

PROJECT REPORT - **INTER DISCIPLINARY**

AI-INTEGRATED HOME AND COMMUNITY PROTECTION SYSTEM
SUPPORT SDG 11

(PROJECT PHASE- II)

*submitted in partial fulfillment of the requirements
for the award of the degree in*

BACHELOR OF TECHNOLOGY

By

PIOUS NIRANJAN.A	(211051101615)
DHANUSH RAJ.N	(211051101005)
THANUSH K	(211191101159)
SANTHOSH R	(211191101131)

**DEPARTMENT OF
CIVIL ENGINEERING & COMPUTER SCIENCE ENGINEERING**



APRIL 2025



Dr. M.G.R.
EDUCATIONAL AND RESEARCH INSTITUTE
DEEMED TO BE UNIVERSITY
University with Graded Autonomy Status
(An ISO 21001 : 2018 Certified Institution)



Periyar E.V.R. High Road, Maduravoyal, Chennai-95. Tamilnadu, India.

DEPARTMENT OF CIVIL ENGINEERING & COMPUTER SCIENCE ENGINEERING

BONAFIDE CERTIFICATE

This is to certify that this Project Report (Project Phase-II) is the bonafide work of

Mr. PIOUS NIRANJAN A Reg. No: 211051101615,

Mr. DHANUSH RAJ N Reg. No: 211051101005,

Mr. THANUSH K Reg. No: 211191101159,

Mr. SANTHOSH R Reg. No: 211191101131,

Who Carried out the project entitled "**AI-Integrated Home and Community Protection System Support SDG 11**" under our supervision from Dec 2024 to Apr 2025.

Internal Guide

Project Coordinator

Department Head

Dr.V. PRIYADARSHINI
Associate Professor
Dept of CIVIL

Dr. MGR Educational and Research
Institute, Deemed to be University

Dr.T.KAVITHA
Professor & HOD
Dept of CIVIL

Dr. MGR Educational and Research
Institute, Deemed to be University

Dr.T.KAVITHA
Professor & HOD
Dept of CIVIL

Dr. MGR Educational and Research
Institute, Deemed to be University

Mrs.A.MAHESWARI
Asst.Professor & Deputy HOD
Dept of CSE(DS&AI)

Dr. MGR Educational and Research
Institute, Deemed to be University

Mr. M. ARUN
Assistant Professor
Dept of CSE

Dr. MGR Educational and Research
Institute, Deemed to be University

Dr. S. GEETHA
Professor & HOD
Dept of CSE

Dr. MGR Educational and Research
Institute, Deemed to be University

Submitted for Viva Voce Examination held on _____

Internal Examiner

External Examiner

DECLARATION

We **PIOUS NIRANJAN A (211051101615), DHANUSH RAJ N (211051101005), THANUSH K (211191101159), SANTHOSH R (211191101131)** hereby declare that the Project Report (Project Phase-II) entitled **"AI-Integrated Home and Community Protection System Support SDG 11"** is done by us under the guidance of **Dr.V.PRIYADARSHINI, Associate Professor & Mrs.A.MAHESWARI, Asst.Professor & Deputy HOD** is submitted in partial fulfillment of the requirements for the award of the degree in BACHELOR OF TECHNOLOGY in Civil Engineering & Computer Science Engineering.

DATE:

PLACE:

- 1.
- 2.
- 3.
- 4.

SIGNATURE OF THE CANDIDATE(S)

ACKNOWLEDGEMENT

We would first like to thank our beloved Founder Chancellor **Thiru.Dr. A.C.SHANMUGAM, B.A., B.L.,** President **Er. A.C.S.Arunkumar, B.Tech., M.B.A.,** and Secretary **Thiru A.RAVIKUMAR** for all the encouragement and support extended to us during the tenure of this project and also our years of studies in his wonderful University.

We express my heartfelt thanks to our Vice Chancellor **Prof. Dr. S. GEETHALAKSHMI** in providing all the support of my Project (Project Phase-II).

We express my heartfelt thanks to our Head of the Department, **Prof. Dr. S.Geetha,Dr.T. KAVITHA, CSE & CIVIL** who has been actively involved and very influential from the start till the completion of our project.

Our sincere thanks to our Project Coordinators **Mr. M Arun, Dr.T. KAVITHA, CSE & CIVIL** and Project guide **Mrs.A.MAHESWARI , Dr.V.PRIYADARSHINI** for their continuous guidance and encouragement throughout this work, which has made the project a success.

We would also like to thank all the teaching and non-teaching staffs of Computer Science and Engineering & CIVIL Engineering department, for their constant support and the encouragement given to us while we went about to achieving my project goals.

CONTENTS

CHAPTER NO	TITLE	PAGE NO
	Title Page	I
	Bonafide certificate	II
	Declaration	III
	Acknowledgement	IV
	Contents	V
	List of Abbreviations	VIII
	List of Figures	IX
	List of Tables	X
	Abstract	XI
	MAJOR DESIGN CONSTRAINTS AND DESIGN STANDARDS TABLE	XII
1	INTRODUCTION	01
	1.1. Problem Statement	01
	1.2. Need for IoT and AI-Driven Safety Solutions	01
	1.3. Proposed Solution	01
	1.4. Significance and Impact	01
	1.5. Detailed Explanations of Emergency Scenarios	02
2	LITERATURE SURVEY	04
	2.1 Literature Survey Insight and Inspiration	04
	2.1.1 Overview of Literature Survey	05
3	PROPOSED SYSTEM	17
	3.1 System Requirements	17
	3.2 Hardware Components	17
	3.3 Software Components	18
	3.4 Communication Flow	18
	3.5 Working Principle	18

4	DESIGN & IMPLEMENTATION	19
	4.1 PROTOTYPE DESIGN	20
	4.2 TESTING SCENARIOS	
	4.2.1 GAS LEAK SIMULATION	21
	4.2.2 THEFT BUTTON/ MEDICAL BUTTON	21
	4.2.3 FIRE DETECTION USING FLAME SENSOR	21 20
	4.2.4 TESTING ACCURACY SCENARIOS	22
	4.2.5 FALSE ALARMS	22
	4.2.6 POWER CONSUMPTION	23
	4.3 DESIGN	24
	4.3.1 DFD Level 0 (Context Diagram)	24
	4.3.2 Level 1 DFD	25
	4.3.3 Level 2 DFD	27
	4.4 UML DIAGRAMS	27
	4.4.1 Use Case Diagram	28
	4.4.2 Class Diagram	29
	4.4.3 Sequence Diagram	30
	4.4.4 Activity Diagram	31
	4.4.5 Communication Diagram	34
	4.4.6 Deployment Diagram	35
	4.5 Implementation Arduino IDE Code	37
5	RESULTS & DISCUSSION	44
	5.1 Case Study	44
	5.1.1 Case Study 1: House 1 and House 2 (Fire Detection)	44
	5.1.2 Case Study 2: House 1 and House 2 (Gas Leak Detection)	45
	5.1.3 Case Study 3: House 1 and House 2 (Theft Detection)	46
	5.1.4 Case Study 4: House 1 and House 2 (Medical Emergency)	47
	5.1.5 Case Study 5: False Alarm and	47

Acknowledgment Button

6	CHALLENGES & LIMITATIONS	50
	6.1 Potential False Alarms	50
	6.2 Wi-Fi & MQTT Reliability	50
	6.3 Large-scale deployment in urban communities introduces challenges	50
7	CONCLUSION & FUTURE WORK	51
	7.1 System Summary & Community Safety Improvement	51
	7.2 Future Enhancements	51
	References	53

LIST OF ABBREVIATIONS

AI	Artificial Intelligence
NLP	Natural Language Processing
IoT	Internet of Things
SDGs	Sustainable Development Goals
MQTT	Message Queuing Telemetry Transport

LIST OF FIGURES

Figure .No	Figure Name	Page.No
4.1	Circuit Diagram & Hardware Setup	18
4.2	TESTING ACCURACY SCENARIOS	21
4.3	Represents Architecture Diagram	22
4.4	Level 0 DFD	23
4.5	Level 1 DFD	24
4.6	Level 2 DFD	26
4.7	Use Case Diagram	27
4.8	Class Diagram	28
4.9	Sequence Diagram	29
4.10	Activity Diagram	31
4.11	Communication Diagram	32
4.12	Deployment Diagram	33
5.1	Prototype Working Model	42
5.2	Case Study 1: Fire Detection	43
5.3	Case Study 2: Gas Detection	43
5.4	Case Study 3: Theft Detection	44
5.5	Case Study 4: Medical Detection	45
5.6	Case Study 5:(False Alarm)	46

LIST OF TABLES

Table.No	Table Name	Page.No
4.1	Response Time for Different Scenarios	21
4.2	False Alarm Rate	22
4.3	Power Consumption Estimates	22

ABSTRACT

Safety in the community is still a major issue in smart city planning, with growing issues of theft, fire risks, gas leaks, and delayed emergency responses. A survey of residential communities in Chennai found that 65.2% of the respondents had theft incidents, mostly in community areas (83.5%), and 55.6% had gas leaks, with 72.8% showing high concern for safety threats. To counteract the limitations, we developed an AI-Based Home and Community Safety System based on IoT-based sensors, real-time communication protocols, and mobile-based monitoring interface. The system consists of flame and gas sensors, OLED display, theft, medical, and false alarm push buttons, and buzzers and LED indicators for notification. A wireless communication framework based on MQTT protocol supports real-time emergency notification among the households to provide immediate response and risk reduction. There is also an IoT dashboard on mobile provided for real-time remote monitoring and controlling of the system, which facilitates ease of access and user interaction. The survey also reflected high community interest in AI-based safety systems with 67.4% considering them to be highly effective and 79.7% willing to trial the system. Prototype testing proved low-latency notifications, efficient hazard detection, and enhanced emergency response systems. The suggested system is in compliance with Sustainable Development Goals (SDG 11 & SDG 9) by increasing the resilience of cities and encouraging smart safety infrastructure.

Keywords: Community safety, AI, IoT, MQTT, Smart cities, Emergency response, Sustainable Development Goals, Urban resilience, IoT dashboard, Remote monitoring.

MAJOR DESIGN CONSTRAINTS AND DESIGN STANDARDS TABLE

Student Group	A.Pious Niranjana (211051101615)	N.Dhanush Raj (211051101005)	K.Thanush (211191101159)	R.Santhosh (211191101131)
Project Title	AI-Integrated Home and Community Protection System Support SDG 11			
Program Concentration Area	Smart cities and Urban Development, Internet of Things (IoT) and AI Integration, Sustainable Development and Resilience			
Constraints Example	Technical Constraints, Cost Constraints, Environmental Constraints, User Adoption and Acceptance Constraints, Maintenance and Support Constraints			
Economic	Yes			
Environmental	Yes			
Sustainability	Yes			
Implementable	Yes			
Ethical	N/A			
Health and Safety	Yes			
Social	Yes			
Political	No			
Other	Power Modulation from Solar Panel			
Standards				
1	ISO/IEC 23894:2023			
2	IEEE 1451			
3	IEEE 802.11			
4	IEEE P2413			
5	NFTA 72			
6	UL268			
Prerequisite Courses for the Major Design Experiences	1. IoT and Smart System Integration 2. Artificial Intelligence for Security Applications 3. Wireless Communication and Networking			