

Smart Agriculture: Crop Recommendation and Water Irrigation Using ML Models

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Abstract: Agriculture plays a vital role in India's economy, yet farmers face challenges such as improper crop selection, inefficient irrigation, and unpredictable climatic conditions. This research proposes a Smart Agriculture system that integrates Machine Learning (ML) and Internet of Things (IoT) technologies to provide intelligent crop recommendations and automated water irrigation. The system collects real-time environmental parameters such as soil moisture, temperature, humidity, and pH using IoT sensors connected to microcontrollers like ESP32. Machine learning algorithms including Random Forest, Support Vector Machine (SVM), and Artificial Neural Networks (ANN) are used to analyze soil and climate data to recommend the most suitable crops. Additionally, regression-based models automate irrigation by predicting precise water requirements. The proposed system enhances productivity, conserves water resources, reduces manual effort, and supports sustainable farming practices. The architecture is scalable, cost-effective, and suitable for rural agricultural environments..

Keywords: Smart Agriculture, Machine Learning, IoT, Crop Recommendation, Irrigation Automation, Precision Farming, Random Forest, Soil Moisture Sensors, ESP32, Sustainable Farming

