-electromagnetics and its potential for short-term earthquake prediction.The authors discuss the various electromagnetic phenomena associated with earthquakes, such as electromagnetic emissions, ionospheric disturbances, and ground-based electromagnetic signals. They highlight the importance of understanding these phenomena as potential precursors to earthquakes and their potential for improving earthquake prediction capabilities.The paper presents several case studies and research findings that demonstrate the correlation between electromagnetic anomalies and seismic activity. It discusses the use of different observation techniques and instruments, including satellite-based observations, ground-based measurements, and ionospheric monitoring systems.The authors also address the challenges and limitations of seismo-electromagnetic methods for earthquake prediction. They emphasize the need for further research to establish robust and reliable prediction models, considering the complexities and uncertainties associated with electromagnetic signals and their interpretation. Overall, the paper provides an informative summary of the current status of seismo-electromagnetics as a tool for short-term earthquake prediction. It highlights the potential of this field while acknowledging the ongoing research efforts required to advance our understanding and improve prediction capabilities.

Disadvantages: One of the main disadvantages is the complexity of the seismo-electromagnetic phenomena. The underlying mechanisms and processes that generate electromagnetic signals in relation to earthquakes are not fully understood. This lack of understanding makes it difficult to establish a reliable and consistent framework for earthquake prediction based on electromagnetic observations. Another disadvantage is the limited predictive power of seismo-electromagnetics for short- term forecasting. The correlation between electromagnetic anomalies and imminent earthquakes is often weak and inconsistent. This inconsistency hinders the development of accurate prediction models and limits the practical application of seismo-electromagnetic techniques in real-time earthquakeforecasting.Practical limitations also exist in implementing seismo-electromagnetic monitoring. Setting up and maintaining the necessary monitoring instruments to capture electromagnetic signals require significant resources and infrastructure. Additionally, the interpretation and analysis of electromagnetic data require specialized knowledge

and techniques, which may not be readily available in all regions.External interferences pose another challenge. Natural factors such as atmospheric conditions and solar activity, as well as human-made electromagnetic noise, can obscure or distort the electromagnetic signals relevant to earthquake prediction. Separating the earthquake-related signals from these interferences adds complexity and reduces the reliability of seismo- electromagneticpredictions

Furthermore, there is a lack of consensus among researchers regarding the interpretation and significance of electromagnetic signals in relation to earthquake prediction. The variation in study sites, measurement techniques, and data analysis methods across different research groups makes it difficult to reproduce and validate results, hindering the establishment of standardized guidelines or predictive modelsOverall, while seismo-electromagnetics holds potential for short-term earthquake prediction, there are significant disadvantages that limit its practical application. Further research and advancements are needed to address these challenges and improve the reliability and effectiveness of seismo-electromagnetic methods for earthquake forecasting.

2.3 Satellite Remote Sensing in Seismology: A Review AndrewA.Tronin(2009)

The paper "Satellite Remote Sensing in Seismology: A Review" by Andrew A. Tronin provides an in-depth review of the applications of satellite remote sensing in seismology. The author explores the use of various satellite-based remote sensing techniques for studying seismic events and their associated phenomena .The paper discusses the utilization of different remote sensing sensors, including optical and synthetic aperture radar (SAR) systems, for seismological research. It examines the capabilities and limitations of these sensors in detecting and monitoring seismic activities, such as earthquakes, ground deformations, and surface displacements. Furthermore, the review highlights the integration of satellite remote sensing data with other geodetic measurements and techniques, such as GPS and InSAR, to enhance the understanding of seismic processes and their impacts on the Earth's surface. The author also addresses the challenges and future prospects of satellite remote sensing in seismology.

Overall, this review paper serves as a valuable resource for researchers and professionals in the field of seismology, providing insights into the application of satellite remote sensing for seismic monitoring, hazard assessment, and the study of earthquake-related phenomena.

Disadvantages:

1. Lack of Specific Details: The statement lacks specific details regarding the content, findings, and conclusions of the paper.The statement only mentions that the paper provides a review of satellite

remote sensing in seismology. It does not specify the depth or breadth of the review, potential biases, or specific areas of focus. The lack of detailed scope may limit the usefulness and applicability of the information for readers seeking specific insights.

3. Absence of Critical Analysis: The statement does not mention any critical analysis or potential criticisms of the reviewed techniques or applications of satellite remote sensing in seismology. A comprehensive review should present a balanced perspective by discussing both advantages and disadvantages of the methodologies and their limitations.

4. Timeframe and Relevance: The statement does not provide information on the publication date of the paper. Since the field of remote sensing and seismology is constantly evolving, the relevance of the information may be limited if the paper was published several years ago and does not incorporate recent advancements in the field.

CHAPTER-3
SYSTEM MODELS

3.1 EXISTING SYSTEM

Geodetic surveys are a valuable technique used to measure the movement of tectonic plates and crustal deformation. This method relies on satellite-based technologies, primarily the Global Positioning System (GPS), to precisely monitor the positions of points on the Earth's surface over time.The basic principle behind geodetic surveys is that as tectonic plates move and interact with each other, they generate stress and strain along fault lines. This strain gradually accumulates over time until it is released through an earthquake. By measuring the displacement of points on the Earth's surface caused by this strain, geodetic surveys provide valuable data for understanding the build-up of stress and estimating the potential for future earthquakes.GPS satellites continuously transmit signals to ground-based receivers, which accurately determine the receiver's position in three-dimensional space. These receivers are installed at various locations along fault lines and other key areas prone to seismic activity. The receivers record the positions of these points over time, allowing scientists to analyze the movement and deformation of the Earth's crust.

Through careful analysis of the GPS data, scientists can identify patterns and trends in the movement of tectonic plates. They can measure the velocity and direction of plate motion, detect changes in strain accumulation along fault lines, and assess the potential for seismic activity in specific regions. By monitoring the gradual accumulation of strain, geodetic surveys provide insights into the level of stress present in the Earth's crust, which can help in estimating the likelihood of future earthquakes.

Furthermore, geodetic surveys enable the identification of areas with higher stress accumulation and the measurement of interseismic deformation, which refers to the deformation that occurs between earthquakes. This information is crucial for understanding the seismic behavior of specific fault segments and the potential for earthquake occurrence. Overall, geodetic surveys using GPS and satellite-based technologies have significantly contributed to our understanding of plate tectonics, crustal deformation, and earthquake dynamics. They provide valuable data for estimating the potential for future earthquakes and play a crucial role in seismic hazard assessment and mitigation efforts.

3.2 DRAWBACKS OF EXISTING SYSTEM

1.Limited spatial coverage: Geodetic surveys require the installation of GPS receivers at specific locations to monitor crustal deformation. As a result, the coverage area is limited to the areas where receivers are deployed. This means that remote or inaccessible regions may have sparse data, which can affect the accuracy of predictions in those areas.

2.High costs and technical requirements: Setting up geodetic surveys can be expensive. It requires specialized equipment, skilled personnel, and ongoing and maintaining a network of GPS receivers for maintenance. The cost and technical requirements may limit the implementation of widespread monitoring networks, particularly in regions with limited resources.

3.Time-consuming data analysis: Analyzing the data collected from geodetic surveys can be a complex and time-consuming process. It involves processing and interpreting large volumes of GPS measurements over time to detect subtle changes in crustal deformation. The analysis requires expertise in geodesy and geophysics, and the interpretation of the results can be challenging.

4.Inherent uncertainties: While geodetic surveys provide valuable information about strain accumulation and plate movement, there are inherent uncertainties associated with the measurements. Factors such as atmospheric conditions, satellite orbits, and data processing techniques can introduce errors into the measurements, which can affect the accuracy of the predictions.

5.Short-term predictions are challenging: Geodetic surveys are more useful for long-term earthquake forecasting and understanding plate tectonics rather than short-term earthquake predictions. While they can provide information about the gradual accumulation of strain along fault lines, predicting the exact timing and magnitude of an earthquake in the near future remains a complex task.

3.3 PROPOSED SYSYEM

The proposed system aims to revolutionize seismological prediction by integrating machine learning techniques with the powerful visualization capabilities of the Google Maps API. The existing system for seismological prediction relies on traditional methods that often have limitations in terms of accuracy and real-time data integration. This proposed system addresses these limitations and offers a more advanced and reliable solution.

The first key component of the proposed system is real-time data acquisition. The system will retrieve up-to-date earthquake data directly from the USGS servers. This ensures that the predictions are based on the most recent and accurate information available. The collected data will then

undergo preprocessing steps, including cleaning, filtering, and feature extraction. These steps will derive relevant information from the raw data, such as location, depth, and historical patterns, which will be used as input for the machine learning model. The heart of the proposed system lies in the development of a machine learning model specifically designed for earthquake prediction. The model, trained on historical earthquake data, will learn patterns and correlations between various features and earthquake occurrences. XGBoost, a popular machine learning algorithm, will be utilized for its ability to handle binary classification tasks effectively. The model will be fine-tuned using appropriate hyperparameters to optimize its performance. Through this process, the model will gain the capability to predict the likelihood and magnitude of earthquakes based on the input data.

The next crucial component is the integration of the Google Maps API. The predicted earthquake locations will be visualized on an interactive map, providing users with a comprehensive view of the spatial distribution of earthquakes. The system will convert latitude and longitude coordinates to the format required by the Google Maps API to ensure accurate and precise location visualization. Users will be able to interact with the map, zooming in and out and exploring specific regions of interest.

To facilitate user interaction, the system will provide a user-friendly interface. Users will have the option to select a desired date horizon for earthquake predictions. Upon selecting a date, the system will generate and display the predicted earthquake locations on the map, providing users with valuable insights into potential seismic activities in specific areas.To ensure the reliability and effectiveness of the predictions, the system will undergo rigorous performance evaluation. Evaluation metrics such as accuracy, precision, recall, and F1-score will be utilized to assess the performance of the machine learning model. The system will also be extensively tested to validate its predictions against real-world earthquake occurrences.

As a future enhancement, the proposed system can be expanded to incorporate additional data sources, such as geological data, satellite imagery, or social media data. By integrating diverse data types, the accuracy and comprehensiveness of the predictions can be further improved. Furthermore, advanced visualization techniques, such as 3D maps or animation, can be explored to provide users with a more immersive and informative experience.

In conclusion, the proposed system for seismological prediction utilizing machine learning and the Google Maps API offers a significant advancement over the existing methods. By leveraging real-time data, machine learning algorithms, and interactive visualization, the system provides more accurate predictions and a comprehensive understanding of earthquake occurrences. It has the potential to revolutionize seismological prediction, enabling better risk assessment and mitigation strategies for earthquake-prone areas.

3.4 DATASET

The dataset used for this project consists of historical earthquake data collected from the USGS servers. The data includes various attributes such as earthquake magnitude, depth, latitude, and longitude. Additional features are engineered from the raw data, including rolling averages of depth and magnitude values to capture temporal patterns. The dataset is preprocessed to handle missing values, ensuring the quality of the data. The outcome variable is prepared by categorizing the earthquakes into different classes based on their severity. This simplified dataset serves as the foundation for training the XGBoost model, which learns from the historical earthquake data to make predictions for future earthquake occurrences. By leveraging real-time data, XGBoost model training, and integrating with the Google Maps API, this project offers an intuitive and informative platform for users to explore and understand earthquake predictions time event.

- time ---------------------- Time when the event occurred. Times are reported in milliseconds since the epoch
- latitude ------------------- Decimal degrees latitude. Negative values for southern latitudes.
- longitude ------------------ Decimal degrees longitude. Negative values for western longitudes.
- depth ---------------------- Depth of the event in kilometers.
- mag ----------------------- Magnitude of event occured.
- magType -------------------- The method or algorithm used to calculate the preferred magnitude
- nst ----------------------- The total number of seismic stations used to determine earthquake location.
- gap ----------------------- The largest azimuthal gap between azimuthally adjacent stations (in degrees).
- dmin ---------------------- Horizontal distance from the epicenter to the nearest station (in degrees).
- rms ----------------------- The root-mean-square (RMS) travel time residual, in sec, using all weights.
- net ------------------------ The ID of a data source contributor for event occured.

- id ------------------------- A unique identifier for the event.

- types ---------------------- A comma-separated list of product types associated to this event.

- place ---------------------- named geographic region near to the event.

- type ----------------------- Type of seismic event.

- locationSource -------------- The network that originally authored the reported location of this event.

- magSource ------------------ Network that originally authored the reported magnitude for this event.

- horizontalError ------------- Uncertainty of reported location of the event in kilometers.

- depthError ------------------ The depth error, three principal errors on a vertical line.

- magError ------------------- Uncertainty of reported magnitude of the event.

- magNst ---------------------- The total number of seismic stations to calculate the magnitude of earthquake.

- status ---------------------- Indicates whether the event has been reviewed by a human.

	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
1	latitude	longitude	depth	mag	magType	nst	gap	dmin	rms	net	id	updated	place	type	horizontal	depthErro	magError	magNst	status	locationSc	magSource
2	60.0852	-150.627	37.6	1.3	ml				0.61	ak	ak0238d5	2023-07-0	31 km NE	earthquake		1.3			automatic	ak	ak
3	35.61333	-117.403	9.61	1.63	ml	16	141	0.05448	0.22	ci	ci4050132	2023-07-0	17km S of	earthquak	0.45	0.84	0.209	15	automatic	ci	ci
4	62.1898	-145.522	31.6	1.2	ml				0.54	ak	ak0238d5	2023-07-0	9 km N of	earthquake		0.2			automatic	ak	ak
5	33.76417	-118.801	10.39	1.74	ml	23	120	0.2397	0.26	ci	ci4050132	2023-07-0	27km S of	earthquak	0.58	1.72	0.207	30	automatic	ci	ci
6	58.2127	-155.093	1.1	0.5	ml				0.32	ak	ak0238d5	2023-07-0	81 km NN'	earthquake		2.5			automatic	ak	ak
7	38.84117	-122.767	0.71	1.11	md	16	155	0.01098	0.08	nc	nc7390738	2023-07-0	4km WNW	earthquak	0.4	0.56	0.14	17	automatic	nc	nc
8	38.14667	-119.194	2.48	2.27	md	11	190	0.2798	0.27	nc	nc7390738	2023-07-0	13km SSE	earthquak	1.77	20.97	0.64	2	automatic	nc	nc
9	19.99767	-155.406	5.26	1.94	md	26	256		0.38	hv	hv734669	2023-07-0	Island of H	earthquak	1.67	1.35	0.64	3	automatic	hv	hv
10	34.962	-119.088	14.71	1.15	ml	14	102	0.1563	0.21	ci	ci4050131	2023-07-0	14km NNE	earthquak	0.48	1.7	0.135	9	automatic	ci	ci
11	38.83683	-122.8	1.79	0.95	md	7	117	0.007828	0.01	nc	nc7390737	2023-07-0	7km WNW	earthquak	0.48	1.61	0.5	8	automatic	nc	nc
12	19.17883	-155.351	29.38	1.81	md	39	191		0.12	hv	hv734669	2023-07-0	13 km ESE	earthquak	0.61	0.78	1.34	8	automatic	hv	hv
13	62.7202	-150.244	18.2	2.5	ml				0.83	ak	ak0238d5	2023-07-0	31 km NN'	earthquake		0.4			automatic	ak	ak
14	53.6381	-133.15	10	4	mb	51	93	0.865	0.78	us	us6000kpf	2023-07-0	175 km S c	earthquak	5.77	1.935	0.056	86	reviewed	us	us
15	58.3428	-133.284	0.1	2.7	ml				0.77	ak	ak0238d5	2023-07-0	Southeast	earthquake		0.4			automatic	ak	ak
16	49.8528	155.0031	136.914	5.1	mb	103	73	3.67	0.76	us	us6000kpr	2023-07-0	121 km SV	earthquak	9.69	6.696	0.02	791	reviewed	us	us
17	64.9596	-146.65	11.4	0.8	ml				0.5	ak	ak0238d4	2023-07-0	13 km NE	earthquake		1.1			automatic	ak	ak
18	34.06867	-118.948	13.72	1.97	ml	47	79	0.0193	0.29	ci	ci4050127	2023-07-0	14km WN'	earthquak	0.5	0.69	0.17	26	automatic	ci	ci
19	61.5803	-148.045	15.2	0.7	ml				0.68	ak	ak0238d4	2023-07-0	32 km SE	earthquak		0.3			automatic	ak	ak
20	35.7635	-117.58	9.91	0.55	ml	7	198	0.1557	0.15	ci	ci4050126	2023-07-0	16km W o	earthquak	1.34	2.59	0.015	4	automatic	ci	ci
21	61.4031	-151.016	68	1.1	ml				0.81	ak	ak0238d4	2023-07-0	29 km N o	earthquak		1.1			automatic	ak	ak
22	61.6344	-150.623	16.3	1.1	ml				0.36	ak	ak0238d4	2023-07-0	Southern	earthquak		0.3			automatic	ak	ak
23	19.1905	-155.494	33.47	2	md	40	77		0.12	hv	hv734669	2023-07-0	2 km SW	earthquak	0.47	0.81	1.39	14	automatic	hv	hv
24	57.7969	-157.122	24.3	1.7	ml				0.91	ak	ak0238d4	2023-07-0	Alaska Per	earthquake		1.7			automatic	ak	ak

all month

Fig 3.4.1 Data set

	time	latitude	longitude	depth	mag	magType	nst	gap	dmin	rms	...	updated	place	type	horizontalError	dept
0	2020-08-11T10:18:15.699Z	61.280000	-149.635500	30.80	1.30	ml	NaN	NaN	NaN	0.49	...	2020-08-11T10:26:13.058Z	2 km N of Elmendorf Air Force Base, Alaska	earthquake	NaN	
1	2020-08-11T10:12:52.490Z	33.583833	-116.802000	7.10	0.69	ml	37.0	41.0	0.03313	0.21	...	2020-08-11T10:16:36.077Z	12km WNW of Anza, CA	earthquake	0.28	
2	2020-08-11T10:02:20.820Z	35.744500	-117.528333	0.89	0.64	ml	9.0	163.0	0.18810	0.19	...	2020-08-11T10:05:51.249Z	12km WSW of Searles Valley, CA	earthquake	0.47	
3	2020-08-11T09:59:26.820Z	33.246167	-115.667000	3.27	1.42	ml	27.0	83.0	0.07307	0.19	...	2020-08-11T10:02:59.960Z	13km SSE of Bombay Beach, CA	earthquake	0.34	
4	2020-08-11T09:55:14.270Z	65.260200	-162.984200	3.20	2.20	ml	NaN	NaN	NaN	0.77	...	2020-08-11T10:24:31.874Z	67 km NNE of White Mountain, Alaska	earthquake	NaN	

Fig 3.4.2 Data set

	latitude	longitude	depth	mag	nst	gap	dmin	rms	horizontalError	depthError	magEi
count	14150.000000	14150.000000	14150.000000	14149.000000	9960.000000	11163.000000	10192.000000	14150.000000	8529.000000	14150.000000	8972.000
mean	39.489640	-116.593391	18.423449	1.479324	19.871084	112.598592	0.411993	0.265078	1.455368	7.591443	0.224
std	16.468250	55.310766	47.851676	1.108082	14.250814	55.766983	1.733845	0.263190	2.768131	614.493953	0.354
min	-65.352200	-179.941300	-3.510000	-1.430000	2.000000	13.000000	0.000000	0.000000	0.080000	0.000000	0.000
25%	35.614208	-148.862825	3.510000	0.790000	11.000000	70.930000	0.021000	0.090000	0.270000	0.450000	0.110
50%	38.154200	-118.176250	7.560000	1.260000	16.000000	101.350000	0.049710	0.160000	0.430000	0.745000	0.164
75%	51.835783	-116.888375	13.200000	1.880000	24.000000	143.630000	0.109784	0.370000	0.760000	1.640000	0.230
max	87.349200	179.928200	636.080000	7.800000	196.000000	355.000000	40.927000	2.170000	26.400000	73091.100000	5.320

Fig 3.4.3 Data set
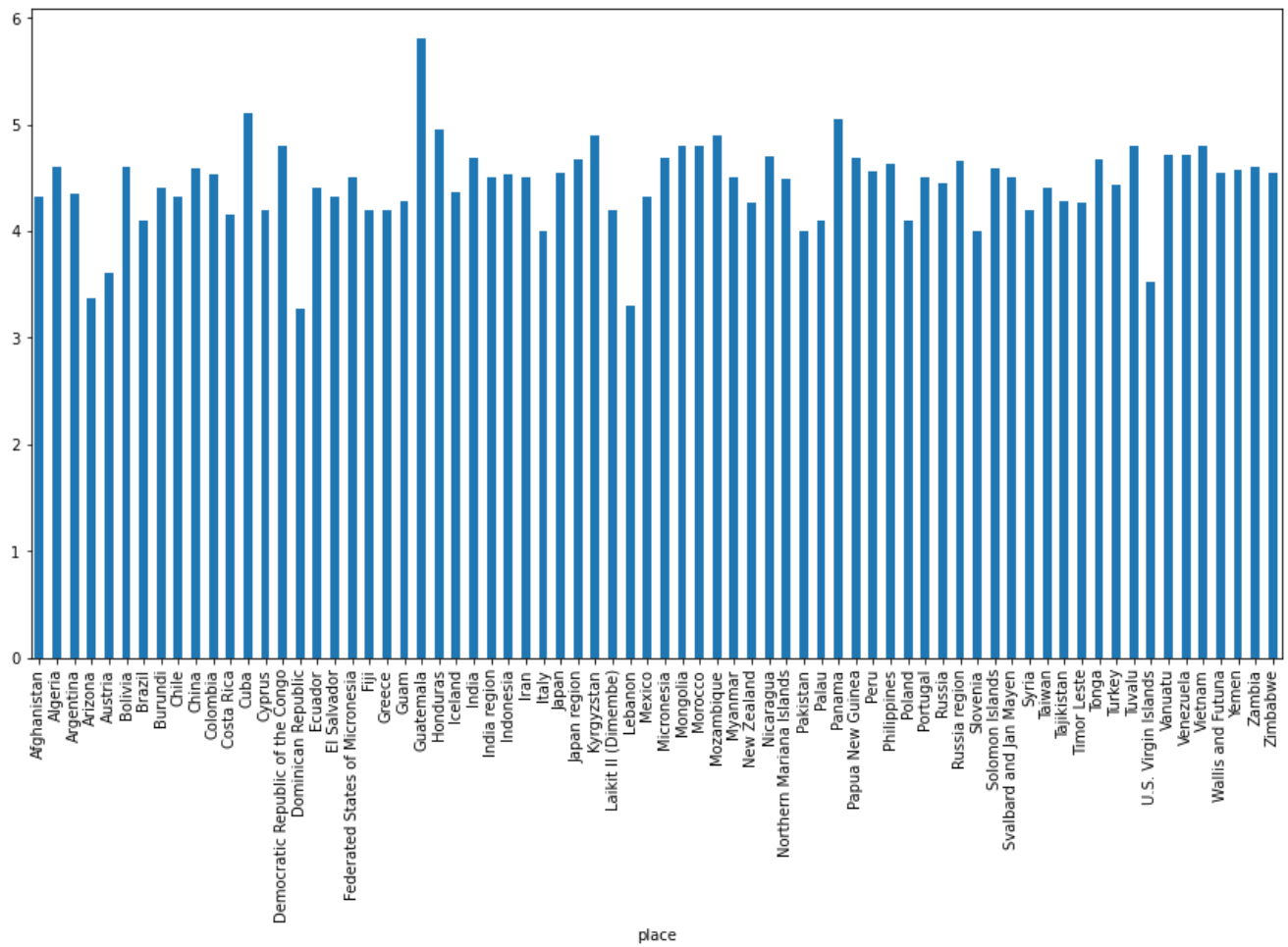
Fig 3.4.4 Data set

CHAPTER-4

WORKING

4.1 ALGORITHM

The XGBoost algorithm is a powerful and widely used machine learning algorithm that belongs to the family of gradient boosting algorithms. It is known for its ability to handle complex patterns in data and make accurate predictions.At its core, XGBoost utilizes ensemble learning, which combines the predictions sequentially, with each tree attempting to correct the mistakes of the previous trees. By of multiple weak models to create a strong predictive model. The algorithm builds decision trees iteratively improving the model's performance, XGBoost can effectively capture intricate relationships and dependencies in the data.To prevent overfittingand enhance generalization, XGBoost incorporates regularization techniques. These techniques control the complexity of the model and reduce the impact of noise in the data, leading to more robust predictions.

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4.2 METHOD

The algorithm used in this project is XGBoost (Extreme Gradient Boosting). XGBoost is a powerful machine learning algorithm that belongs to the ensemble learning family and is particularly effective for regression and classification tasks.

In the context of this project, the XGBoost algorithm is utilized for earthquake prediction. The process begins with the extraction of real-time earthquake data from the USGS (United States Geological Survey) servers. The data is then preprocessed and prepared for model training.

Feature engineering techniques are applied to the dataset, including the calculation of rolling averages for depth and magnitude values. These rolling averages provide a smoothed representation of the data, which helps in capturing important patterns and trends.The dataset is divided into training and testing sets. The XGBoost algorithm is trained using the training data, where it iteratively builds an ensemble of weak decision tree models. Each model focuses on minimizing the errors made by the previous models, gradually improving the overall prediction accuracy.The hyperparameters of the XGBoost algorithm, such as the maximum depth of the trees and the learning rate, are set based on the requirements of the project. The algorithm uses gradient boosting techniques to optimize a specific objective function and find the best possible model for earthquake prediction.

Once the XGBoost model is trained, it is used to make predictions on live earthquake data. The model takes into account various features, including latitude, longitude, depth, and previous earthquake magnitudes, to estimate the likelihood of earthquakes occurring within a specified date horizon.

The predicted earthquake locations are visualized on a map using the Google Maps API. Users can interact with the web application, select a date horizon of interest, and view the corresponding earthquake predictions on the map.

In summary, the XGBoost algorithm plays a crucial role in this project by leveraging real-time earthquake data, performing feature engineering, and making accurate predictions. Its ability to handle complex datasets and capture intricate patterns makes it a suitable choice for earthquake prediction tasks.

4.3 MODULES

Data Acquisition

The code reads earthquake data from the USGS servers using the URL "https://earthquake.usgs.gov/earthquakes/feed/v1.0/summary/all_month.csv". The data is sorted by time and truncated to extract only the required columns: date, latitude, longitude, depth, magnitude, and

place. The place column is split to extract the simplified location. Mean latitude and longitude values are calculated for each simplified location. Rolling averages are calculated for depth and magnitude using different window sizes. The outcome variable (mag_outcome) is derived based on the rolling averages of magnitude. NaN values and unnecessary columns are removed from the dataframe.

Data splitting and feature selection

The data is split into training and testing sets using the train_test_split function from sklearn.model_selection. The training set is used to train the XGBoost model.

Model training

The XGBoost model is trained using the training data.

The model is trained with the objective of binary logistic regression and evaluated based on the AUC metric.

The maximum depth and learning rate (eta) are set as hyperparameters for the XGBoost model.

The number of training iterations (num_round) and early stopping rounds are also defined.

4.4 ARCHITECTURE OF THE SYSTEM
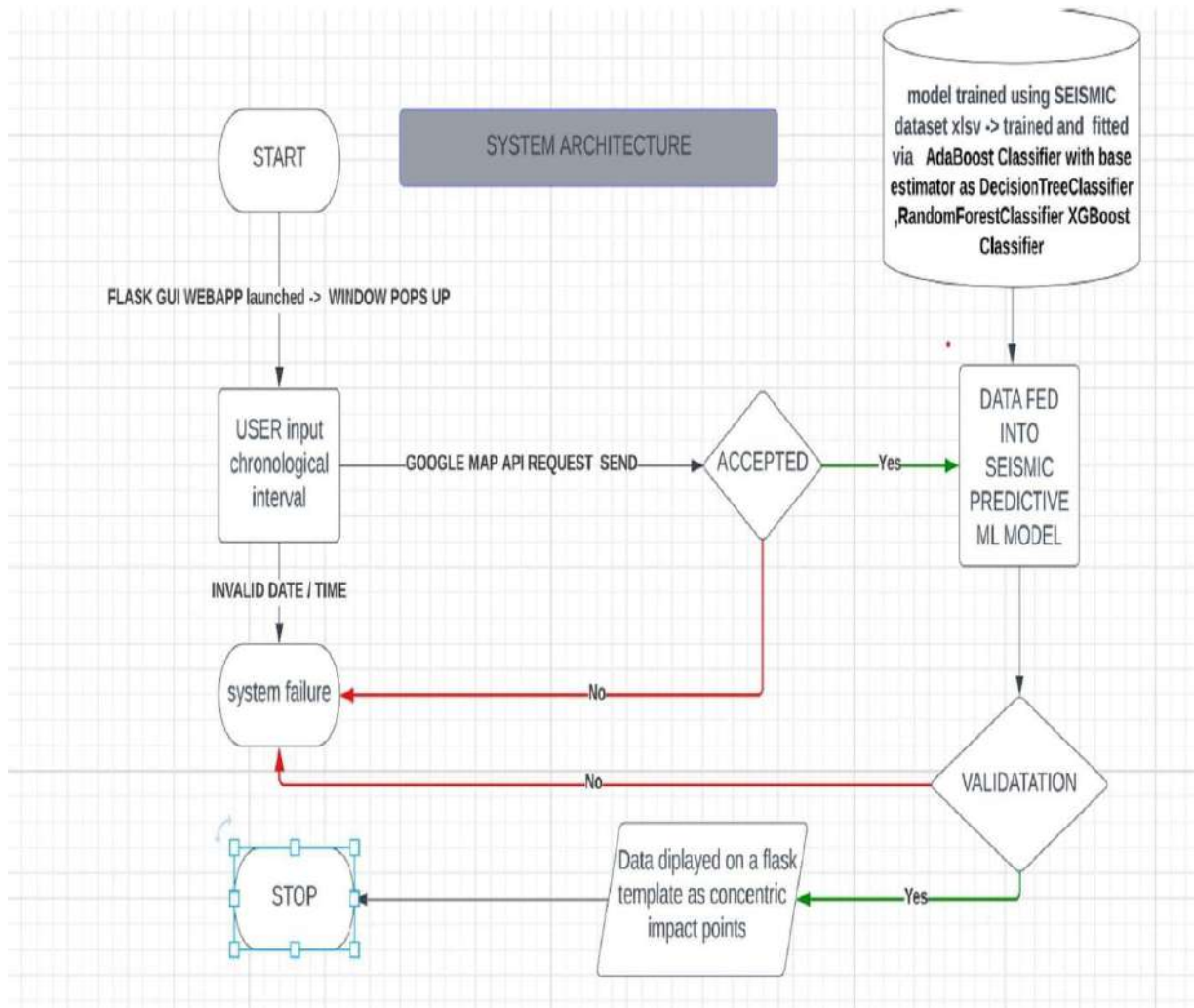
Fig 4.4.1 : Architecture Of The System

4.5 ADVANTAGES OF PROPOSED SYSTEM

1.Data-Driven Approach: ML-based earthquake prediction techniques analyze large volumes of historical earthquake data to identify patterns and correlations that may not be apparent to human

experts. ML algorithms can automatically extract complex relationships and features from the data, enabling more accurate predictions.

2. Increased Accuracy: ML models can leverage advanced algorithms and techniques to improve prediction accuracy. They can consider a wide range of input variables, including seismic data, geological data, and geospatial information, to make more precise predictions compared to traditional methods that rely on a limited set of parameters.

3.Real-Time Monitoring: ML models can be trained on real-time earthquake data, allowing for continuous monitoring and updating of predictions. This enables prompt identification of potential earthquake events and timely warnings to affected regions, improving disaster preparedness and response.

4.Early Warning Systems: ML-based earthquake prediction models can be integrated into early warning systems, providing alerts and notifications to populations in high-risk areas. This can help individuals and organizations take proactive measures to protect lives and property, such as evacuating buildings, shutting down critical infrastructure, or activating emergency response plans.

5. Scalability and Automation: ML techniques can handle large-scale data processing and analysis efficiently. They can automatically adapt and update their predictions as new data becomes available, eliminating the need for manual adjustments and intervention. This scalability and automation make ML-based approaches more practical and cost-effective for large-scale earthquake prediction efforts.

6.Improved Understanding: ML models can uncover hidden patterns and relationships within earthquake data that may contribute to a better understanding of seismic events. By identifying important features and variables, ML algorithms can provide insights into the underlying causes and mechanisms of earthquakes, aiding scientific research and informing future mitigation strategies.

7.Complementary Approach: ML-based earthquake prediction techniques can complement traditional methods, such as seismology and geophysics. By combining the strengths of different approaches, it is possible to achieve more comprehensive and accurate earthquake predictions, leading to enhanced safety measures and reduced societal impacts.

CHAPTER-5
SYSTEM REQUIREMENTS

Studying the current system to see how it operates and where improvements could be made is what requirement analysis entails. For implementing modifications where they are needed, a detailed understanding of the present system is required. The aim is served through proper planning and data collection. The purpose of this document's popularity is to outline all of the prerequisites for the software's popularity. We cannot visit each company or office due to our hectic schedules. This issue will be dealt with on this website. It will assist in avoiding data inconsistencies and missing data. The first step in the software development process is to conduct a software requirement analysis. The requirement specification phase consists of two basic activities.

- Problem or requirement analysis.

- Requirement specification.

The purpose of the problem analysis activity is to comprehend many parts of the problem, such as the problem's requirements, its context, and how it fits into the client's organisation. The comprehended problem is defined or written in the second activity, resulting in the SRS. The purpose of the requirement analysis phase is to produce SRS. The software requirement specification (SRS) is a method of formalising the ideas that clients have in their heads. This document serves as the foundation for software development and validation. The difficulty in defining software requirements stems from the fact that there are three parties involved: the customer, the end users, and the programme developer. The requirements document must be easy to read for both the client and the user, as well as for the developers to use as a foundation for software development. A communication gap exists due to the various parties engaged in software requirement specification. This disconnect occurs when the client is unfamiliar with the software or the software development process, or when the developer is unfamiliar with the client's problem and application area. SRS fills in the gaps in communication.

5.1 SYSTEM SPECIFICATION

5.1.1 SOFTWARE REQUIREMENT

LANGUAGE	-	PYTHON
TOOLKIT	-	FLASK
OS	-	WINDOWS 10 OR ABOVE

5.1.2 HARDWARE REQUIREMENT

CPU	- Dual Core
Hard Disk Space	- 512 GB or above
Main Memory	- RAM 4 GB or above
Clock-Speed	- 2.6 GHZ
Monitor	- 15 ″ SVGA COLOR

5.2 PYTHON

Python is a dynamic, high-level, open-source, interpreted programming language that is free to use. Both object-oriented and procedural-oriented programming are supported. Because Python is a dynamically typed language, we don't need to declare the type of a variable. For example X=10, where x can be a String, an int, or anything else.

5.2.1 FEATURES OF PYTHON

Easy to code: Python is an object-oriented programming language. Python is a very simple language to learn compared to other programming languages such as c, c#, java script, and java. Python is a fairly simple language to code with, and anyone can learn the basics in a matter of hours or days. It is also a language that is user-friendly for programmers.

Free and Open Source: Python is a free programming language that you may download from the official website. Because it is open-source, the source code is also available to the general public. As a result, you can download it, use it, and share it.

Object-Oriented Language: One of the key features of python is Object-Oriented programming. Python supports object oriented language and concepts of classes, objects encapsulation etc

GUI Programming Support: Graphical Users interfaces can be made using a module such as PyQt5, PyQt4, python or Tk in python. PyQt5 is the most popular option for creating graphical apps with Python.

High-Level Language: Python is a high-level language. When we write programs in python, we do not need to remember the system architecture, nor do we need to manage the memory.

Extensible feature: Python is an Extensible language. We can write some python code into c or c++ language and also we can compile that code in c/c++ language.

Python is Portable language: Python language is also a portable language. For example, if we have python code for windows and if we want to run this code on other platform such as Linux, Unix and Mac then we do not need to change it, we can run this code on any platform.

Python is integrated language: Python is also an integrated language because we can easily integrated python with other language like c, c++ etc.

Interpreted Language: Python is an Interpreted Language. Because python code is executed line by line at a time. Like other language c, c++, java etc. there is no need to compile python code this makes it easier to debug our code. The source code of python is converted into an immediate form called byte code.

Large Standard Library: Python has a large standard library which provides rich set of module and functions so you do not have to write your own code for every single thing. Thereare many libraries present in python for such as regular expressions, unit-testing, web browsers etc.

Dynamically Typed Language: Python is dynamically-typed language. That means the type (for example- int, double, long etc.) for a variable is decided at run time not in advance. Because of this feature we don't need to specify the type of variable. When comparing Python

syntax to those of other computer languages,

- Python was created with readability in mind, and it bears some resemblance to the English language, with a mathematical impact.
- In contrast to other programming languages, Python employs new lines to complete commands, rather than semicolons or parentheses. Indentation and whitespace are used in Python to specify scope, such as the scope of loops, functions, and classes. Curly brackets are commonly used in other computer languages for this reason.

CHAPTER-6
CONCLUSION AND FUTURE SCOPE

6.1 CONCLUSION

In conclusion, the project aimed to explore the potential of using machine learning algorithms and the Google Maps API in the context of seismology prediction. While machine learning can be a valuable tool in analyzing and processing seismic data, it is important to note that earthquake prediction remains a complex and challenging task.Throughout the project, several key steps were followed. Historical seismology data was collected, including earthquake records and relevant geophysical information. Feature engineering techniques were employed to extract meaningful features from the collected data, preparing it for machine learning algorithms. A suitable machine learning model was selected and trained using the prepared data. The model's performance was evaluated using testing data and appropriate evaluation metrics.The integration of the Google Maps API allowed for the visualization of predicted seismic events, providing a geographical context and overlaying seismic zones, fault lines, and other relevant features on a map.

However, it is important to note that earthquake prediction is an ongoing area of research, andits accurate prediction remains a significant challenge. While machine learning algorithms can contribute to the analysis process, they are just one piece of the puzzle. Domain expertise,incorporation of other seismological techniques, and a comprehensive understanding of geological factors are crucial for reliable and accurate earthquake prediction.It is recommended to continue exploring and refining the machine learning models used, considering advancements in the field and incorporating new data sources. Collaboration with domain experts and seismologists would be valuable to gain deeper insights and improve the prediction accuracy. Additionally, considering the dynamic nature of seismology, it is crucial to update the model regularly with new data and adapt it to changing conditions to maintain its reliability. Overall, this project serves as an exploration of the potential of machine learning algorithms and the Google Maps API in seismology prediction, highlighting the need for further research and collaboration to enhance our understanding and ability to predict seismic events.

6.2 FUTURE SCOPE

1. Real-time Data Integration: Incorporate real-time earthquake data streams from seismic sensors and monitoring networks to improve the accuracy and timeliness of predictions. Explore techniques for handling streaming data and updating the prediction models dynamically.

2. Advanced Machine Learning Techniques: Investigate advanced machine learning techniques, such as deep learning, reinforcement learning, or generative models, to enhance the prediction accuracy and capture complex patterns in seismic data.

3. Ensemble Modeling: Implement ensemble modeling approaches, such as model averaging or stacking, to combine the predictions of multiple machine learning models. This can help improve prediction reliability and mitigate the impact of individual model biases.

4. Uncertainty Estimation: Develop techniques to quantify and estimate uncertainty in earthquake predictions. Incorporate probabilistic models or Bayesian methods to provide confidence intervals or probability distributions for predicted earthquake parameters.

5. Multi-parameter Prediction: Expand the prediction scope to include multiple earthquake parameters, such as magnitude, depth, and focal mechanism. Explore the relationships and dependencies between these parameters to improve overall prediction accuracy.

6. Integration of Additional Data Sources: Integrate additional data sources, such as geological information, weather data, or satellite imagery, to enrich the prediction models and capture relevant environmental factors that may influence earthquake occurrences.

7. User Feedback and Crowdsourcing: Implement mechanisms for users to provide feedback on the accuracy of predicted earthquakes. Leverage crowdsourcing techniques to collect user reports and incorporate them into the prediction system for continuous model improvement.

8. Geospatial Analysis and Visualization: Enhance the geospatial analysis capabilities by incorporating advanced visualization techniques and analytical tools. Provide users with interactive visualizations that allow them to explore earthquake patterns, historical data, and prediction trends.

9. Collaborative Research and Data Sharing: Foster collaboration with seismology research institutions, government agencies, and other stakeholders to share data, insights, and methodologies.

Encourage open data initiatives to promote transparency and enable collective efforts in earthquake prediction research.

10. Mobile Applications and Notifications: Develop mobile applications that utilize the prediction models and Google Maps API to provide real-time earthquake alerts, notifications, and safety recommendations to users based on their geographical location.

11. Integration with Disaster Response Systems: Explore integration with existing disaster response systems and emergency management platforms to provide seamless coordination and support during earthquake events. Enable automated alerts, resource allocation, and decision- making based on the predicted earthquake information.

12. Long-term Seismic Hazard Assessment: Extend the project's scope to include long-term seismic hazard assessment, considering the historical earthquake data, fault characteristics, and geological information. Provide insights into the likelihood and intensity of future earthquakes in specific regions.

13. Scalability and Cloud Infrastructure: Optimize the prediction system for scalability by leveraging cloud infrastructure and distributed computing techniques. This will allow handling large volumes of data and accommodating increased user demand.

14. Continuous Model Monitoring and Updating: Establish a framework for continuous model monitoring and updating to adapt to evolving seismic patterns and changes in data characteristics. Implement techniques for model retraining and evaluation to ensure the prediction system's ongoing performance.

15. Public Awareness and Education: Promote public awareness and education about earthquake prediction, preparedness, and safety measures through the integration of educational resources, informative content, and community engagement features within the user interface.
The future scope of seismology prediction using machine learning algorithms and Google Maps API is vast and continuously evolving. By exploring these areas, we can further enhance our ability to predict earthquakes accurately, mitigate their impacts, and contribute to the field of seismology research and public safety.

16.The code could also be improved by using a more robust way to predict the outcome magnitude. The current code simply predicts the average magnitude of the previous seven days. A more robust way would be to use a machine learning model that takes into account other factors, such as the depth and location of the earthquake.

17.The code could also be improved by adding more features to the dataset. The current dataset

only includes the date, latitude, longitude, depth, and magnitude of the earthquake. Adding more features, such as the time of day, the tectonic plate, and the seismic activity in the region, could improve the accuracy of the predictions.

18.The code could also be improved by using a more efficient way to calculate the moving averages. The current code uses a rolling window, but a more efficient way would be to use a cumulative sum.

The code for the earthquake prediction app could be improved in several ways. First, it could be updated to use a more recent version of XGBoost. Second, the moving averages could be calculated more efficiently using a cumulative sum. Third, the outcome magnitude could be predicted more robustly by taking into account other factors, such as the depth and location of the earthquake. Fourth, the dataset could be improved by adding more features, such as the time of day, the tectonic plate, and the seismic activity in the region. Finally, the code could be modified to predict earthquakes in other parts of the world, of different magnitudes, and in the future.

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November 10, 2022

CERTIFICATE

This is to certify that **Ms. RIZANA SHAJAHAN, B.Tech** (Electronics & Communication Engineering) student, MUSALIAR COLLEGE OF ENGINEERING & TECHNOLOGY, PATHANAMTHITTA, has successfully completed the Internship Training in our **Power Electronics Group (PEG), Fabrication Shop, Transformer Winding, Electro Plating, Tool Room, Security and Surveillance Group (SSG), Special Products Group (SPG), Search and Rescue Beacon (SRB) and Technology Development Centre** of Keltron Equipment Complex, Thiruvananthapuram from 22-10-2022, 25-10-2022 to 29-10-2022, 31-10-2022 to 05-11-2022 and 07-11-2022 to 08-11-2022.

Her conduct and character during the period with us were good.

Chief General Manager

ADVANCED HOSPITAL ROBOT

PROJECT REPORT

Submitted by

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to

the APJ Abdul Kalam Technological University

in partial fulfillment of the requirement for the award of the Degree

of

Bachelor of Technology

In

Computer Science and Engineering

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JUNE 2023

DECLARATION

We undersigned hereby declare that the project report on **"ADVANCED HOSPITAL ROBOT",** submitted for partial fulfilment of the requirements for the award of degree of Bachelor of Technology of the APJ Abdul Kalam Technological University, Kerala is a bonafide work done by us under supervision of **Prof. Jan Mary Thomas**. This submission represents our ideas in our own words and where ideas or words of others have been included. We have adequately and accurately cited and referenced the original sources. We also declare that we have adhered to ethics ofacademic honesty and integrity and have not misrepresented or fabricated any data or idea or fact or source in our submission. We understand that any violation of the above will be a cause for disciplinary action by the institute and/or the University and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been obtained. This report has not been previously formed the basis for the award of any degree, diploma or similar title of any other University.

PATHANAMTHITTA   **AKSHAY KRISHNAN**

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This is to certify that the report entitled "**ADVANCED HOSPITAL ROBOT**" is submitted by **AKSHAY KRISHNAN (MCK19CS005), ASIF ASHARUF (MCK19CS012), KARTHIK U (MCK19CS020), RIYA MATHEW (MCK10CS029)** to the APJ Abdul Kalam Technological University in partial fulfillment of the requirements for the award of the degree of Bachelor of Technology in Computer Science & Engineering as a record of bonafide work done under our supervision and guidance. This report in any form has not been submitted to any other University or Institution for any purpose.

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ABSTRACT

As robotic technology develops, the medical field adopts more and more automated practices to improve hospital services. In pandemic conditions such as COVID 19, direct contact with patients may result in the spreading of disease. Hence the health community finds difficulty in distributing medicines and disposal of waste. Here we are going to specify the design and development of an automatic guided robot for hospital applications, whichcan be controlled remotely. AHR is a line follower robot, powered by a battery. It has infrared sensors at the bottom for path identification. The main purpose of the medical robot is to deliver the medicine to the patient either automatically or manually using Android application. Medicine is delivered using a vending machine associate with AHR. The AHR automatically identifiesthe path using line following technique. A sanitizing machine, garbage collection box and patientmonitoring system were attached to this AHR. When the hand is placed near to the sanitizing machine it will automatically sanitize your hand and to put the garbage waste patient comes closer to the garbage bin attached with med robot automatically detect the presence of patientand automatically open the lid of the garbage bin. Patient monitoring system monitors the vital body parameters of the patient such as temperature, Heart rate, oxygen saturation level, if any of this parameter exceeds the thresholds a SMS is sent to doctor's mobile phone.

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ABBREVIATIONS

IoT   Internet of Things

MCU   Micro Controller Unit

MEDROBO   Medical Robot

IoRT   Internet of Robotics Things

CHAPTER 1
INTRODUCTION

1.1 GENERAL BACKGROUND

Robotics is the branch of engineering and computer science that deals with building robots, machines that can move and respond to sensory input. The field of artificial intelligence known as robotics. Robotics is the use of robots to perform a variety of activities using engineering and computer science. Robots have largely mechanical construction and can be controlled remotely or autonomously. Robotics are being used more frequently in a variety of fields because they can handle more work than humans can and lower workloads. The goal of having robots mimic human intelligence and appearance has not been met, despite the researchers' best efforts Most robots currently lack the ability to see, making it difficult for them to properly identify objects. Prioritizing the inefficiencies linked to robots' technology is crucial for its proper and successful operation. Although the widespread usage of robotics technology would eliminate many human jobs and lead to unemployment in the community. Robotic job performance will result in a decline of human employment, so the transition should be handled methodically. Robotics advances will reduce the need for many high-end, precise occupations and benefit a number of industries, including agriculture, the military, healthcare, and others. As a result, there will be some balance between the actual need and demand for robot assistance in the job. The advancement of robotics technology should be encouraged by society, since it will benefit both individuals and numerous economic sectors. Robotics can aid with a variety of activities that are beyond the capacity of humans, and their use in warfare would be very beneficial. Robotics technology has advanced so much, and they are now practically present in every industry and sector, from transportation to healthcare to recreation.

1.2 PROBLEM STATEMENT

Nowadays, robotics is a rapidly expanding sector that touches practically every industry, including healthcare. An IoT of robots are used in healthcare applications for surgery, caregiving, motion robots, and pharmaceutical robots. Robotic systems have significantly increased human ability to sense, interact, manipulate, and change the environment. The operations and environments for which medical robotic devices are intended are wholly unrelated to disease therapy and prevention. Hospitals are overflowing as a result of the novel corona virus, or COVID-19, which is the severe pandemic cause. Consequently, the technology is greatly needed to assist the hospital staff. Robotic healthcare thus finds the ideal approach to

support them by giving them their excellent work and assisting them in avoiding direct contact with the patients who are infected with the corona virus. A nurse's primary responsibility is to take care of the patients who are assigned to them by administering medications at regular intervals and keeping track of the patient's physical characteristics. It would take between 30 minutes and an hour to deliver the medication and assess the patients' vital signs (heart rate, pressure, temperature, and oxygen saturation) on a daily basis in one ward. Therefore, the dispensing of medications and parameter monitoring could be automated to lessen the workload of the medical staff.

1.3 PROJECT SCOPE

Robotics and automation are also employed in research labs to automate laborious, repetitive, and high volume work so that technicians and scientists can concentrate on more strategic duties that lead to speedier discoveries. High-quality patient care, effective clinical procedures, and a secure working environment for patients and healthcare professionals are all made possible by the use of robots in the medical area. Intelligent therapies, regular and individualized monitoring for patients with chronic diseases, minimally invasive operations, and social interaction for elderly patients are all made possible by medical robots. Additionally, when robots reduce workloads, nurses and other healthcare providers can contact with patients more personally and show more compassion, both of which can improve patients' long-term wellbeing. In hospitals, medication is dispersed and delicate goods are handled by dispensing robots. Robotic dispensers are particularly useful because they can accurately and quickly deliver medication. They are also capable of handling thick or delicate liquids. Hospitals are using robots to carry out the disinfection and sanitation procedure since inadequate hygiene and sanitation can result in numerous diseases.

CHAPTER 2
LITERATURE SURVEY

2.1 "IoT and Robotics: A Synergy" by Ankur Roy Chowdhury, 2012.

The idea of the Internet of Robotic Things (IoRT), first proposed by Dan Kara of ABI Research, calls for enhancing the current Internet of Things (IoT) with active sensorization, which would lead to the emergence of new commercial opportunities at the nexus of IoT and robotics. This position paper examines the relationship between the Internet of Things and robotics, discussing IoT technologies that would be useful in the robotics industry. The emergence of cloud robotics and its contribution to assisting robot mobility, manipulation, and sensing. The study then analyzes how robots can function as a particular form of edge device, extending the capabilities of current IoT infrastructure. Applications for IoT-assisted robotics are considered in a variety of industries, including healthcare, the military, industrial facilities, and rescue missions. The use case of an intelligent transport system equipped with an IoRT-inspired architecture is discussed in the paper's conclusion. Applications for IoT-assisted robotics will develop in a digital environment where IoT nodes, robots, and people work together cooperatively. The actors would be free to independently agree on secure communication principles in this framework based on the nature of the information they wish to exchange and the services they wish to deliver or access. As a result, research on IoT-assisted robotics applications ranges from short-range communication technologies to semantic-oriented services, from consensus theory to protocol design, from application design to information-centric networking, from security to whatever is required to create a smart, pervasive, and secure environment. The rest of the paper is organized as follows: it discusses Cloud Robotics and broadly, how it can help robots tap into the IoT ecosystem and enhance their abilities, talks about the different types of edge devices and how robots are a special class of them; thereby, implying how robots can help augment the IoT ecosystem, talks about the various application areas of IoT-aided robotics, concludes the paper by presenting a use case of an Intelligent Transport System governed by an IoRT system.

2.2 "Design and Fabrication of Remote-Controlled Nursing Vehicle" by Gopal Kaliyaperuma, Choudhury Rajat Kumar Pattnaik, Akash Kumar Nath, Aditya Dubey, Tarun Kumar Sharma, 2021.

In current times of the COVID epidemic, there is a major demand for a remote-controlled vehicle with robot-like capabilities to ensure proper patient monitoring, deliver necessary supplies, and maintain the hospital environment sanitized, even in the absence of a human. By building a nursing vehicle that may be used in hospital settings, we want to offer a solution. The project uses an embedded C language programme, temperature sensor, water pump, microcontroller, and Wi-Fi camera. The project is locally managed via an embedded system based on the ESP8266. A Wi-Fi controller is utilized to steer the nursing truck, and a camera that also contains a speech kit for patient-doctor communication is used to track its movements. Additionally installed is the MLX90614 IR temperature sensor, which aids in taking patients' temperatures. Based on the measurements, the components are 3D modelled and sketched using the Catia V5 application. All vehicle operations are controlled remotely using the open-source BLYNK Android application. By gathering materials, modelling the project geometrically in three dimensions, and putting the pieces together, the prototype of the model is produced. The concept offers a very dependable and robust system and considerably reduces the problems encountered in a medical setting. The nursing vehicle provides communication between a doctor and a patient adhering to social distance standards, contactless temperature assessment, and supply delivery to patients with infectious disorders like Covid. With the help of this system, we can address the issue of a lack of human resources in hospitals and replace nurses.

2.3 "The Impact of Robotics on Employment and Motivation of Employees in the Service Sector, with Special Reference to Health Care" by Mohammed Qureshi, Rumaiya Sajjad Syed, 2019.

One of the key factors influencing the economic success of service sector organizations in this age of information explosion is human capital. Particularly so in the health care industry, which, according to centers for Medicare and Medicaid Services, accounts for over 10% of the gross domestic product (GDP) of the majority of industrialized countries. Health care's contribution to the economy has increased from 7.2% of GDP in 1965 to over 16% of GDP at present, and is expected to reach 20% of GDP in just 10 years. Thus, it is now even more crucial that human resources in the healthcare industry are handled effectively. To achieve this, businesses engaged in the healthcare industry should put their primary attention on integrating cutting-edge technology with employees' daily tasks. The primary goal of the study is to offer

light on how robots is being used in the health care industry, how it affects employee employment and motivation, and what potential benefits and drawbacks it may have. In order to establish strategies for its usage by small, medium, and big health care service providers, it is ultimately intended to raise awareness of the good and negative effects of robots on the industry's workers. This study also lays the groundwork for future research into the various factors that should encourage medical personnel to use robotics into their routine procedures. Examine the influence of robots on employment and employee motivation, as well as the effects of robotics on healthcare and the health care business as a whole. To assist in achieving the main purpose, several sub objectives were created.

2.4 "Robotic Assistance and Patient Monitoring in Hospitals using IoT" by Nimi Sheth, Sahil Jethwa, 2019.

By taking precautions and receiving treatment for existing illnesses, health and medical care involve maintaining good mental and physical health. In order to prevent a recurrence of the condition, it comprises all reasonable and required medical assistance, tests, examinations, treatments, diagnoses, assessments, and services. A suggestion to enhance the current state of healthcare globally through automation and robotics has been put forth in this paper. The most important aspect of medication is health care and regular monitoring because the patient is in the recovery stage. Any carelessness during this delicate moment could have fatal repercussions. Here, we suggest an Internet of Things (IoT)-enabled multipurpose automated medical assistant system with a data recorder to speed up the patient's recuperation. This robot is an internet-connected autonomous device that has capabilities like lifting arms to carry things and food packages, delivering medications, avoiding collisions, and engaging with patients to alleviate loneliness.

2.5 "Development of a Hospital Mobile Platform for Logistics Tasks", by Carlos Antonio Acosta Calderon, Elara Rajesh Mohan, Buck Sin Ng, 2020.

The workflow of healthcare professionals must be improved because it is crucial to the delivery of healthcare services. The use of an autonomous mobile base will increase the effectiveness of hospital logistical activities including collecting and delivery. Healthcare personnel can better serve the community by concentrating on other tasks by streamlining such logistical tasks. Currently, there are commercially available solutions to handle these logistical chores, which allow a mobile base to move around in a structured setting like a hospital. At this article, we outline our strategy for creating a mobile base that can be delivered at a reasonable cost at healthcare facilities. The suggested method can move between stations in the hospital by first drawing a map of the floor and then specifying where these stations are. By doing this, it is less expensive to add lines to the floor, install laser markers, and use several commercial alternatives. The suggested approach can also navigate while keeping users and delivered objects safe. In order for the system to be able to operate independently without frequently needing to be recharged, the article examines system design factors, navigation, and battery management.

2.6 "Smart Medicine Trolley "by Shreya Bhosale, Krutika Deshmukh, Yogesh Ghule, 2021.

Due to the COVID19 pandemic in 2020, social distance has taken on a significant role in our daily lives. During this time, medical professionals should focus on taking care of themselves, especially doctors and nurses. For these Covid warriors, the Smart Medicine Trolley is one sort of assistance. In addition to delivering medical supplies to isolated patients, the smart medication cart also uses UV light to sanitize the area. They are safe because of this. Using a smartphone application, this tram travels along the path. Therefore, the smart medicine trolley keeps the environment clean and safe, gives all medications and other necessities to patients without putting them in direct touch with other people, and also maintains patient-doctor connection. This tram makes sure that all environmental and health-related concerns are addressed. One such technological device that prevents direct contact with isolated patients while sanitizing the environment by guaranteeing safety is the Smart Medicine Trolley. The doctor loads the trolley with all the necessary supplies and medications. The tram is driven by a smartphone application, and we have complete control over its movement. Therefore, this tram operates in accordance with the commands received through the smartphone application. The HC-05 Bluetooth module facilitates the movement of the trolley throughout this process. The tram is driven by Motor Driver L293D, who also turns the wheels. Arduino interacts with a variety of hardware parts during operation, including Bluetooth, sensors, motor drivers, and others. Code

is loaded into Arduino utilizing an Atmega328P IC via USB connection. Trolley moves in accordance with the code as it receives commands, and it is controlled by a remote. A servomotor is used to control the trolley's linear movement. An obstruction in front of the tram is found by an ultrasonic sensor. By giving the isolated patient all the equipment, they need and this aids in the trolley's movement.

CHAPTER 3
EXISTING SYSTEM

MedRobo is an alternate solution to the difficulties faced by the hospital staff in treating the coronavirus positive patients, who raised this problem. It delivers the medicine to the patient and checks the important parameters of the patient such as temperature, heart rate, SpO2 and blood pressure without the involvement of humans or by avoiding the direct contact of hospital staff with the patients. By using the reference parameters which are given to the system, will compare with the measured parameters. Then the recorded parameters data will be sent to the doctors through the IOT platform. The movement and finding the path to patient location is done through a line follower and with RFID tag. The medical staff will be aware whether the medicine is delivered or not. Also, can reevaluate and view the data of individual patients after a particular interval of time to make sure that all those patients suffering from coronavirus are feeling better and are in good condition.

The robot starts to move by the line follower in that we use the IR transmitter and receiver. The robot moves by a 12-volt dc motor and it is controlled by the Double BTS7960 motor driver. Theline following robot follows a line and it can detect this colored line with the help of IR proximity sensors and send signals to Arduino mega 2560. This IR sensor works like a diode, it consists of a transmitter and receiver. The transmitter transmits the light and the receiver receives it. When the robot changes position from the line the transmitted light is not received by the receiver. Then the motor will stop. In that condition while the receiver is not receiving then the motor moves two steps to right or to left to get back to the line while when the receiver receives the light then again moves. This line following is accomplished by using the IR proximity sensor which is connected to the Arduino mega 2560. The 775 DC motors are driven by the double BTS 7960 motor driver. When it reaches in front of the patient room RFID is detected.

The robot will make a buzzer to make attention inside the room and to open the room. When the room opens the robot will move inside the room and reach near to the patient bed. When it reaches the bed, it displays the question on the display to start and yes it to process. First medicine vending

occurs. Before starting the process, the user is being asked to confirm vending. If yes, medicine starts vending. This is done by the dc motor with motor driver l293d. Vended medicine falls into a box placed, it consists of an IR sensor while medicine falls into it then IR light cut then vending motor stop and vending also stops. After confirmation, the process of vital patient monitoring starts. The parameters monitoring is temperature, pressure, heart rate and SpO2. The temperature is measured using LM35 temperature sensor and digital blood pressure sensor is used tomeasure pressure. MAX30100 sensor module is used to measure both heart rate and SpO2. For this process, initially in the LCD display the message is displayed asking the user to place his/her hand and press confirm. The three parameters temperature, SpO2 and heart rate is measured and the user is asked to confirm and to take off his/her hands. After this, it is displayed to put a bp cuff and confirm. After reading the blood pressure, the patient is asked to remove the cuff and to press confirm. All the values read are sent to NodeMCU which is a microcontroller having an inbuilt Wi-Fi driver. It is configured with local WIFI. An IP address is provided and the patient ID and parameters are uploaded to this address. In NodeMCU the receiver also has this ID and it checks the ID and compares. After comparing if the ID matches the read parameters are stored in an array and uploadit in the corresponding folder. The read values are compared using a threshold and if the value variesfrom threshold a message is sent to the doctor through the GSM module. After the process, the patient is asked to confirm the finish. If yes, then the robot will get back to the main floor and move forward to the next room. After completing all rooms, the robot gets back to the staffing room.

3.1 EXISTING SYSTEM DRAWBACK

It does not provide sanitizing and garbage unit.

It can be controlled only by automatic mode.

CHAPTER 4
SYSTEM DESIGN

4.1 PROPOSED SYSTEM

IoT (Internet of Things) is the network of physical objects-devices, vehicles, buildings and other items embedded with electronics, software, sensors, and network connectivity-that enables these objects to collect and exchange data. Exchanging and storing data via Internet provides flexibility in easy data transfer, as well as reduce the time and effort in maintaining paper records.

In health care and cases of emergencies, each second is important for patient's life. Maintenance of paper records for each patient is a time-consuming process. Also, in case when patient has to shift to different hospitals, having digital data helps in faster exchange of information and understanding of the patient's medical history leading to faster examinations. Also, records in digital form make it easier to analyze details and come up with quicker solutions. Hence, a device with sensors (for heart rate, blood pressure and body temperature, three of important parameters frequently tested) which continuously sends data over the internet and maintains real time record of patients could help in understanding condition of patients. AHR is an alternate solution to the difficulties faced by the hospital staff in treating the coronavirus positive patients, who raised this problem. It delivers the medicine to the patient and checks the important parameters of the patient such as temperature, heart rate, SpO2 and blood pressure without the involvement of humans or by avoiding the direct contact of hospital staff with the patients. By using the reference parameters which are given to the system, will compare with the measured parameters. Then the recorded parameters data will be sent to the doctors through the IOT platform. The movement and finding the path to patient location is done through a line follower and with RFID tag. The medical staff will be aware whether the medicine is delivered or not.

The Advanced Hospital Robot consists of a microcontroller as the central part and all the other peripherals for the delivering medicines, parameter measurements, sanitizing and garbage unit are

connected to this microcontroller. The temperature sensor, blood pressure sensor and heart and SpO2 sensors are connected for parameter measurement. For obstacle detection, obstacle sensor IR is used. RFID reader for the path recognition, NODEMCU and GSM module for the transferring of measured parameters value are connected. This robot could improve efficiency, patient safety, workload for healthcare workers, and infection control procedures in healthcare environments by combining sanitizing, medicine vending, parameter monitoring, and rubbish collecting capabilities. It's crucial to keep in mind that these robots would still assist medical professionals in managing and supervising the care and decision-making processes. An automated machine made specifically to transport and dispense pharmaceuticals in a hospital setting is called a medicine delivery robot. These robots are designed to move throughout the hospital and distribute medications to various locations, including patient rooms, nursing stations, and pharmacies. Robots that distribute medications often have the following key characteristics and capabilities:

1. Autonomous navigation: These robots have sensors, cameras, or mapping technology to help them find their way about on their own. To go where they're going, they can recognize barriers, avoid collisions, and follow predetermined courses or maps.

2. Medication management and storage: Medication delivery robots frequently contain locked drawers or compartments to store drugs. To ensure precise medication retrieval and distribution, the robots may use barcode scanning or other identification techniques.

3. Medication verification: These robots can scan RFID tags to confirm that the medication being administered is what was prescribed, ensuring patient safety. By doing this, medication mistakes are reduced and the proper medication is administered to the correct patient.

4. Workflow improvement: By automating the distribution of medications, these robots can improve workflow and cut down on the time required by medical staff to perform routine distribution duties. This enables medical personnel to concentrate more on patient care and other important duties.

5. Security features: Robots that dispense medications are made with security in mind. To ensure safe operation in the medical setting, they might have sensors to recognize and avoid obstructions.
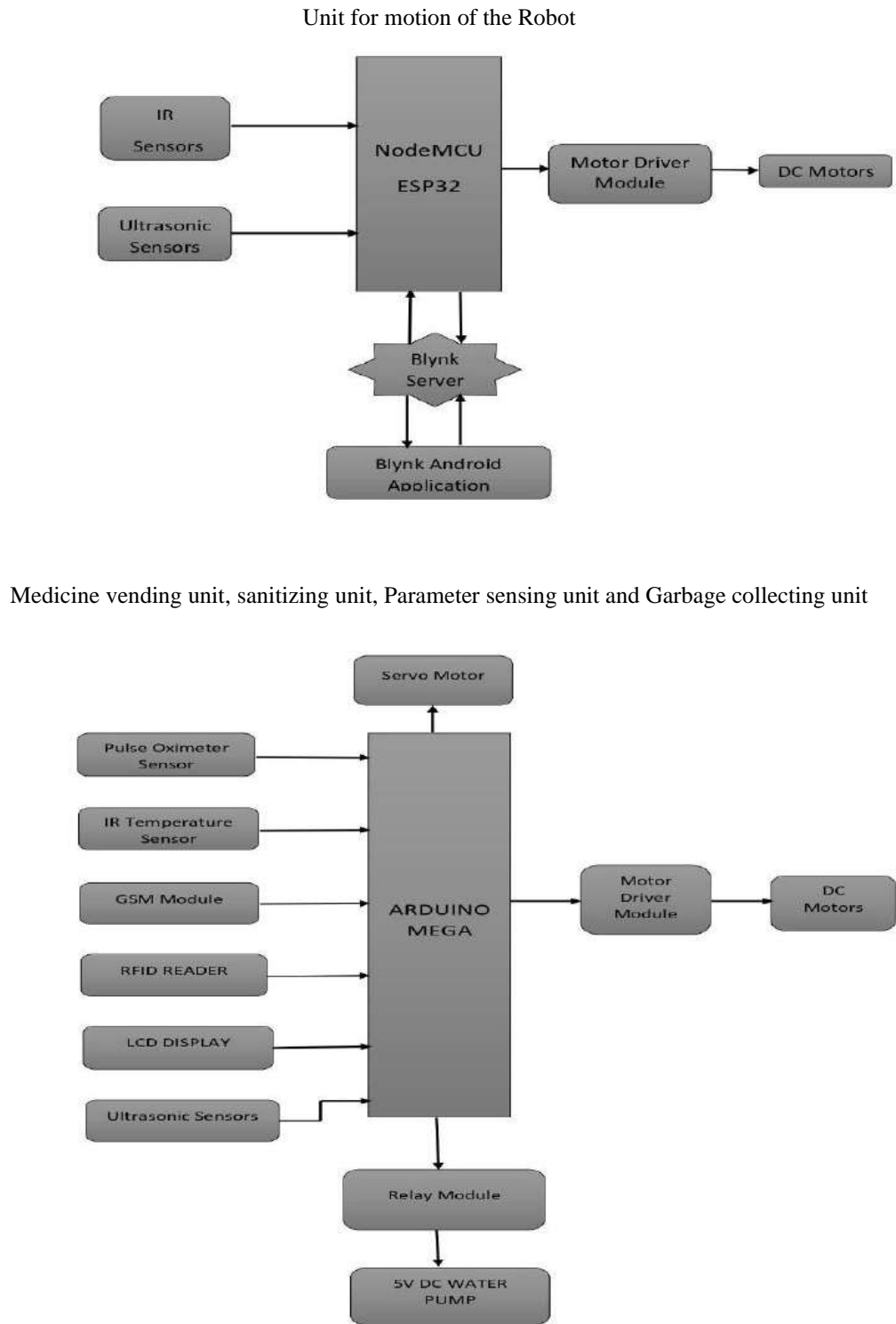
4.2 SYSTEM ARCHITECTURE

Unit for motion of the Robot

Medicine vending unit, sanitizing unit, Parameter sensing unit and Garbage collecting unit

Fig 4.2 Architecture of AHR

4.2.1 Architecture of unit for the Motion of the Robot

NodeMCU ESP32

The NodeMCU ESP32 serves as the communication module and creates connectivity between the robot and outside devices. It is in charge of establishing connections with the Blynk IoT server and app, allowing for remote management and information sharing.

Wheels and DC Motors

The robot has four wheels, each of which is powered by a DC motor. The NodeMCU ESP32 is connected to these motors, giving the robot's mobility precise control. The robot's ability to move forward, backward, and turn smoothly depends on the motors' ability to change their speed and direction.

The robot has two different operating modes: manual and automatic motion. By clicking on the correct keys on the Blynk IoT app, the user can manually control the robot's movement when it is in manual mode. These instructions are transmitted to the NodeMCU ESP32, which deciphers them and operates the motors as necessary. In automatic mode, the robot travels independently by employing a line-following approach to follow a predetermined course. The user can choose between these modes via the Blynk IoT app, providing flexibility and adaptability in various situations. Communication between the robot and outside components, like the Blynk IoT app and server, is made easier by the NodeMCU ESP32. In addition to providing regulated motion, the line-following and ultrasonic sensors also guarantee precise navigation and obstacle avoidance. An easy-to-use interface is provided for manually controlling the robot and switching to autonomous mode through the Blynk IoT app, which is connected to the Blynk server. This cutting-edge medical robot offers healthcare facilities improved mobility, precise movement, and the capacity to complete activities on its own, ultimately enhancing productivity and patient care.

Ultrasonic sensor

The robot includes ultrasonic sensors to enable safe navigation and obstacle avoidance. These sensors produce ultrasonic waves, which they use to time how long it takes for a wave to return after colliding with an obstruction. Regardless of whether the robot is in manual or automatic mode, the NodeMCU ESP32 can detect the existence of obstacles by analyzing the returning signal and taking the necessary action.

Blynk IoT App and Server

In order to control the robot, the Blynk IoT app is essential. Through its user-friendly interface, the user can

communicate with the robot. The app initiates contact with the NodeMCU ESP32 by connecting to the Blynk server, enabling the exchange of instructions and data.

Line Following Sensors

When the robot is in automated line following mode, infrared (IR) sensors start working. These sensors pick up the line on the floor and inform the NodeMCU ESP32 of their findings. By analysing this data, the controller can modify the robot's motion to keep it on the intended course.

Line following robot

A very basic robot called a "line follower robot" follows a line, either a white or a black line. As they are so easy to construct, beginners who are just starting out in robotics frequently start with this kind of robot. In essence, there are two different kinds of line-following robots: one is a black line follower that moves in accordance with the black line, and the other is a white line follower that moves in accordance with the white line. Actually sensing the queue, a queue follower follows it. Although the concept seems straightforward, with a little more work, robots like this are already being employed in numerous industries, such as warehouse robots and manufacturing floor management robots.

Concept of Line Following Technique

Light is a factor in how a queue follower operates. Here, I make use of how light behaves on white and black surfaces. Light is almost entirely reflected when it hits a white surface and completely absorbed when it hits a black surface. A robot that follows lines is constructed using this property of light. This line-following robot built on an Arduino platform makes use of infrared transmitters and

receivers, often known as photodiodes. Light is transmitted and received through them. Infrared light

is transmitted through IR. Infrared light strikes a white surface, is reflected back, and is then picked up by photo diodes, which causes some voltage changes. The photo diode does not receive any light or rays when IR light strikes a black surface because the light is absorbed by the black surface and no rays are reflected back. When a sensor detects a white surface in an Arduino line-following robot, Arduino receives a 1 as input, and a 0 as input when it detects a black line.

4.2.2 Architecture of units for Medicine vending, Sanitizing, Parameter sensing and Garbage collection of the Robot

Arduino Mega 2560

The Arduino Mega 2560, which is at the center of the architecture, is the primary microcontroller in charge of directing and coordinating the actions of the robot. It processes data from various sensors and modules and then takes the appropriate actions in accordance with the preprogrammed logic.

LCD Display

The LCD display is used as an interface for showing messages or information when it is linked to the Arduino Mega 2560. It enables simple communication between the robot and users by providing real-time feedback, such as instructions, alerts, or patient-specific information.

RFID reader

Reading the RFID tags connected to patients is done by the RFID reader, which is attached to the Arduino Mega 2560. The RFID reader recognises the distinctive tag when a patient approaches, enabling the robot to access the patient's medical history, any prescription medications, and other pertinent data.

5V water pump

An essential part of the sanitising unit is the 5V water pump. A chemical solution or sanitising agent, for example, is intended to be circulated onto the surfaces that need to be cleaned. The Arduino Mega 2560 supplies power and control signals to the water pump through the relay module, which is attached to the water pump.

Relay Module

The relay module controls the power supply to the 5V water pump by acting as a switch. It enables fine control over the sanitising process by enabling the Arduino Mega 2560 to turn the pump on and off. The Arduino Mega 2560, which provides control signals to turn on or off the water pump, has the relay module attached to the proper digital pins.

Pulse oximeter

The Arduino Mega 2560 is coupled with a pulse oximeter that measures SpO2 levels. It records the patient's heart rate and oxygen saturation levels, giving important medical data. This data is processed by the Arduino Mega for analysis and, if necessary, further action.

IR Temperature Sensor

An infrared (IR) temperature sensor is connected to the Arduino Mega 2560 to detect the patient's body temperature. It measures the infrared radiation emitted by the patient and provides accurate temperature readings. The Arduino Mega processes this information and triggers appropriate responses based on the predefined thresholds.

GSM Module

When the monitored parameters exceed the predetermined threshold values, the GSM module is used to relay messages. The robot may transmit messages or alerts to medical specialists or authorised personnel when it is connected to the Arduino Mega 2560, ensuring quick action and attention.

Servo Motor

The servo motor, controlled by the Arduino Mega 2560, is responsible for the medicine dispensing mechanism. Upon receiving instructions, the Arduino Mega triggers the servo motor to dispense the appropriate medication based on the patient's RFID tag or other identified parameters.

Motor Driver Module

The Arduino Mega 2560 is connected to the motor driver module, which regulates the DC motor in charge of opening the trash can. When instructed to collect the trash cans, the Arduino Mega turns on the motor driver module, assuring smooth and accurate operation.

Ultrasonic Sensors

Both the sanitization unit and the waste unit use ultrasonic sensors. These sensors, which are coupled to the Arduino Mega 2560, can recognise items in close vicinity or barriers. The robot uses the ultrasonic sensors in the sanitization unit to autonomously navigate and start the disinfection process. They aid in locating and recognising waste bins in the garbage unit, allowing the robot to collect them effectively.

As a whole, the architectural design shows how different parts connected to the Arduino Mega 2560 have been carefully integrated. This enables the sophisticated hospital robot to offer capabilities for SpO2 measurement, temperature sensing, garbage collection, sanitization, and vending of medications. In order to ensure effective and efficient patient care in healthcare settings, the Arduino Mega serves as the central controller, collecting data from numerous sensors and modules, processing it, and launching the relevant actions.

4.3 MODULES

4.3.1 Medicine vending

The automated devices known as medical vending machines are used to dispense prescription medications, medical equipment, and other unrelated medical products in exchange for payment through an interface. Depending on their intended use, medical vending machines can be positioned in a suitable location. Emerging nations are now catching on to the pattern of developed markets, where health insurance is typically sold through vending machines. Additionally, by saving time and recording information about the purchase, medical vending machines can be used to deliver prescription medications. This frees up the pharmacist's time so that they can focus on safety concerns or other issues outside inventory management. Medical vending machines perform tasks including sorting tablets and capsules, counting pills, and mixing reagents in precisely the right amounts at the right concentrations. Dispensing facilities are essential in settings like home healthcare, prisons, and other non-pharmacy settings. Due to their increased dependability and efficiency, medical vending machines are anticipated to be deployed in locations including hospitals, pharmacies, and homes. One benefit for patients residing in nursing homes may be the precision of inventory control using medical vending machines. Due of their larger range of uses and the automation they provide, medical vending machines can be utilized by manufacturers to package capsules. The market for medical vending machines is expected to rise as a result of the expanding demand for 24-hour access to medical essentials.

4.3.2 Parameter monitoring

The term monitoring parameters refers to a specific set of constituents that are seen during each monitoring event. These constituents include waste components, reaction products, hazardous constituents, and physical parameters that can be used to reliably detect releases from waste management facilities. Temperature, pressure, heart rate, and oxygen saturation are the variables being monitored. I2C Protocol is used to

interface the temperature sensor and pulse oximeter sensor with the Arduino Mega board.

4.3.3 Garbage Unit

As staff members are exposed to medical and biohazardous waste, the transport and treatment of hospital garbage is a time-consuming, dangerous, and infectious operation. The hospital biomedical waste that is collected shouldn't be kept on hand for more than a day. Mobile robots must move and navigate securely in a setting with plenty of people. Smart bins use sensors and an Arduino-based microcontroller to gather waste. AHR moves along a predetermined course while including some sensors. The installation of a robot unit improves turnaround time, lowers annual costs, and limits staff exposure to biological waste.

4.3.4 Sanitizing Unit

The biggest organ in the human body is the skin. It is a component of the body's first line of defense and serves as a surface barrier to stop numerous microorganisms that cause disease from entering our bodies. Our skin regulates our internal temperature. During the COVID-19 pandemic, hand sanitizer has recently gained a lot of popularity. In order to avert the pandemic, frequent hand washing, hand sanitizer use, and mask use have become the new norm. Hand sanitizer can us in our efficient combat against the coronavirus.

4.4 COMPONENTS USED

a. Arduino Mega 2560

b. NodeMCU ESP32

c. Motor Driver Module

d. DC Motor

e. IR Sensors

f. Ultrasonic Sensor

g. Pulse Oximeter Sensor

h. Temperature Sensor

i. GSM Module

j. RFID Reader & Tags

k. LCD Display

l. Relay Module

m. Submersible Water Pump

n. Servo Motor

o. 12V Battery

## 4.4.1 Arduino mega 2560 microcontroller
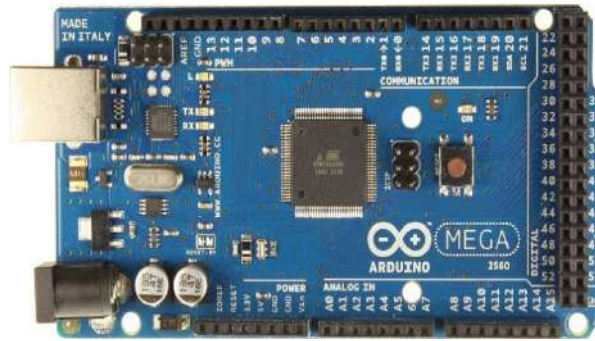
The Arduino Mega 2560 is a microcontroller board based on the ATmega2560 (datasheet). It has 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. The Mega is compatible with most shields designed for the Arduino Demilune or Decimal. The Mega 2560 is an update to the Arduino Mega, which it replaces. The Arduino Mega can be powered via the USB connection or with an external power supply. The power source is selected automatically. External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector. The board can operate on an external supply of 6 to 20 volts. If supplied withless than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts. The Mega2560 differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the ATmega16U2 (ATmega8U2 in the revision1 and revision 2 boards) programmed as a USB-to-serial converter. Revision 2 of the Mega2560 board has a resistor pulling the 8U2 HWB line to ground, making it easier to put into DFU mode. The Arduino Mega2560 has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega2560 provides four hardware UARTs for TTL (5V) serial communication.

4.4.2 NodeMCU ESP32
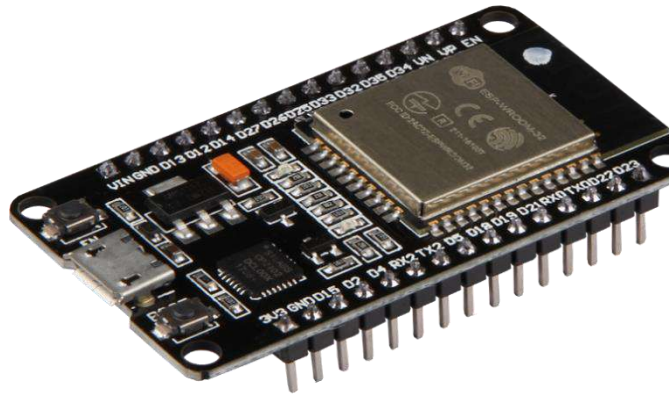
ESP Home offers complete support for the NodeMCU ESP32 board. The internal GPIO pin numbering on the board is frequently used by ESP32 boards. GPIO0 is used to determine the boot mode on startup. It should therefore not be pulled LOW on start up to avoid booting into flash mode. You can, however, still use this as an output pin. GPIO34-GPIO39 cannot be used as outputs (even though GPIO stands for "general purpose input output). GPIO32-GPIO39: These pins can be used with the Analog to Digital Sensor to measure voltages. GPIO2: This pin is connected to the blue LED on the board as seen in the picture above. It also supports the touch pad binary sensor as do the other pins marked touch in the above image. 5V is connected to the 5V rail from the USB bus and can be used to power the board. NodeMCU is an open-source firmware for which open source prototyping board designs are available. The name NodeMCU combines "node" and "MCU" (microcontroller unit) and it refers to the firmware rather than the associated development kits.

4.4.3 Motor Driver Module
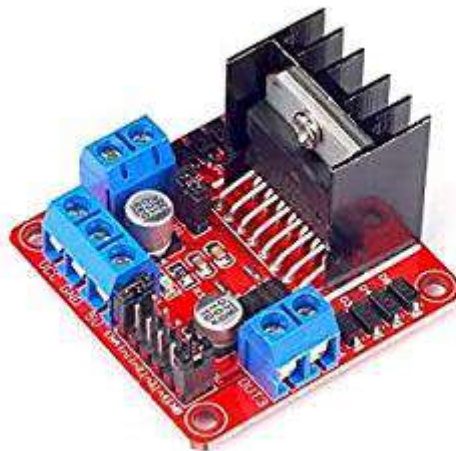
L298N module is a high voltage, high current dual full-bridge motor driver module for controlling DC motor and stepper motor. It can control both the speed and rotation direction of two DC motors. This module consists of an L298 dual-channel H-Bridge motor driver IC. This module uses two techniques for the control speed and rotation direction of the DC motors. These are PWM – For controlling the speed and H-Bridge – For controlling rotation direction. These modules can control two DC motor or one stepper motor at the same time. This motor driver module consists of two main key components, these are L298 motor driver IC and a 78M05 5V regulator.

4.4.4 Dc Motor

A DC motor is any motor within a class of electrical machines whereby direct current electrical power is converted into mechanical power. Most often, this type of motor relies on forces that magnetic fields produce. Regardless of the type, DC motors have some kind of internal mechanism, which is electronic or electromechanical. In both cases, the direction of current flow in part of the motor is changed periodically. The speed of a DC motor is controlled using a variable supply voltage or by changing the strength of the current within its field windings. While smaller DC motors are commonly used in the making of appliances, tools, toys, and automobile mechanisms, such as electric car seats, larger DC motors are used in hoists, elevators, and electric vehicles. A 12v DC motor is small and inexpensive, yet powerful enough to be used for many applications. Because choosing the right DC motor for a specific application can be challenging, it is important to work with the right company. A prime example is MET Motors, which has been creating high-quality permanent magnet DC motors for more than 45 years.

4.4.5 IR Sensors

An infrared (IR) sensor is an electronic device that measures and detects infrared radiation in its surrounding environment. While measuring the temperature of each colour of light (separated by a prism), he noticed that the temperature just beyond the red light was highest. IR is invisible to the human eye, as its wavelength is longer than that of visible light (though it is still on the same electromagnetic spectrum). Anything that emits heat (everything that has a temperature above around five degrees Kelvin) gives off infrared radiation. There are two types of infrared sensors: active and passive. Active infrared sensors both emit and detect infrared radiation. Active IR sensors have two parts: a light emitting diode (LED) and a receiver. When an object comes close to the sensor, the infrared light from the LED reflects off of the object and is detected by the receiver. Active IR sensors act as proximity sensors, and they are commonly used in obstacle detection systems.

4.4.6 Ultrasonic Sensors

The HC-SR04 Ultrasonic Distance Sensor is a sonar-based sensor used to gauge a distance to an item. The HC-SR04, which consists of two ultrasonic transmitters (essentially speakers), a receiver, and a control circuit, measures an object's distance without making contact with it. High frequency ultrasonic waves from the transmitters bounce off any surrounding solid objects, and the receiver listens for any return echo. The control circuit then processes that echo to determine how long it took for the signal to travel from transmission to reception. Using this time and some clever math's, it is then possible to determine how far away the reflected object is from the sensor.

4.4.7 Pulse Oximeter Sensor
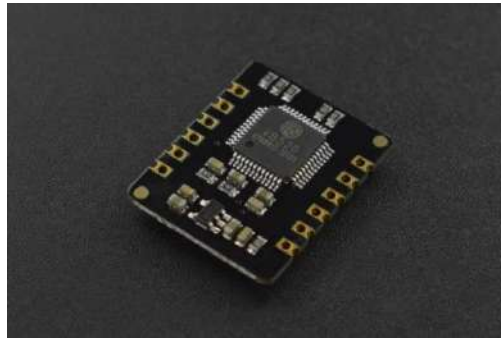
The MAX30102 is a biosensor module with integrated pulse oximetry and heart-rate monitoring. It has inbuilt photodetectors, LEDs, optical components, low-noise electronics, and electronics that reject ambient light. For the purpose of simplifying the design-in process for mobile and wearable devices, the MAX30102 offers a whole system solution.

4.4.8 Temperature Sensor

The MLX90614 is an infrared thermometer used for measuring temperatures without making contact. The single TO-39 can house both the IR sensitive thermopile detector chip and the signal conditioning ASIC. A low noise amplifier, 17-bit ADC, and strong DSP unit are built within the MLX90614 to give the thermometer great accuracy and resolution. The thermometer has a digital SMBus output that provides full access to the measured temperature across the whole temperature range(s) with a resolution of $0.02°C$ and is factory calibrated. Pulse width modulation (PWM) can be configured for the digital output by the user. The 10-bit PWM is often set up to continuously communicate temperatures in the range of -20 to $120°C$ with an output resolution of $0.14°C$.

4.4.9 GSM Module

A small GSM modem that can be utilised in a number of Internet of Things projects is the SIM800L GSM module. Almost all of the functions of a typical cell phone, including SMS messaging, calling, GPRS Internet connectivity, and much more, are all possible with this module. Since the chip's operational voltage spans from 3.4V to 4.4V, direct LiPo battery supply is a perfect fit for it. It is a great option for projects with restricted area because of this. The SIM800L GSM chip's data pins, including those required for UART communication with the microcontroller. The module has automated baud rate detection and supports baud rates between 1200 and 115200 bps. To connect to the network, the module needs an outside antenna. Consequently, the module typically comes with a solderable helical antenna. If you want to keep the antenna away from the board, the board also offers a U.FL connector. The back of the device has a SIM socket. Any 2G Micro SIM card will operate without a hitch. Usually, the surface of the SIM socket has engravings indicating how the SIM card should be inserted correctly.

4.4.10 Relay Module

In order to control high voltage, current loads such solenoid valves, motors, AC loads, and lighting, a relay module with a single channel board is employed. This module includes 6-pins:

- Normally Open (NO): Unless we provide a signal to the relay module's signal pin, this pin is typically open. In order to connect to the NO pin, the common contact pin shatters its link through the NC pin.

- Common Contact: This pin is used to connect the load that we want to use the module to switch. Normally Closed (NC): A closed circuit is created by connecting this NC pin to the COM pin.

However, once the relay is switched by sending an active high/low signal towards the signal pin from a microcontroller, this NC connection will dissipate.

- Signal Pin: The signal pin is mostly utilized for relay control. This pin functions in either active low or active high. Therefore, in the active low scenario, the relay turns on when we apply an active low signal to the signal pin, and in the active high situation, the relay turns on when we apply a high signal to the signal pin. To make contact with the common terminal and the normally open terminal, the relay coil must be strengthened in order for these modules to function, which is why they often operate on an active high signal.

- 5V VCC: To operate, this pin requires 5V DC. So, this pin receives a 5 V DC power source.

- Ground: This pin links the power supply's GND terminal to the device.

CHAPTER 5

METHODOLOGY

5.1 WORKFLOW

Work Flow Diagram of
Line Following robot
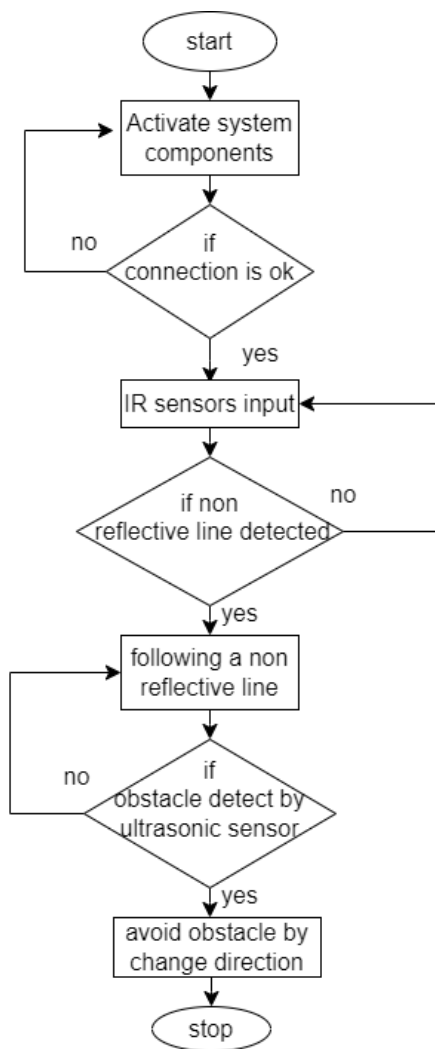
Work Flow Diagram of Patient Monitoring system,
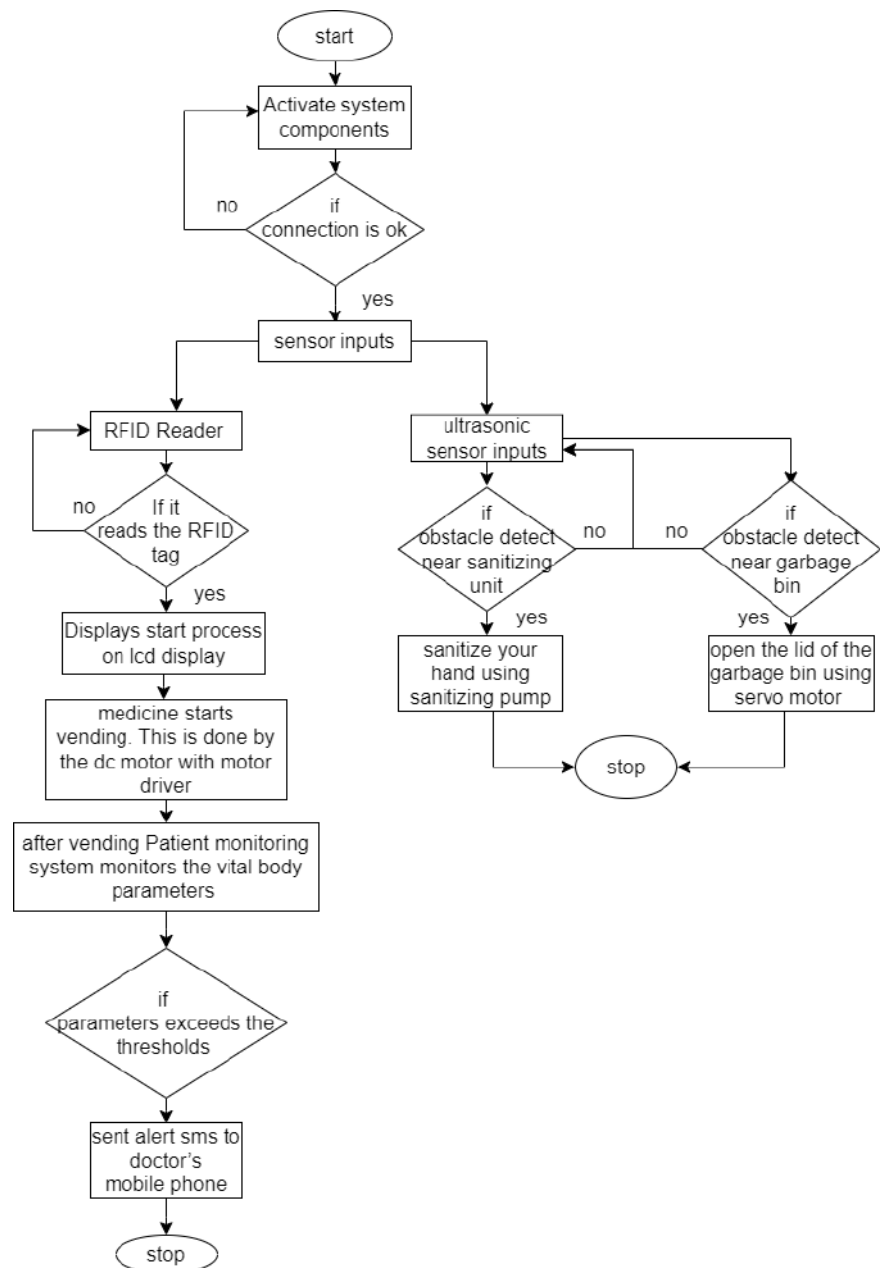Medicine Dispense, Sanitizing machine, garbage collection.

Fig 5.1 Flowchart

Initialize all the sensors and board by powering the supply. The robotic movement mode is selected by using Blynk android application. We have two modes, first Automatic and manual mode. In manual mode the medical robot is controlled by the Blynk android application, and in automatic mode medical robot is moved along with the line following technique. In automatic mode, the medical robot detects an obstacle in front of the robot, it stops and waits for the path clearance. To start the rest of the process, instructions are displayed on the LCD display attached with the medical robot. To start the procedure the patient should show the RFID tag to the robot. The medical robot identifies the patient using RFID tag. The next instruction is to sanitization, patient need to show its hand to sanitizer unit is automatically detect the hand, if not then it waits until detection of hand and dispense the sanitizer. After sanitizer dispense the medicine start dispensing according to the predefined prescription allotted to the RFID tag. Then medical robot guide patient to show their hand to the temperature and pulse oximeter sensor to take readings, if parameters exceed the threshold, then alert message is sent to the doctor's mobile number. The medical robot waits for patient hand detection for garbage unit for opening and closing lid. If presence is not detected then no action is performed.
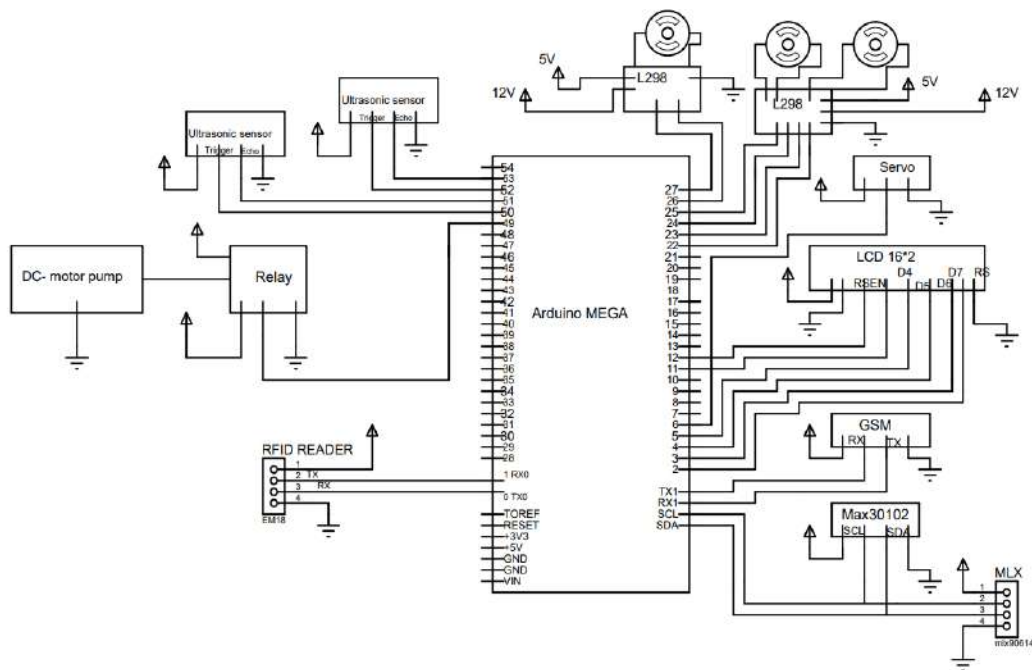
5.2 CIRCUIT DIAGRAMS

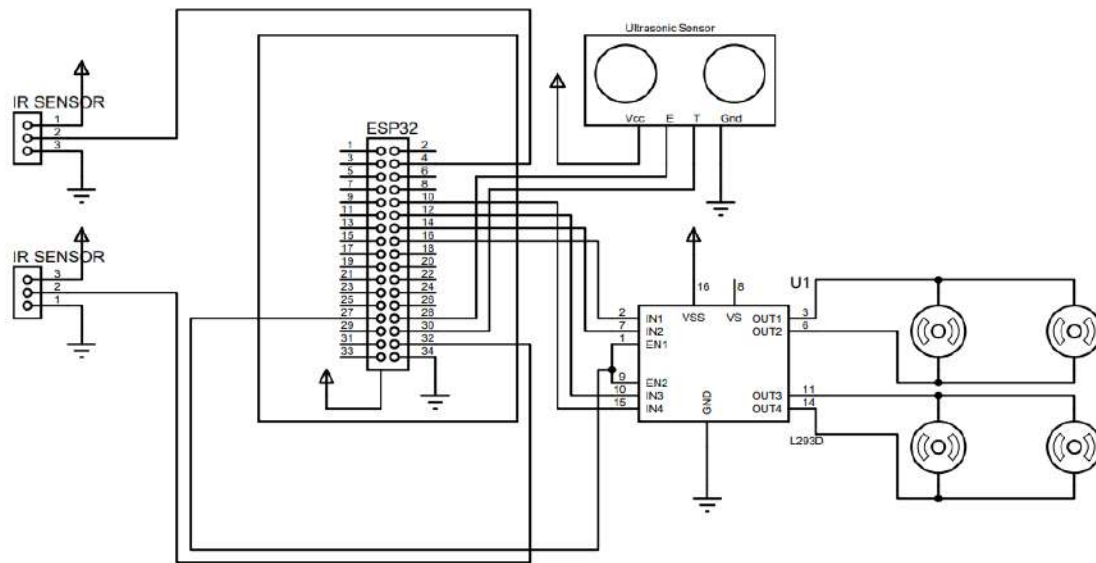Fig 5.2 Circuit diagram of Arduino Mega 2560

Fig 5.3 Circuit diagram of NodeMCU ESP32

5.3 ALGORITHM

1. Start the system by powering the supply

2. Mode Selection using Blynk Android Application

3. The robot starts to move by the line follower in that we use the IR transmitter and receiver or by controlled by Blynk Android Application.

4. Read RFID Tag to start procedure

5. When the hand is placed near to the sanitizing machine it will detect the presence hand using the Ultrasonic sensor and automatically sanitize your hand.

6. Medicine is delivered using a vending machine associate with Med Robot.

7. Patient monitoring system monitors the vital body parameters of the patient such as temperature, Heart rate, oxygen saturation level, if any of this parameter exceeds the thresholds a SMS is sent to doctor's mobile phone.

8. And to put the garbage waste, when patient comes closer to the garbage bin attached with med robot automatically detect the presence of patient using the Ultrasonic sensor is interfaced with the controller and automatically open the lid of the garbage bin using servo motor.

5.4 WORKING

The working of the line-following robot with various functionalities, such as detecting and following a black line, detecting RFID signals, vending medicine, and monitoring vital patient parameters are described.

Line Following

The robot uses an IR transmitter and receiver pair as an IR proximity sensor. The transmitter emits infrared light, and the receiver detects the reflected light .By positioning the sensors on the robot's underside, it can detect the line underneath it. If the receiver doesn't receive the reflected light, it means the robot has deviated from the line. In this case, the robot stops its movement and performs a corrective action. The corrective action involves moving the motor two steps to the right or left to get back on the line. Once the receiver detects the reflected light again, the robot resumes following the line. Also, we can control the robot using a mobile app manually.

Sanitizing Machine

An ultrasonic sensor is connected to the Arduino Mega using GPIO pins. A water pump is connected to the Arduino Mega using a relay module. The ultrasonic sensor detects the presence of an object (presumably hands) and triggers the sanitizing process. The Arduino Mega controls the water pump to dispense the sanitizing solution.

RFID Detection

As the robot reaches in front of a patient, it uses an RFID reader to detect RFID signals. RFID (Radio Frequency Identification) is a technology that uses electromagnetic fields to identify and track tags attached to objects or people.

Medicine Vending

When the RFID reads, the robot initiates the medicine vending process. Medicine vending is accomplished using a DC motor and motor driver. The motor drives the vending mechanism to dispense the medicine into a box/container.

Vital Patient Monitoring

After the medicine vending process, the robot begins monitoring vital patient parameters. The specific parameters mentioned are temperature, heart rate, and oxygen saturation level. The robot likely uses appropriate sensors or devices to measure these parameters. If any of the monitored parameters exceed predefined thresholds, indicating a potential medical concern, the robot initiates an action. In this case, the action is sending an SMS to the doctor's mobile phone to alert them about the patient's condition.

Garbage Collection Box

An ultrasonic sensor is connected to the Arduino Mega to detect the presence of a patient. A servo motor is connected to the Arduino Mega to automatically open the lid of the garbage bin. When a patient approaches the garbage bin, the ultrasonic sensor detects their presence and triggers the servo motor to open the lid.

CHAPTER 6
SYSTEM REQUIREMENT ANALYSIS

A System Requirement Specification (SRS) is basically an organization's understanding of a customer or potential client's system requirements and dependencies at a particular point prior to any actual design or development work. The information gathered during the analysis is translated into a document that defines a set of requirements. It gives the brief description of the services that the system should provide and also the constraints under which, the system should operate. Generally, SRS is a document that completely describes what the proposed software should do without describing how the software will do it. SRS document itself states in precise and explicit language those functions and capabilities a software system must provide, as well as states any required constraints by which the system must abide. SRS also functions as a blueprint for completing a project with as little cost growth as possible. SRS is often referred to as the "parent" document because all subsequent project management documents, such as design specifications, statements of work, software architecture specifications, testing and validation plans, and documentation plans, are related to it. Requirement is a condition or capability to which the system must conform. Requirement Management is a systematic approach towards eliciting, organizing and documenting the requirements of the system clearly along with the applicable attributes. The elusive difficulties of requirements are not always obvious and can come from any number of sources.

Software requirement specification permits a rigorous assessment of requirements before design can begin and reduces later redesign. It should also provide a realistic basis for estimating product costs, risks and schedules. A hardware requirements list is often accompanied by a hardware compatibility List (HCL), especially in case of operating systems. An HCL lists tested, compatible, and sometimes incompatible hardware devices for a particular operating system or application.

Software Specifications

- Tool used: Arduino IDE
- Languages: C
- Operating System: Windows 7 or later.

Hardware Specifications

- Processor: i3 or i5 (i5 is better).

- RAM: 8GB (Minimum).

- Hard Disk: 500GB or above.

- Mouse: Logitech Serial.

- Keyboard: Standard 104 Enhanced Keyboard.

Software Part

Blynk IoT Platform is used to control the switching the mode of Med Robot either Automatic or Manual mode.

6.1 BLYNK IOT

Blynk is an Internet of things (IoT) business that offers a platform for developing mobile (IOS and Android) applications that may link electronic devices to the Internet and enable remote monitoring and control of those items. Blynk is a new platform that allows you to quickly build interfaces for controlling and monitoring your hardware projects from your iOS and Android device. After downloading the Blynk app, you can create a project dashboard and arrange buttons, sliders, graphs, and other widgets onto the screen. Using the widgets, you can turn pins on and off or display data from sensors.

In order to manage deployed goods at scale, businesses employ Blynk IoT software to monitor and analyze telemetry data. For organizations to concentrate on boosting productivity, the platform provides comprehensive IoT solutions. Blynk IoT stores, shows, and visualizes sensor data while enabling remote control of hardware and data storage. Utilizing unique widgets, users of the software can design interfaces for their projects. The IoT software features offered by Blynk include device management, sensor data visualization, equipment remote control, and more. Professionals may brand their IoT applications with their company logo, unique fonts, and colors using the platform's white label option. These apps allow users to connect to any number or kind of manufactured goods. Additionally, Blynk provides clients with personalized dashboards that may be updated as needed. Web developers, small and medium-sized businesses, key industries, and enterprise clients benefit most from Blynk IoT software.

6.1.1 Features of Blynk IOT

1. Blynk IoT creates applications for businesses that use gadgets to share data without the assistance of third parties.

2. By unlocking current data sources and offering a quick, centralized examination, Blynk IoT enhances Big Data Analytics.

3. Each configuration item (CI) within an organization is tracked and managed using Blynk IoT's configuration management system.

4. Blynk IoT offers reliable connectivity management that enables businesses to manage their networked assets and smart devices globally.

5. Blynk IoT collects data from consumer electronics including Smart TVs, appliances, security systems, and fitness bracelets via internal sensors.

6. Blynk IoT software aids businesses in developing data management plans.

6.2 ARDUINO C LANGUAGE

The C language is one of the most widely used programming languages in robotics. The Arduino microcontroller uses a programming language based on C and is a great way to learn the basics of this important language whilst doing hands-on robotics. An Arduino Mega 2560 microcontroller is actually just the sizable chip in the middle of the Arduino. The high-level code you write is translated into machine code and then implemented on this chip. For connecting input devices like sensors and output devices like motors, use the pins at the top and bottom of the board.

6.2.1 Features of C Language

1. The C Language is a straightforward language that is simple to learn even for a beginner and is incredibly efficient to use in terms of both the time it takes to design and execute programs.

2. C Language program runs the same way everywhere.

3. Because it allows us to write functions, C is a structured programming language.

4. It has a wide range of features, including support for numerous data types, operators, and keywords, the ability to structure code using functions, loops, and decision-making statements; complex data structures, such as structures, arrays, and pointers; and more. This makes C quite resourceful and powerful.

5. C supports various inbuilt functions and libraries that create development fast.

6. C language a large ecosystem of 3rd party libraries, which are created by developers or coders around the world, and anyone can use them.

7. In C language you can break your code and put it in multiple source code files.

CHAPTER 7
EXPERIMENT AND RESULT ANALYSIS

7.1 HARDWARE SETUP

Fig 7.1 Snapshots of AHR

AHR has all the components required for medicine vending, parameter monitoring, sanitizing and garbage collection. It includes sensors like ultrasonic sensors to detect hand for sanitization and garbage collection, IR sensors for detecting any objects in the robot's path, temperature sensor for measuring the temperature and pulse oximeter sensors for measuring SpO2 levels. A GSM module is used to relay messages if the monitored parameters exceed the threshold value. RFID reader is used to scan the RFID tags to identify the patient.

7.2 TEST CONDITIONS

Table 7.1 Test condition for Garbage Collection and Ultrasonic Sensor

SL. No	Ultrasonic Sensor	Garbage Collection
1.	When the hand is shown in front of the sensor	Opens the lid
2.	When no hand is shown	Lid remains closed

When the patient shows its hand in front of the ultrasonic sensor it detects the hand and opens the lid else the lid remains closed until no hand is detected.

Table 7.2 Test Condition for RFID Reader and RFID Tags

SL. No	RFID Tags	RFID Reader
1.	Valid Tag	Identify the patient
2.	Invalid Tag	Doesn't identify the patient

Each patient has its own RFID tags and without RFID tags robot doesn't identify the patient. Hence it doesn't vend the medicines. RFID tags are scanned using RFID readers.

Table 7.3 Test Condition for IR Sensor and Movement

SL. No	IR Sensor	Movement
1.	If sensor detects the path	Robot moves with the Line following technique
2	If sensor doesn't detect the path	Robot stops

The robot starts to move by the line following technique wherein we use the IR sensors. If any object comes in front of the robot, it stops and wait for path clearance.

7.3 SOFTWARE SETUP

Blynk IoT platform can be utilized to enable both manual and automatic mode movement in robots. In manual mode Blynk provides a user-friendly interface that can be customized with buttons, sliders, or joysticks. Through the Blynk app, users can interact with the robot and control its movement manually. They can use buttons to move the robot forward, backward, turn left or right, or stop.
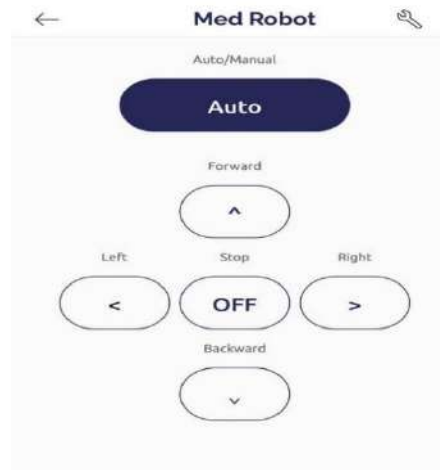

Fig 7.2 User Interface

In automatic mode, AHR is equipped with sensors such as IR sensors and ultrasonic sensors. Blynk app receives sensor data from these sensors, and based on the programmed logic, initiates the automatic movement actions. If an IR sensor detects an obstacle, the robot automatically changes its path or stop. By integrating Blynk IoT with the robot's control system, users can switch between manual and automatic modes, providing flexibility and versatility in controlling the robot's movement.

CHAPTER 8
CONCLUSION AND FUTURE SCOPE

AHR offers numerous benefits, including improved efficiency, accuracy, and patient safety. They can navigate hospital environments, deliver medications to patients, and provide automated reminders for medication adherence. We suggest AHR to administer medications to patients and monitor their vital signs in place of nurse care. With the aid of an RFID tag and a queue follower, the robot locates the patient's location. Since there is less direct contact between patients and staff members in hospitals, there is a lower risk of infectious diseases spreading among the medical professionals. Both patients and medical professionals save time. The future of these hospital robots is promising as continued research, development, and collaboration between robotics engineers, healthcare providers, and regulatory bodies will drive advancements in this field.

The future of these hospital robots is promising as continued research, development, and collaboration between robotics engineers, healthcare providers, and regulatory bodies will drive advancements in this field. The advanced hospital robot holds several potential avenues for further development and improvement. Enhanced Navigation and Obstacle Avoidance can be achieved by incorporating ultrasonic sensors for obstacle detection and further future iterations could incorporate advanced sensors, such as LiDAR or 3D cameras, for more accurate mapping and obstacle avoidance. This would allow the robot to navigate complex hospital environments with greater precision and safety. The inclusion of artificial intelligence (AI) and machine learning algorithms could enable the robot to learn and adapt its behavior based on the hospital's specific needs. This could involve optimizing the line following technique, improving object recognition capabilities, or dynamically adjusting its motion based on real-time feedback. Integrating the robot with the hospital's electronic medical records system would enable it to access and retrieve patient data, track medication administration, and assist healthcare providers in delivering personalized care. This integration could enhance the overall efficiency and effectiveness of the robot in supporting healthcare workflows.

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APPENDIX

Code for Arduino Mega

```
//#include <Wire.h>
#include <LiquidCrystal.h>
#include <Servo.h>
#include <Wire.h>
#include <Adafruit_MLX90614.h>
#include "MAX30105.h"
#include "spo2_algorithm.h"

#define trigger 52     //Trigger
#define echo 53        //Echo
#define trigger2 50    //Trigger
#define echo2 51       //Echo
#define MAX_BRIGHTNESS 255


Servo servoMotor;
MAX30105 particleSensor;
LiquidCrystal lcd(12, 11, 5, 4, 3, 2);


int count = 0;                          // count = 0
char input[13];                          // character array of size 13
boolean flag = 0;
int  num=0;
float hand;
int duration;
float distance;
int duration2;
float distance2;
char msg;
float data1=0;
float data2=0;
float data3=0;

#if defined(__AVR_ATmega328P__) || defined(__AVR_ATmega168__)
//Arduino Uno doesn't have enough SRAM to store 100 samples of IR led data and red led data in 32-bit
format
//To solve this problem, 16-bit MSB of the sampled data will be truncated. Samples become 16-bit data.
uint16_t irBuffer[100]; //infrared LED sensor data
uint16_t redBuffer[100];  //red LED sensor data
```

```
#else

uint32_t irBuffer[100]; //infrared LED sensor data
uint32_t redBuffer[100];  //red LED sensor data
#endif

int32_t bufferLength; //data length
int32_t spo2; //SPO2 value
int8_t validSPO2; //indicator to show if the SPO2 calculation is valid
int32_t heartRate; //heart rate value
int8_t validHeartRate; //indicator to show if the heart rate calculation is valid
byte pulseLED = 11; //Must be on PWM pin
byte readLED = 13; //Blinks with each data read


Adafruit_MLX90614 mlx = Adafruit_MLX90614(); //-> mlx declaration

void setup()
{
 lcd.clear();
 lcd.home ();                  // go home
 lcd.print("Intialising...");
 pulsesetup();
 delay(1000);
 Serial.begin (9600);
 Serial1.begin (115200);
 pinMode(22,OUTPUT);
 pinMode(23,OUTPUT);
 pinMode(24,OUTPUT);
 pinMode(25,OUTPUT);
 pinMode(26,OUTPUT);
 pinMode(27,OUTPUT);
 pinMode(trigger, OUTPUT);
 pinMode(echo, INPUT);
 pinMode(trigger2, OUTPUT);
 pinMode(echo2, INPUT);
 pinMode(A2,OUTPUT);

 analogWrite(A2,130);

 pinMode(49,OUTPUT);
 digitalWrite(49, HIGH);   //relay

 servoMotor.attach(6);
 servoMotor.write(10);

 lcd.begin(16,2);            // initialize the lcd
 lcd.home ();               // go home
```

```arduino
  lcd.print("I am Med robot");
  Serial.println("I am Med robot");
  delay(1000);

   Serial1.println("Initializing...");
  delay(500);

  Serial1.println("AT"); //Once the handshake test is successful, it will back to OK
 delay(1000);

  Serial1.println("AT+CMGF=1"); // Configuring TEXT mode
 delay(1000);
Serial.println("GSM OK");
 lcd.setCursor ( 0, 0 );        // go to the next line
//vending3  ();
//delay(200);
//vendingstop();
//delay(1000);
}

void loop()
{
//delay(3000);
//  digitalWrite(49, LOW);
//  Serial.println("Motor on");
//  delay(3000);
//  digitalWrite(49, HIGH);
//  Serial.println("Motor off");
//  delay(3000);



 lcd.setCursor ( 0, 0 );        // go to the next line
 lcd.print ("Scan your RFID");
Serial.println("Scan your RFID");

 if(Serial.available())
  {
    count = 0;
    while(Serial.available() && count < 13)       // Read 12 characters and store them in input array
    {
      input[count] = Serial.read();
      count++;
      delay(5);
    }
    Serial.println(input);                         // Print RFID tag number
  lcd.clear();
  lcd.setCursor ( 0, 0 );
```

```
   lcd.print ("Your ID is:");
   lcd.setCursor ( 0, 2 );
   lcd.print (input);
   delay(1000);
   lcd.clear();
   num=0;
    }

    if(strncmp(input,"140049BBBB5D",13)==0)
    {
    if(num==0)
     {

       sanitize();
     }


    if(num==1)
     {
      num++;
      lcd.clear();
      lcd.setCursor ( 0, 0 );
      lcd.print ("Collect Your");
      lcd.setCursor ( 0, 2 );
      lcd.print ("medicine");

     medicine1();

     delay(3000);

     }


if (num==2)
{
   lcd.clear();
   lcd.setCursor(0,0);
  lcd.print("Place finger    ");
  lcd.setCursor ( 0, 2 );
   lcd.print ("on Sensor   ");

   pulse();

  num++;
 }
if(num==3)
  {
    num++;
```

```
   lcd.clear();
    lcd.setCursor ( 0, 0 );
   lcd.print ("Put Your Hand on  ");
   lcd.setCursor ( 0, 2 );
   lcd.print ("IR temp sensor   ");

for(int i=0;i<10;i++)
  {
    lcd.clear();
  temp();
//  if(data1>37)
//  {
//    sendsms();
//
//  }
  delay(500);
    }
   if(data1>37 || data3<60|| data3>90 || data2>100)
  {
   sendsms();
  }

    data1=0;
   data2=0;
   data3=0;
   }

   if(num==4)
  {
   lcd.clear();
   lcd.setCursor(0,0);
  lcd.print("Garbage bin is");
  lcd.setCursor(0,1);
  lcd.print("opening...");
  delay(1000);
   garbage();
   lcd.clear();

  }
  }
  else  if(strncmp(input,"14004A2CB3C1",13)==0)
   {
   if(num==0)
   {
    sanitize();
   }
```

```
  if(num==1)
   {
    num++;
    lcd.clear();
    lcd.setCursor ( 0, 0 );
    lcd.print ("Collect Your");
    lcd.setCursor ( 0, 2 );
    lcd.print ("medicine");

   medicine2();

   delay(3000);

    }


if (num==2)
{
   lcd.clear();
   lcd.setCursor(0,0);
  lcd.print("Place finger    ");
  lcd.setCursor ( 0, 2 );
   lcd.print ("on Sensor   ");

   pulse();

  num++;
 }
if(num==3)
  {
    num++;
     lcd.clear();
    lcd.setCursor ( 0, 0 );
   lcd.print ("Put Your Hand on  ");
   lcd.setCursor ( 0, 2 );
   lcd.print ("IR temp sensor   ");

for(int i=0;i<10;i++)
  {
    lcd.clear();
  temp();
```

Code for NodeMCU ESP32

```cpp
#include <WiFi.h>

#include <BlynkSimpleEsp32.h>
#define BLYNK_TEMPLATE_ID "TMPLkWb-gOK5"
#define BLYNK_TEMPLATE_NAME "Med Robot"
#define BLYNK_AUTH_TOKEN "7Ld_gQ5jia035myqmZcpBCWVH55dvYt_"

#define in1 5 //Motor1  L293 Pin in1
#define in2 18 //Motor1  L293 Pin in1
#define in3 19 //Motor2  L293 Pin in1
#define in4 21 //Motor2  L293 Pin in1
#define R_S 15//ir sensor Right
#define L_S 22 //ir sensor Left
#define trigger 2     //Trigger
#define echo 4        //Echo
#define enable1Pin  14

int pinval;
int duration;
float distance;

// Setting PWM properties
const int freq = 30000;
const int pwmChannel = 0;
const int resolution = 8;
int dutyCycle = 255;


char auth[] = BLYNK_AUTH_TOKEN;
char ssid[] = "FLEMING 4G";
char pass[] = "Fleming#2023";

void forward(){  //forword

digitalWrite(in1, LOW);  //Right Motor forword Pin
digitalWrite(in2, HIGH); //Right Motor backword Pin
digitalWrite(in3, LOW);  //Left Motor backword Pin
 digitalWrite(in4, HIGH); //Left Motor forword Pin
 ledcWrite(pwmChannel, 255);

}

void turnRight(){ //turnRight
```

```
digitalWrite(in1, HIGH); //Right Motor forword Pin
digitalWrite(in2, LOW);  //Right Motor backword Pin
digitalWrite(in3, LOW);  //Left Motor backword Pin
digitalWrite(in4, HIGH); //Left Motor forword Pin
ledcWrite(pwmChannel, 255);
}

void turnLeft(){ //turnLeft


  digitalWrite(in1, LOW);
  digitalWrite(in2, HIGH);
  digitalWrite(in3, HIGH);
  digitalWrite(in4, LOW);
  ledcWrite(pwmChannel, 255);

}

void Stop(){ //stop

digitalWrite(in1, LOW); //Right Motor forword Pin
digitalWrite(in2, LOW); //Right Motor backword Pin
digitalWrite(in3, LOW); //Left Motor backword Pin
digitalWrite(in4, LOW); //Left Motor forword Pin

}

void backward()
{
digitalWrite(in1, HIGH); //Right Motor forword Pin
digitalWrite(in2, LOW);  //Right Motor backword Pin
digitalWrite(in3, HIGH); //Left Motor backword Pin
digitalWrite(in4, LOW);  //Left Motor forword Pin
ledcWrite(pwmChannel, 255);

}

void setup() {
  Serial.begin(115200);
  ledcSetup(pwmChannel, freq, resolution);
  ledcAttachPin(enable1Pin, pwmChannel);
  pinMode(in1, OUTPUT);
  pinMode(in2, OUTPUT);
  pinMode(in3, OUTPUT);
  pinMode(in4, OUTPUT);
  pinMode(R_S, INPUT);
  pinMode(L_S, INPUT);
  pinMode(trigger, OUTPUT);
```

```
  pinMode(echo, INPUT);
 //Initialize the Blynk library
 Blynk.begin(auth, ssid, pass, "blynk.cloud", 80);
}

void loop() {
 //Serial.println(analogRead(34));
 Blynk.run();
inputs();

 if(pinval==1){
 if((digitalRead(R_S) == 0)&&(digitalRead(L_S) == 0)){
 forward();

 Serial.println("Forward");
  delay(100);
 }   //if Right Sensor and Left Sensor are at White color then it will call forword function

if((digitalRead(R_S) == 1)&&(digitalRead(L_S) == 0))
{
 turnRight();
 ledcWrite(pwmChannel, 255);
 Serial.println("Right");
 delay(100);
 } //if Right Sensor is Black and Left Sensor is White then it will call turn Right function

if((digitalRead(R_S) == 0)&&(digitalRead(L_S) == 1))
{
 turnLeft();
 ledcWrite(pwmChannel, 255);
Serial.println("Left");
delay(100);
} //if Right Sensor is White and Left Sensor is Black then it will call turn Left function

if((digitalRead(R_S) == 1)&&(digitalRead(L_S) == 1)||distance < 10)
{
 Stop();
 Serial.println("Stop");
 } //if Right Sensor and Left Sensor are at Black color then it will call Stop function
 }

 delay(100);

}

BLYNK_WRITE(V0)
{
pinval=param.asInt();
```

```
}

 BLYNK_WRITE(V1)
{

if(pinval==0){
forward();
ledcWrite(pwmChannel, 255);

}

 }

 BLYNK_WRITE(V2)
{
 if(pinval==0){
backward();
ledcWrite(pwmChannel, 255);
}

 }

 BLYNK_WRITE(V3)
{
 if(pinval==0){
turnRight();
ledcWrite(pwmChannel, 255);
}

 }

BLYNK_WRITE(V4)
{
  if(pinval==0){
turnLeft();
ledcWrite(pwmChannel, 255);
}

 }
BLYNK_WRITE(V5)
{
 Stop();
 }
```

PROGRAM OUTCOMES

PO1: Engineering Knowledge

The hardware and software components utilized in this project are successfully transformed to the engineering knowledge used in it. The integration of servo motors, Arduino Mega 2560, NodeMCU ESP32, ultrasonic sensors, and IR sensors demonstrates a mastery of robotics fundamentals and allows for precise control, motion, sensing, and navigation. The microcontroller programming efficiently manages servo motor control, sensor data processing, and path-following and obstacle detection. The user-friendly interface also makes manual and automatic control, interaction with medical experts easier, provide parameter and patient monitoring. The combination of these parts and the use of engineering expertise allow the robot to sanitize patients, dispense medications, and check patient parameters on its own without constant doctor input.

PO5: Modern Tool Usage

Modern tools are essential for improving human-robot interaction. The tool used to develop AHR is Arduino. The major pros of using Arduino and IoT are:

IoT makes it possible for the robot to connect to the internet, enabling smooth connection and data exchange with other systems and equipment.

For hardware development, Arduino offers a flexible and adaptable platform.

The major cons of using Arduino and IoT are:

Compared to more advanced microcontrollers or computer systems, Arduino boards have less processing power and memory.

PO6: The Engineer and the Society

It specifically addresses the need for effective and efficient healthcare services in society. The robot helps to improve patient outcomes and lighten the stress on medical staff by automating some duties and assisting healthcare workers.

PO8: Ethics

The project raises ethical considerations related to the privacy of the patients. It is essential to protect patients' privacy and safeguard the confidentiality of medical information. Patients should be informed in a simple and understandable manner about the functions, advantages, hazards, and purpose of the robot.

P10: Communication

For idea sharing, project requirements discussion, problem solving, and decision-making within the group, effective communication is essential. Understanding the unique needs and expectations of clients, such as hospitals or other healthcare facilities, requires communication. Reports on a variety of topics, including the requirements analysis, technical specifications, and suggested solutions are prepared and presented for the project.

PO11: Project Management and Finance

The cost of purchasing the robot's hardware components is included in the budget. This could involve servo motors, ultrasonic sensors, infrared sensors, microcontrollers, and communication modules like the NodeMCU ESP32. To ensure cost-effective execution and efficient resource allocation, financial considerations are made.

PO12: Life Long Learning

Lifelong learning offers the perspective and framework required to continuously enhance the robot's performance, keeping up with new technological developments and ethical issues and adapting to the changing demands of the healthcare industry. The development team can guarantee that the robot remains creative, efficient, and in line with the most recent developments in healthcare robotics by embracing lifelong learning.

PS01:

The names, dosages, expiration dates, and patient-specific requirements of medicines are stored in a database. The robot can access and use this information while dispensing medications. It is possible to create a user-friendly interface for the robot using web technologies. To ensure effective communication and data synchronization between the robot and the hospital's infrastructure, networking protocols are used to convey sensor data, patient information, and other pertinent data.

PS02:

We utilized C to control the robot's movements, integrate sensors and actuators, implement logic for medicine vending, parameter checking, sanitizing, and garbage collection.

Ref: SMEC-23/5 753
Date - 29th May 2023

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Mr. Alan Sam Shibu, S4** student from **EEE** dept., Musaliar College of Engineering and Technology, Pathanamthitta has successfully completed his internship program in **Electrical System Design** at SMEC Automation Pvt. Ltd. from 15th May 2023 to 29th May 2023.

During this period, he has acquired sufficient knowledge and skill in his field of expertise. He is having good exposure, initiative, and a positive attitude towards completion of given task within the time frame. His conduct and discipline through the period were very good.

I wish him all the best in his future endeavors.

For SMEC Automation Pvt. Ltd.
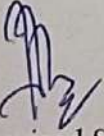
Authorised Signatory

Ref: SMEC-23/5 752
Date - 29th May 2023

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Mr. Sanjai S, S4** student from **EEE** dept., Musaliar College of Engineering and Technology, Pathanamthitta has successfully completed his internship program in **Electrical System Design** at SMEC Automation Pvt. Ltd. from 15th May 2023 to 29th May 2023.

During this period, he has acquired sufficient knowledge and skill in his field of expertise. He is having good exposure, initiative, and a positive attitude towards completion of given task within the time frame. His conduct and discipline through the period were very good.

I wish him all the best in his future endeavors.

For SMEC Automation Pvt. Ltd.

Authorised Signatory

Ref: SMEC-23/5 756
Date - 29th May 2023

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Mr. Dennis George Thomas, S4** student from **EEE** dept., Musaliar College of Engineering and Technology, Pathanamthitta has successfully completed his internship program in **Electrical System Design** at SMEC Automation Pvt. Ltd. from 15th May 2023 to 29th May 2023.

During this period, he has acquired sufficient knowledge and skill in his field of expertise. He is having good exposure, initiative, and a positive attitude towards completion of given task within the time frame. His conduct and discipline through the period were very good.

I wish him all the best in his future endeavors.

For SMEC Automation Pvt. Ltd.

Authorised Signatory

Ref: SMEC-23/5 750
Date - 29th May 2023

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Mr. Nandu Mohan, S4** student from **EEE** dept., Musaliar College of Engineering and Technology, Pathanamthitta has successfully completed his internship program in **Electrical System Design** at SMEC Automation Pvt. Ltd. from 15th May 2023 to 29th May 2023.

During this period, he has acquired sufficient knowledge and skill in his field of expertise. He is having good exposure, initiative, and a positive attitude towards completion of given task within the time frame. His conduct and discipline through the period were very good.

I wish him all the best in his future endeavors.

For SMEC Automation Pvt. Ltd.

Authorised Signatory

Ref: SMEC-23/5 754
Date - 29th May 2023

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Mr. Soji Reji, S4** student from **EEE** dept., Musaliar College of Engineering and Technology, Pathanamthitta has successfully completed his internship program in **Electrical System Design** at SMEC Automation Pvt. Ltd. from 15th May 2023 to 29th May 2023.

During this period, he has acquired sufficient knowledge and skill in his field of expertise. He is having good exposure, initiative, and a positive attitude towards completion of given task within the time frame. His conduct and discipline through the period were very good.

I wish him all the best in his future endeavors.

For SMEC Automation Pvt. Ltd.

Authorised Signatory

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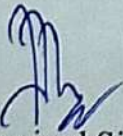CIN No: U45309KL2001PTC014516

Ref: SMEC-23/5 751
Date - 29th May 2023

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Mr. Amal Shaji, S4** student from **EEE** dept., Musaliar College of Engineering and Technology, Pathanamthitta has successfully completed his internship program in **Electrical System Design** at SMEC Automation Pvt. Ltd. from 15th May 2023 to 29th May 2023.

During this period, he has acquired sufficient knowledge and skill in his field of expertise. He is having good exposure, initiative, and a positive attitude towards completion of given task within the time frame. His conduct and discipline through the period were very good.

I wish him all the best in his future endeavors.

For SMEC Automation Pvt. Ltd.

Authorised Signatory

Ref: SMEC-23/5 748
Date - 29th May 2023

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Ms. Ashika Sara Mathew**, S4 student from EEE dept., Musaliar College of Engineering and Technology, Pathanamthitta has successfully completed her internship program in **Electrical System Design** at SMEC Automation Pvt. Ltd. from 15th May 2023 to 29th May 2023.

During this period, she has acquired sufficient knowledge and skill in her field of expertise. She is having good exposure, initiative, and a positive attitude towards completion of given task within the time frame. Her conduct and discipline through the period were very good.

I wish her all the best in her future endeavors.

For SMEC Automation Pvt. Ltd.

Authorised Signatory

Ref: SMEC-23/5 749
Date - 29th May 2023

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Mr. P Avinash Krishna, S4** student from **EEE** dept., Musaliar College of Engineering and Technology, Pathanamthitta has successfully completed his internship program in **Electrical System Design** at SMEC Automation Pvt. Ltd. from 15th May 2023 to 29th May 2023.

During this period, he has acquired sufficient knowledge and skill in his field of expertise. He is having good exposure, initiative, and a positive attitude towards completion of given task within the time frame. His conduct and discipline through the period were very good.

I wish him all the best in his future endeavors.

For SMEC Automation Pvt. Ltd.

Authorised Signatory

Ref: SMEC-23/5 746
Date - 29th May 2023

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Ms. Serene Susan Gigy, S4** student from **EEE** dept., Musaliar College of Engineering and Technology, Pathanamthitta has successfully completed her internship program in **Electrical System Design** at SMEC Automation Pvt. Ltd. from 15th May 2023 to 29th May 2023.

During this period, she has acquired sufficient knowledge and skill in her field of expertise. She is having good exposure, initiative, and a positive attitude towards completion of given task within the time frame. Her conduct and discipline through the period were very good.

I wish her all the best in her future endeavors.

For SMEC Automation Pvt. Ltd.

Authorised Signatory

Ref: SMEC-23/5 755
Date - 29th May 2023

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Mr. Sreyas Kumar S, S4** student from **EEE** dept., Musaliar College of Engineering and Technology, Pathanamthitta has successfully completed his internship program in **Electrical System Design** at SMEC Automation Pvt. Ltd. from 15th May 2023 to 29th May 2023.

During this period, he has acquired sufficient knowledge and skill in his field of expertise. He is having good exposure, initiative, and a positive attitude towards completion of given task within the time frame. His conduct and discipline through the period were very good.

I wish him all the best in his future endeavors.

For SMEC Automation Pvt. Ltd.

Authorised Signatory

Ref: SMEC-23/5 757
Date - 29th May 2023

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Mr. Muhammed Bilal, S4** student from **EEE** dept., Musaliar College of Engineering and Technology, Pathanamthitta has successfully completed his internship program in **Electrical System Design** at SMEC Automation Pvt. Ltd. from 15th May 2023 to 29th May 2023.

During this period, he has acquired sufficient knowledge and skill in his field of expertise. He is having good exposure, initiative, and a positive attitude towards completion of given task within the time frame. His conduct and discipline through the period were very good.

I wish him all the best in his future endeavors.

For SMEC Automation Pvt. Ltd.

Authorised Signatory

Ref: SMEC-23/5 747
Date - 29th May 2023

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Ms. Lakshmi S Babu, S4** student from **EEE dept.,** Musaliar College of Engineering and Technology, Pathanamthitta has successfully completed her internship program in **Electrical System Design** at SMEC Automation Pvt. Ltd. from 15th May 2023 to 29th May 2023.

During this period, she has acquired sufficient knowledge and skill in her field of expertise. She is having good exposure, initiative, and a positive attitude towards completion of given task within the time frame. Her conduct and discipline through the period were very good.

I wish her all the best in her future endeavors.

For SMEC Automation Pvt. Ltd.

Authorised Signatory

KELTRON ®

Keltron Equipment Complex
Karakulam - 695 564
Thiruvananthapuram
KERALA, INDIA

Phone : 0472 - 2815999
Fax : 0472 - 2888736
E-mail : kectraining@keltron.org
Website : www.keltron.org

KEC/TDC/T/2022/2589/13775

November 10, 2022

CERTIFICATE

This is to certify that **Mr. SINO THOMAS, B.Tech** (Electronics &
Communication Engineering) student, MUSALIAR COLLEGE OF
ENGINEERING & TECHNOLOGY, PATHANAMTHITTA, has successfully
completed the Internship Training in our **Power Electronics Group (PEG),**
Fabrication Shop, Transformer Winding, Electro Plating, Tool Room,
Security and Surveillance Group (SSG), Special Products Group (SPG),
Search and Rescue Beacon (SRB) and Technology Development Centre
of Keltron Equipment Complex, Thiruvananthapuram from 22-10-2022,
25-10-2022 to 29-10-2022, 31-10-2022 to 05-11-2022 and 07-11-2022 to
08-11-2022.

His conduct and character during the period with us were good.

Chief General Manager

Musaliar
COLLEGE OF ENGINEERING & TECHNOLOGY
PATHANAMTHITTA

ACCREDITED BY **NAAC**
AN ISO 9001 - 2015 CERTIFIED INSTITUTION
APPROVED BY AICTE , GOVT OF INDIA
AFFILIATED TO APJ ABDUL KALAM KERALA TECHNOLOGICAL UNIVERSITY

No.MCET/HQ/KTU/Stdt Gen

08.11.2021

General Manager
Keltron Ltd.
Aroor

Sir,

SUB: INTERNSHIP TRAINING BY OUR IV SEM B TECH (ECE) STUDENTS

Greetings from Musaliar College of Engineering & Technology

The following B Tech (Electronics and Communication Engineering) Semester – IV students of our college have been granted permission to visit your unit to undergo a training programme as part of their curriculum prescribed by APJ Abdul Kalam Technological University from 16th to 24th Nov 2021.

S No	Name of the students	Admission No.
1	Arjun A Nair	19047
2	Asif Malik	19046
3	Bejoy V Jooby	19026
4	Bithin Johnson Bijoy	19039
5	Gayathri M	19070
6	Meenakshi S	19022
7	Moosa Abdulla	19050
8	Stains Alex Joseph	19051
9.	Visal Tulasi	19049
10	Mathews Joji	19027
11	Yadhu Krishna B K	19147
12	Atul T Ashok	20309

Hence, I request you to kindly permit them to undergo a training programme in your esteemed organization to enable them to complete their assignment.

Yours faithfully,

PRINCIPAL

PRINCIPAL
Musaliar College of
Ingineering & Technology,
Pathanamthitta