

# AI AND IOT BASED CROP RECOMMENDATION SYSTEM FOR PRECISION AGRICULTURE

The integration of artificial intelligence (AI) and the Internet of Things (IoT) is revolutionizing the agricultural sector, enabling data-driven decision-making and enhancing productivity through precision farming. This project presents an AI and IoT-based crop recommendation system designed to assist farmers in selecting the most suitable crops based on real-time environmental conditions. The system employs a network of sensors to continuously monitor critical agricultural parameters, including nitrogen (N), phosphorus (P), potassium (K) levels, soil pH, temperature, humidity, and rainfall. The sensor data is collected over a specified duration (at least half a day), averaged to ensure stability, and transmitted via Wi-Fi to a web-based application.

The core of the system is a machine learning model trained on a dataset of 2,200 instances, which leverages RandomForestClassifier to predict the most suitable crops for a given set of environmental conditions. The web application, developed using HTML, CSS, and Flask, provides a user-friendly interface for both real-time data visualization and manual data entry. Key functionalities include starting and stopping data collection, downloading historical sensor data, and viewing crop recommendations based on either real-time or manually entered values. The collected data is stored in CSV files, indexed by time, for future analysis, providing valuable insights into long-term environmental trends.

The integration of sensor networks with AI-based crop prediction introduces a data-driven approach to farming, offering personalized recommendations that enhance crop yield, optimize resource use, and promote sustainable farming practices. By automating the process of data collection and analysis, this system empowers farmers to make informed decisions, potentially improving crop management strategies and boosting productivity. Additionally, the web interface facilitates easy access to data, providing flexibility for users to interact with the system in real-time or manually input their own data for recommendations. This project demonstrates how AI and IoT can be effectively combined to advance modern agricultural practices.