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Smart Gas Leak Detector

An intelligent, cost-effective solution for real-time gas leak detection and automated alerts to prevent household and industrial accidents

The Problem We're Solving

Gas leaks in residential homes, industrial facilities, and commercial kitchens pose severe risks including fires, explosions, and serious health hazards. Traditional gas detection systems are prohibitively expensive, difficult to access for average consumers, and critically lack real-time alert capabilities.

The absence of affordable, smart detection systems leaves countless households and businesses vulnerable to preventable gas-related accidents every day.
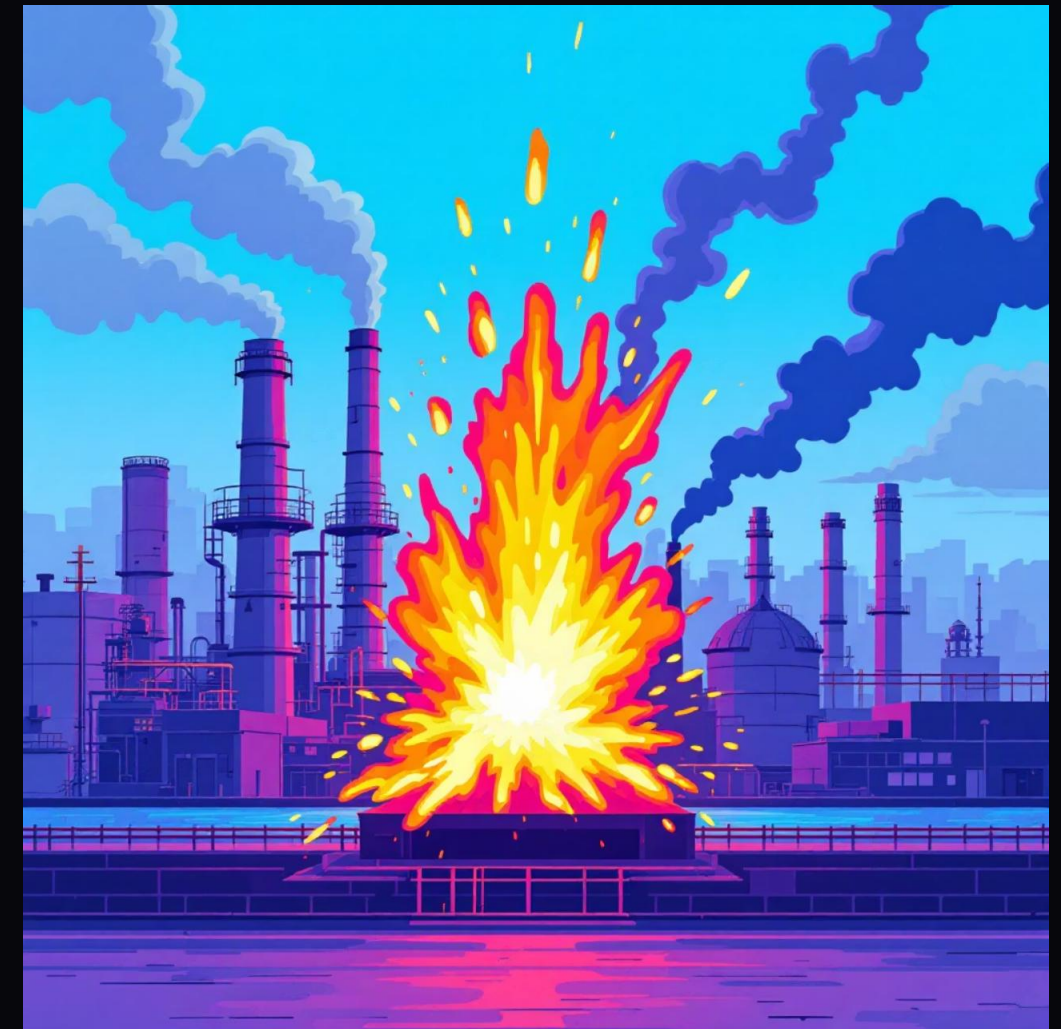
Project Objectives

Real-Time Detection

Continuously detect harmful gases including LPG, methane, and other combustible gases with high precision and instant response

Immediate Alerts

Provide instant notifications through multiple channels—buzzer alarms, LED indicators, and mobile notifications

Enhanced Safety

Ensure user safety through early detection and timely warnings, preventing accidents before they escalate

Cost-Effective Design

Develop an affordable, reliable system accessible to households and small businesses without compromising quality

Our Proposed Solution

01

Gas Sensor Detection

Deploy MQ series sensors to continuously measure gas concentration levels in the environment

02

Microcontroller Processing

Connect sensors to Arduino or ESP32 microcontroller for intelligent data processing and decision-making
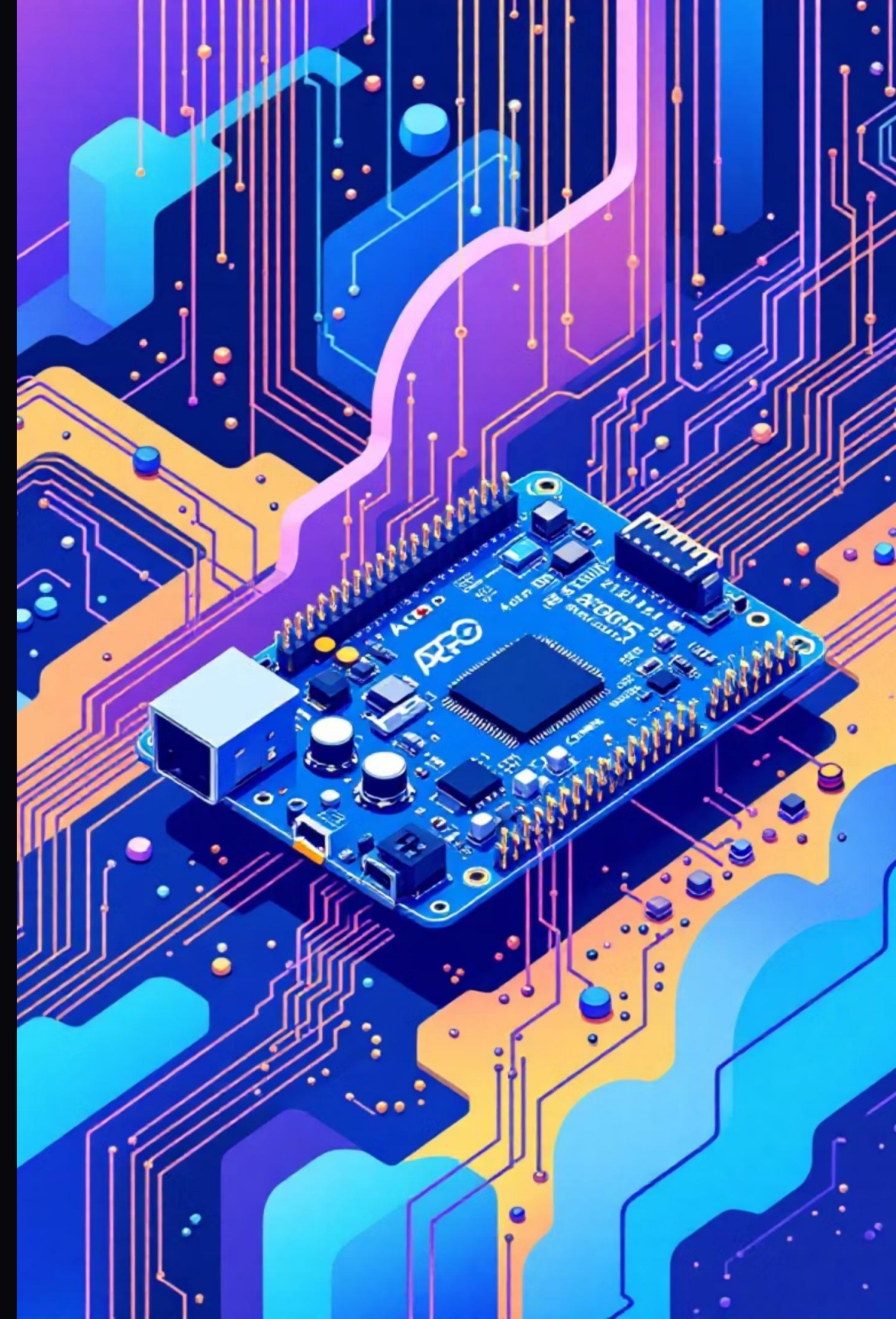
03

Alert Activation

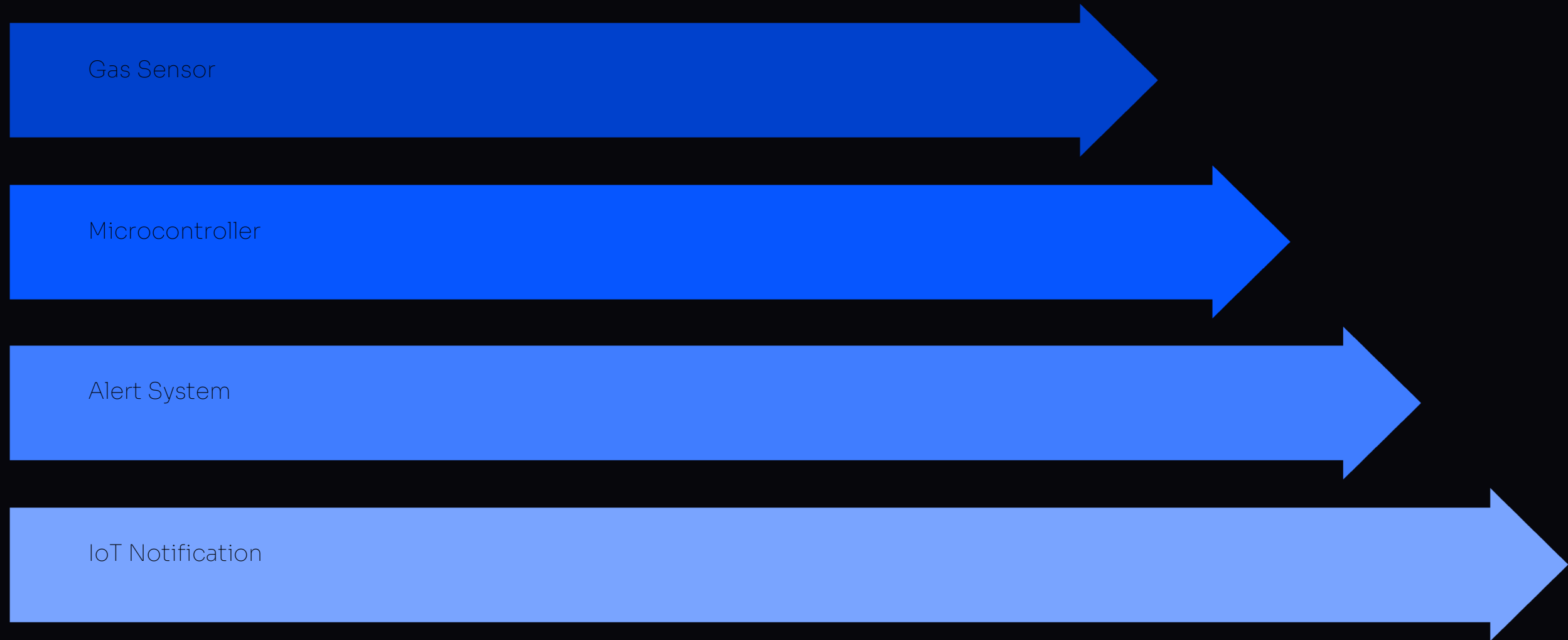Automatically trigger buzzer and LED alerts when gas levels exceed predefined safety thresholds

04

IoT Notifications

Send real-time notifications via Wi-Fi or GSM networks directly to users' mobile devices and applications

System Architecture

Gas Sensor

Microcontroller

Alert System

IoT Notification

The system architecture demonstrates a streamlined data flow from detection to notification, ensuring rapid response times and reliable performance across all components.

Hardware & Software Components

Hardware Components

- **MQ Gas Sensor:** Detects LPG, methane, and combustible gases

- **Arduino/ESP32:** Microcontroller for processing and control

- **Buzzer:** Audio alert mechanism for immediate warnings

- **LED Indicators:** Visual status and alert signals

- **Power Supply:** Reliable power source for continuous operation

Software Tools

- **Arduino IDE:** Primary development environment for programming

- **Embedded C/Python:** Programming languages for sensor logic

- **IoT Platform:** Cloud connectivity for remote notifications

- **Mobile App Interface:** User-friendly alert management system
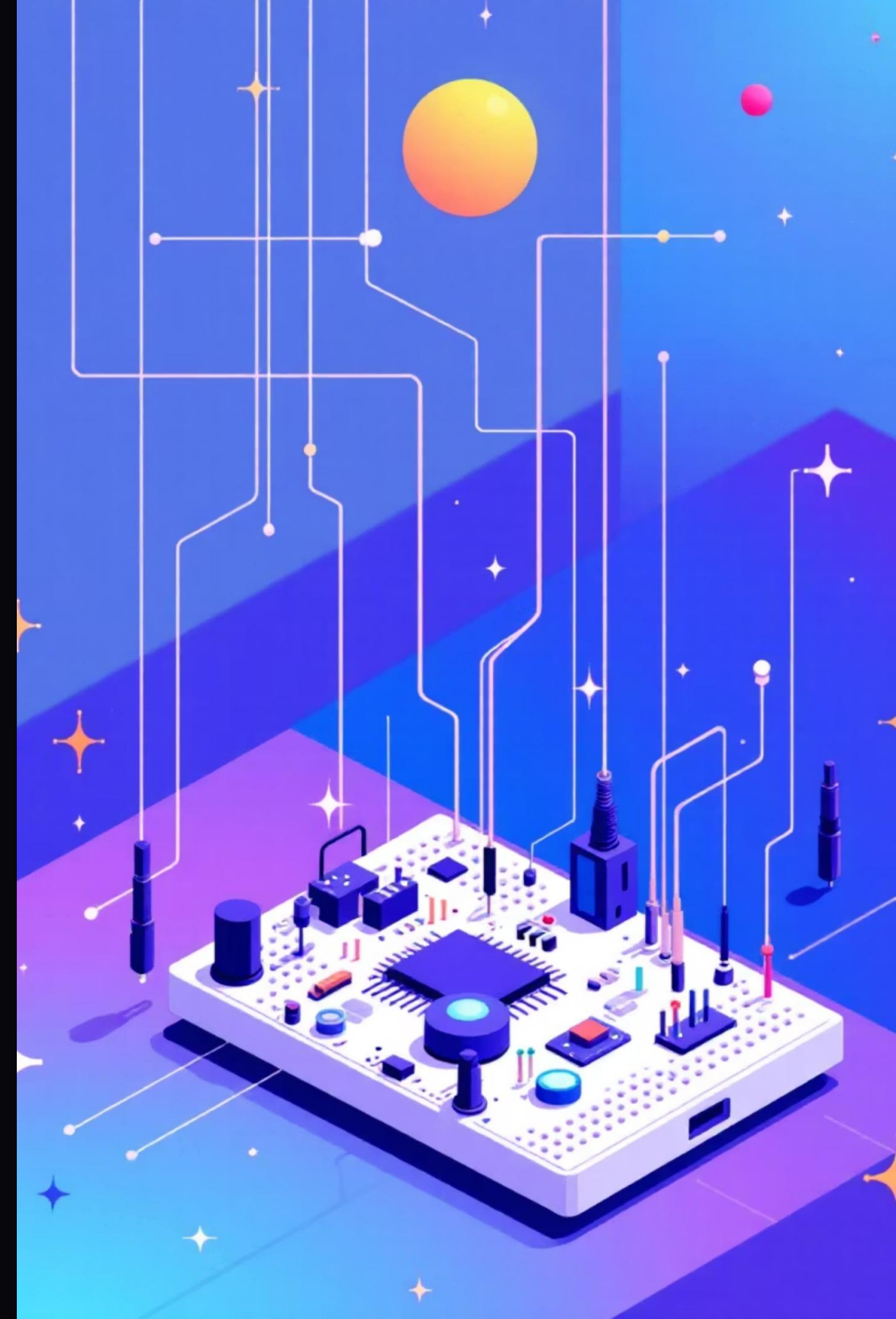
Problem-Solving Approach

Risk Identification

Analyse potential gas leak scenarios and identify high-risk areas requiring monitoring

Continuous Monitoring

Implement 24/7 real-time surveillance of gas concentration levels in the environment

Threshold Comparison

Compare sensor readings against calibrated safety threshold limits continuously

Automated Response

Trigger immediate alerts and notifications automatically when thresholds are exceeded

Challenges Faced & Solutions

Sensor Calibration Accuracy

Achieving precise calibration of MQ sensors required extensive testing across different gas concentrations and environmental conditions. We implemented multiple calibration cycles and reference gas standards to ensure reliable readings.

False Alarm Management

Environmental factors like humidity, temperature variations, and cooking fumes caused false alarms. We developed intelligent filtering algorithms and multi-factor validation to reduce false positives significantly.

Power Optimisation

Continuous monitoring demanded high power consumption. We implemented sleep modes, sensor duty cycling, and efficient power management protocols to extend operational time and reduce energy costs.

Network Connectivity Issues

IoT notifications faced delays due to weak Wi-Fi signals and network interruptions. We integrated GSM backup systems and local alert mechanisms to ensure failsafe operation even during connectivity loss.

Results & Impact

100%
Real-Time Detection

Continuous gas monitoring with instant response capability

<3s
Alert Response Time

Immediate alerts through buzzer, LED, and mobile notifications

85%
Cost Reduction

Significantly more affordable than commercial detection systems

Key Outcomes: Our prototype successfully demonstrated reliable gas leak detection, immediate multi-channel alerts, and enhanced safety measures. The system prevents accidents through early warning mechanisms and provides peace of mind to users with continuous monitoring capabilities.

Future Scope & Innovations

Smart Home Integration

Seamless connectivity with existing smart home ecosystems like Google Home, Alexa, and Apple HomeKit for unified control

Automatic Valve Shut-Off

Implement automated gas valve control to immediately stop gas flow when dangerous leaks are detected

AI-Based Predictions

Utilise machine learning algorithms to predict potential gas leaks before they occur based on usage patterns and sensor trends

Cloud Monitoring Dashboard

Develop comprehensive cloud-based analytics platform for historical data tracking, reporting, and remote system management

Conclusion: The Smart Gas Leak Detector represents an effective, affordable, and reliable solution for early gas leak detection. Through real-time monitoring and automated alerts, we're making safety accessible to everyone whilst preventing potentially catastrophic accidents.

THANK YOU