

Organic Fertilizer Recommendation System and Disease Prediction with Chatbot

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Abstract: This paper, titled "organic fertilizer recommendation system with disease prediction," addresses the challenges farmers face in identifying plant diseases and selecting suitable fertilizers. Using machine learning and natural language processing, the system features a Tamil chatbot for easy communication in rural areas. The chatbot predicts plant diseases and recommends organic fertilizers like neem oil and cow dung. The fully text-based system ensures accessibility for farmers with basic mobile phones. It promotes eco-friendly farming practices, reducing reliance on harmful chemicals. The platform also supports soil health and environmental conservation. Ultimately, it empowers farmers and contributes to a sustainable agricultural future.

Keywords: organic fertilizer, disease prediction, machine learning, Tamil chatbot, text based system, ecofriendly farming.

1. Introduction

Organic fertilizers play a vital role in promoting sustainable agriculture by enriching the soil with essential nutrients. Unlike chemical fertilizers, they improve soil health over time, reducing environmental harm and fostering ecofriendly farming practices. These fertilizers, such as compost and manure, are derived from natural sources and help maintain the balance of the ecosystem while increasing crop yield. In the modern agricultural landscape, organic fertilizers have become indispensable for ensuring long-term soil fertility and crop productivity.

2. Objectives

A. Why Do We Need this Project

The agricultural sector in Tamil Nadu and other regions heavily relies on traditional methods, which may not always align with modern advancements in sustainable farming. Farmers often face the following challenges:

1. **Lack of Accessible Information:** Many farmers lack access to real-time, localized advice on soil health, crop selection, and disease prevention.
2. **Complex Decision-Making:** Selecting the right fertilizer or crop variety based on soil and environmental conditions can be challenging without technical expertise.
3. **Economic and Environmental Concerns:** The misuse of chemical fertilizers and pesticides can lead to soil

degradation and environmental harm.

This paper aims to bridge these gaps by using technology to deliver precise, localized, and sustainable farming solutions through a conversational AI chatbot in Tamil.

B. Objectives

- Personalized fertilizer and crop recommendations
- Crop disease prediction and treatment suggestions
- Tamil chatbot for farmer accessibility
- Promotion of sustainable farming practices

3. Methodology

A. Data Collection

The project uses datasets containing information about soil types, crop varieties, fertilizer recommendations, and common crop diseases. These datasets are preprocessed to ensure accuracy and reliability.

B. Front-End Development

The chatbot's front-end is designed using HTML and CSS, providing an intuitive and user-friendly interface for farmers. The interface supports text-based input and output in Tamil, making it accessible to users with varying levels of technical expertise.

C. Machine Learning Models

The backend utilizes multi-class classification algorithms to analyze input data and predict outcomes. Key components include:

- **Soil Analysis:** Based on user-provided soil type (e.g., red soil), the model suggests the most suitable crops and organic fertilizers.
- **Disease Prediction:** The system uses classification techniques to identify potential diseases based on symptoms described by the user and provides tailored solutions.

D. Evaluation Metrics

The performance of the machine learning models is evaluated using accuracy scores and confusion matrices. These metrics help assess the model's effectiveness in delivering accurate recommendations and predictions.

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E. Integration of Tamil NLP

Natural language processing (NLP) capabilities are integrated to enable seamless communication in Tamil. This includes processing user queries, understanding context, and generating responses in Tamil.

4. Conclusion

The Organic Fertilizer Recommendation and Disease Prediction System with Chatbot is a groundbreaking solution tailored to empower farmers with precise agricultural insights. By leveraging advanced technologies such as transfer learning, NLP, and BERT, the platform simplifies the process of crop and soil analysis, organic fertilizer recommendations, and disease diagnosis.

The system integrates a user-friendly Tamil chatbot, providing farmers with personalized guidance and actionable solutions for their agricultural needs. By analyzing soil conditions, crop types, and symptoms, the chatbot ensures relevant, data-driven recommendations to improve yield and sustainability.

This project eliminates the uncertainty in decision-making, offering farmers clear insights into organic practices and effective disease management. The combination of AI-driven predictions and conversational assistance sets a new benchmark in agricultural technology, paving the way for smarter, more sustainable farming practices.

5. Future Enhancement

Future enhancements for the project aim to further improve its functionality, accuracy, and accessibility for Tamil-speaking farmers. One significant improvement would be the integration of real-time sensor data using IoT-based devices to collect information on soil moisture, temperature, and nutrient levels. This would enable the chatbot to provide more precise and dynamic recommendations based on live data. Additionally, incorporating voice-based interaction in Tamil would make the chatbot more accessible, especially for farmers who are not familiar with text-based communication. Another critical enhancement is the development of an advanced disease diagnosis feature using image recognition technology. This would allow farmers to upload pictures of diseased plants, enabling the system to automatically identify issues and suggest

targeted solutions. Furthermore, integrating weather forecasting APIs would provide farmers with weather-based recommendations, such as ideal planting times or preventive measures for weather-related crop diseases. To ensure accessibility in remote areas with limited internet connectivity, the project could also include an offline version of the chatbot, allowing farmers to access essential information without the need for continuous internet access. These enhancements would significantly improve the chatbot's ability to support farmers in making informed and sustainable farming decisions.

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