IoT-powered Smart Farming for Soil Moisture and Crop Health

Source of Dataset: The dataset is derived from the IoT-based Smart Agriculture Plant Health Monitoring system, which includes data collected through various environmental and soil sensors. These sensors measure parameters such as soil moisture, temperature, humidity, light intensity, water TDS, rain sensing, water flow rate, and biogas levels. The data is collected from sensors embedded in agricultural fields, continuously transmitting real-time information to a cloud-based platform (Thingspeak) for storage and visualization.

More info about Dataset: https://github.com/SmartAgroTechDY/Smart-Agriculture-Plant-Health-Monitoring-using-IoT

Link to the Dataset: https://data.mendeley.com/datasets/65jxyrxv7b/1

Data Collection Method: The data is collected through a series of IoT sensors connected to an Arduino Uno and ESP8266 microcontroller. These sensors measure key environmental factors that affect crop health and growth. The data is captured at regular intervals, transmitted to a cloud platform for real-time monitoring, and stored in MS Excel for local analysis. Sensors are calibrated to ensure accurate measurement, and data is continuously streamed to allow for real-time decision-making.

Observations in the Dataset: The dataset includes several thousand observations across different environmental parameters, with each data point representing a snapshot of the field's condition at a specific time. Given the nature of the IoT system, the data is continuously collected, ensuring that the dataset is updated in real-time. The dataset size is small (approximately 150 KB), with key environmental readings recorded for each observation.

Variables in the Dataset: The dataset consists of the following key variables:

- **Soil Moisture**: Indicates the amount of water in the soil.

- **Temperature**: Represents the ambient temperature of the environment and soil.

- **Humidity**: Measures the moisture level in the air.

- **Light Intensity**: Measures the amount of sunlight hitting the crops.

- **Water TDS (Total Dissolved Solids)**: Indicates the quality of water available for irrigation.

- **Rain Sensing**: Captures the presence of rainfall in the area.

- **Water Flow Rate**: Measures the rate of water flow in irrigation systems.

- **Biogas**: Indicates the presence of biogas, which is important for assessing farm waste decomposition.

IoT Application/System: The IoT-based Smart Agriculture System aims to address key challenges in traditional agriculture, such as inefficient resource management, unpredictable weather patterns, and reduced crop productivity. The system uses real-time data from sensors to automate critical farming processes such as irrigation, monitor environmental conditions, and provide actionable insights to farmers. For instance, if soil moisture drops below a predefined threshold, the system automatically triggers irrigation to optimize water use. The

system also generates alerts for potential issues, such as temperature spikes or low moisture levels, allowing farmers to take timely action.

This system is designed for farmers, agricultural businesses, and environmental researchers who need to monitor and manage crop health efficiently.

Industry Fit: This IoT application fits into the **Smart Agriculture** industry, which leverages technology to improve farming efficiency, reduce costs, and promote sustainability. It falls under the broader category of **Industrial IoT (IIoT)**, where technology is used to enhance operations in industrial sectors, in this case, agriculture. The system's features align with the growing trend of precision farming, which uses real-time data to make informed decisions about crop management.