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Research Article

Machine learning-based fertilizer recommendation for agriculture

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ABSTRACT

Agriculture is the backbone of many economies, especially in developing nations where a large portion of the population relies on farming as their primary source of livelihood. However, traditional farming practices are increasingly insufficient in addressing the growing demand for food due to rapidly changing climate conditions, soil degradation, and inefficient resource management. This study presents a machine learning–based Crop and Fertilizer Recommendation System designed to enhance the decision-making capabilities of farmers. The system analyzes historical agricultural data, real-time environmental inputs, and soil conditions to provide personalized recommendations for crop selection and fertilizer usage. Utilizing both supervised and unsupervised learning techniques—such as Naïve Bayes, Random Forest, and clustering algorithms—the system predicts the most suitable crops for a given location and offers fertilizer suggestions based on deviations in soil nutrient levels. The solution is deployed through an intuitive web and mobile application interface, ensuring accessibility for farmers with varying levels of technical knowledge. By fostering data-driven agricultural practices, the system aims to increase yield, reduce environmental impact, and contribute to global food security.

Key Words: Fertilizer, Machine learning, Soil Nutrient Analysis, Smart Farming.

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