

## **Problem Statement and Motivation**

### Intelligent Home Energy Monitoring System

#### *Problem Statement*

Electricity costs continue to increase, yet many homeowners have very little insight into how energy is actually being used inside their homes. Most utility bills only show a total monthly charge, without explaining which appliances or areas of the house are responsible for higher consumption. Because of this, users often rely on guesswork when trying to lower their energy bills, such as unplugging devices or limiting usage without knowing if those actions make a real difference.

Additionally, identifying energy waste or unusual spikes in electricity usage is difficult without real-time or historical data. Many existing smart home solutions are either too expensive, too complex, or require advanced technical knowledge and extensive hardware installations. These barriers prevent everyday users from adopting energy monitoring systems that could help them save money and improve efficiency. As a result, there is a need for a simpler and more accessible solution that provides clear and useful insights into household energy usage.

#### *Motivation*

The motivation behind the Intelligent Home Energy Monitoring System is to give homeowners a clear understanding of how electricity is consumed throughout their homes. By tracking energy usage at the device and room level and presenting the information through an easy-to-use dashboard, users can make informed decisions that help reduce energy waste and lower monthly utility bills.

From a business perspective, this system represents an opportunity to combine smart home hardware with a subscription-based software platform. Homeowners could save hundreds of dollars per year by identifying inefficient appliances, monitoring usage patterns, and adjusting their behavior based on real data. In exchange, users gain access to a centralized energy monitoring service that continuously provides insights into their energy consumption.

Overall, this project demonstrates how an intelligent, user-friendly energy monitoring system can help users save money, improve energy efficiency, and support the growing demand for smart home technologies.