PDR

Team 27 - Domus

Introduction

Sreeram Andra
Computer Engineer: vssa8989@bu.edu

Anirudh Singh
Computer Engineer: ansingh@bu.edu

Vansh Bhatia
Electrical Engineer: vansh@bu.edu

Akhil Bongu
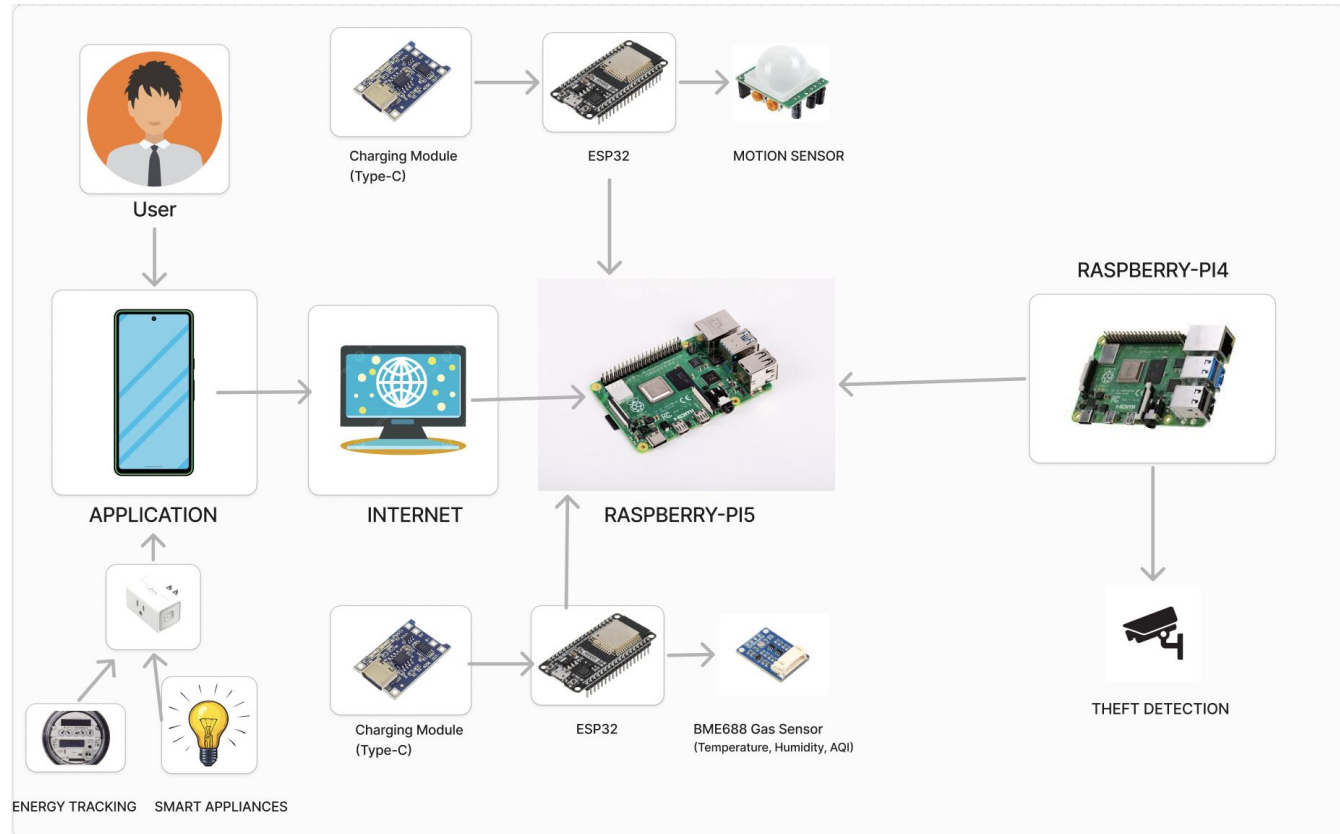Computer Engineer: akbongu@bu.edu

Problem Statement

This project solves the need for a smart home system offering real-time control and security with enhanced privacy by integrating edge-computing, offering a one-stop solution.

Deliverables (Fall 2024)

- Motion Detection

- Facial Recognition

- Environmental Monitoring

- Energy Monitoring

- Mobile Application Features

- LLM Integration

- System Performance

System Block Diagram

User

Charging Module
(Type-C)

ESP32

MOTION SENSOR

RASPBERRY-PI4

APPLICATION

INTERNET

RASPBERRY-PI5

Charging Module
(Type-C)

ESP32

BME688 Gas Sensor
(Temperature, Humidity, AQI)

THEFT DETECTION

ENERGY TRACKING   SMART APPLIANCES

Design Review/Technologies used

HARDWARE COMPONENT	PURPOSE
Raspberry Pi 5	Central microprocessor
Raspberry Pi 4B	Microprocessor/Camera
ESP 32	Microprocessor/Edge Sensors
Edge Sensors	Collect Data
Smart Plug	Measures Energy Consumption
Camera	Collects Video Footage
Edge Modules	Houses Edge Circuits
Coral AI USB Accelerator	Boosts Inference Capabilities

Design Review/Technologies used

SOFTWARE COMPONENT	PURPOSE
Raspberry Pi OS	Calibration of Pi 5
C++ Code Files	Collect data from edge sensors
LLM (GPT 3.5 Turbo)	User interactivity
React-Native	UI Interface
Computer Vision Model (dlib + OpenCV)	Facial Recognition
SolidWorks	Housing Unit Design
SQLite	Database Storage
WebSocket protocol	Two way real time data communication
Gstreamer protocol	Live streaming of camera footage

Test Results

FEATURE	METRIC	OUTCOME
Motion Detection	Detection Accuracy	100%
Theft Detection	Facial recognition latency	<1 second
Environmental Sensing	Temperature Accuracy	±1°C
	Humidity Accuracy	±2%
Energy Tracking	Toggle latency for devices	<1 second
	Real-time power consumption display	Accurate

Deliverables (Spring 2025)

- Predictive Analysis of Energy Usage

- Fully functional user friendly LLM

- Activity Recognition and Alert System

- Fully functional Theft Detection

- Deployable Application with desired User-Experience

- Final Housing Unit(s)

Schedule

TASK NAME	START		END	DURATION	DAYS COMPLETE	DAYS REMAININ	PERCENT COMPLETE
Edge Sensor Data + Communication	10/1	1	11/10	41	41	0	100%
Mobile App UI Enhancement	10/5	5	3/20	167	50.1	116.9	30%
LLM Integration + Training	11/28	28	2/15	80	32	48	40%
Activity Recognition	12/5	5	2/10	68	6.8	61.2	10%
Smart Plug Integration	11/17	17	11/25	9	9	0	100%
Theft Detection	10/10	10	3/15	157	78.5	78.5	50%
Energy Tracking	11/13	13	1/30	79	55.3	23.7	70%
Final Housing Development	11/10	10	2/20	103	51.5	51.5	50%
Energy Predictive Analysis	11/30	30	2/25	88	8.8	79.2	10%
Functional Testing	3/5	5	3/20	16	0	16	0%
Product Verification	3/15	15	3/25	11	0	11	0%

Gantt chart showing project tasks over Days (0–200):

- Edge Sensor Data + Communication
- Mobile App UI Enhancement
- LLM Integration + Training
- Activity Recognition
- Smart Plug Integration
- Theft Detection
- Energy Tracking
- Final Housing Development
- Energy Predictive Analysis
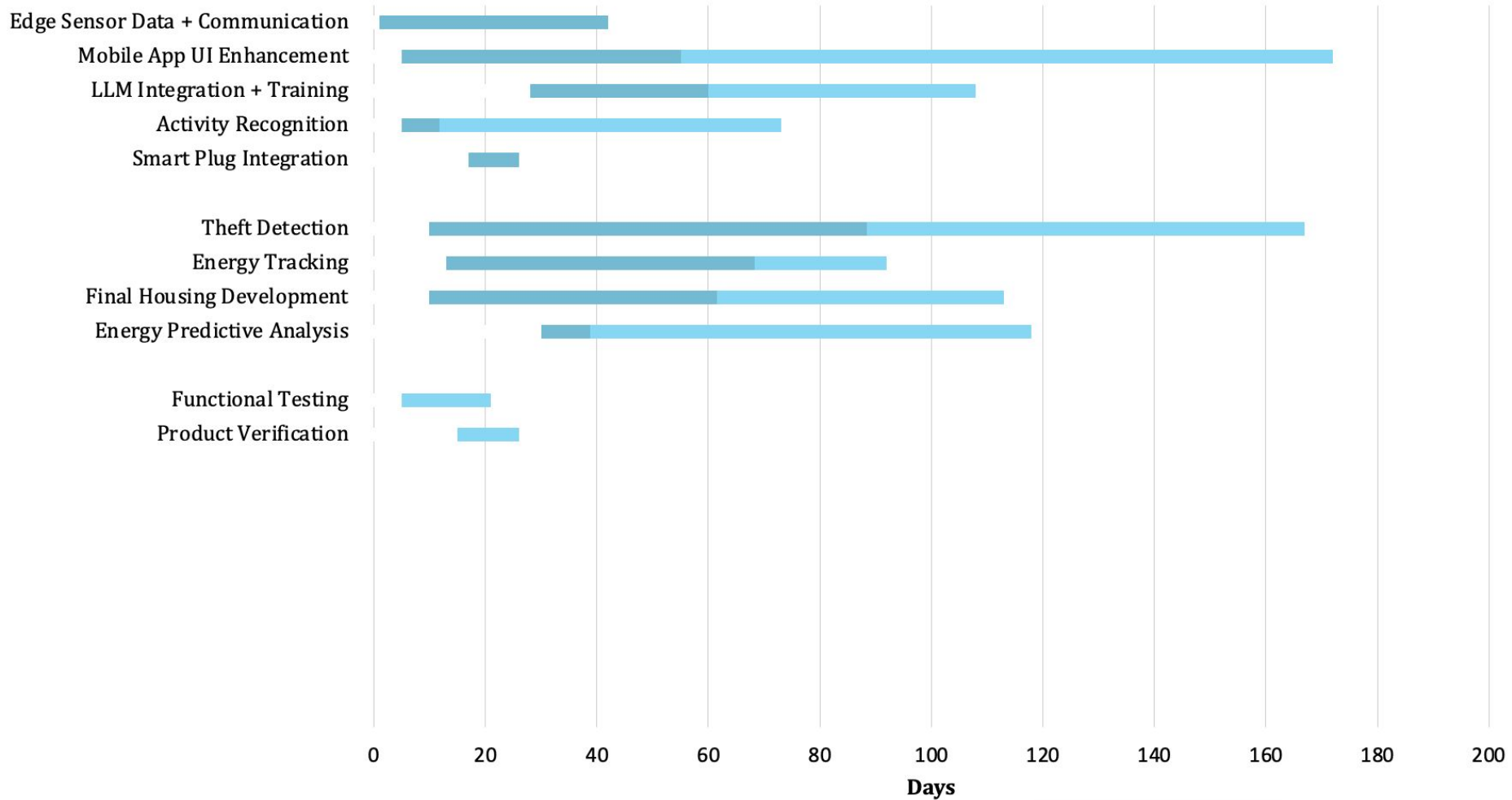- Functional Testing
- Product Verification

Days

THANK YOU!