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IOT based Food Spoilage Detection System

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Abstract: *Food spoilage is a major public health and food safety concern, and traditional manual freshness checking is often subjective, inconsistent, and time-consuming. This project presents an IoT-based food freshness monitoring system that detects early spoilage by continuously sensing gases and environmental conditions around stored food. The system uses MQ-3 and MQ-135 gas sensors to identify spoilage-related volatile compounds, along with a DHT11 sensor to measure temperature and humidity. An ESP32 microcontroller collects and processes the sensor readings in real time, displays live values locally on an OLED screen, and hosts an IP-based web dashboard for quick monitoring over a local network. Based on predefined threshold logic, the system classifies food quality into three levels—Fresh, Average, or Stale enabling faster and more reliable decision-making. For remote access and historical tracking, the ESP32 transmits live sensor data to Firebase Realtime Database, where it is stored as both current values and time-stamped records. A companion Android application retrieves this data to display real-time readings, food quality status, and history trends, providing a practical solution for smart kitchens, food storage units, and small-scale food quality control environments.*

Keywords: Food Freshness Monitoring, Food Spoilage Detection, Internet of Things (IoT), ESP32, MQ-3 Gas Sensor, MQ-135 Gas Sensor, DHT11, OLED Display, Web Dashboard, Firebase Realtime Database, Android Application, Real-Time Monitoring, Sensor Threshold Classification, Smart Food Storage, Food Quality Control

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