**SMART AGRICULTURE USING ENSEMBLE MACHINE LEARNING TECHNIQUE IN IoT ENVIRONMENT**

**Abstract:**

This project proposes a smart agriculture system that integrates ensemble machine learning techniques within an Internet of Things (IoT) framework to improve agricultural productivity and enable data-driven decision-making. The system collects real-time environmental data using DHT11 sensors, soil moisture sensors, and the ESP32 microcontroller, monitoring key parameters such as temperature, humidity, and soil moisture. This sensor data is transmitted to the ThingSpeak cloud platform for storage and visualization, where MATLAB is used to process and analyze the data in comparison with a predefined dataset. To enhance prediction accuracy, the system employs ensemble learning by combining multiple machine learning models, thus overcoming the limitations of individual algorithms. These predictions provide actionable insights for farmers, enabling optimized crop selection, better irrigation planning, and efficient resource management. The overall goal is to promote sustainable agriculture practices, reduce operational costs, and maximize crop yield. This smart farming framework demonstrates a scalable and efficient solution for the future of precision agriculture, offering robust support for modern farming needs.Additionally, the system can be expanded to include pest detection and disease prediction based on additional sensor inputs. Alerts and recommendations can be sent directly to farmers’ mobile devices via IoT dashboards or SMS. Future work may involve integrating remote satellite data and drone imagery for further enhancing model performance. Overall, this project exemplifies the transformative potential of AI and IoT in revolutionizing agriculture.

**Keywords**: Machine Learning, IoT, ESP32, DHT11, Soil Moisture Sensor, ThingSpeak, MATLAB