Smart Agro System

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Abstract: *Agriculture is a critical sector, especially in developing nations like India, where a majority of the population relies on farming for their livelihood. However, many small and marginal farmers still lack access to advanced tools, expert advice, or timely information to make informed decisions about crop cultivation or disease management. This often results in crop failure, economic loss, and increased dependence on harmful pesticides. The Smart Agro System is designed to address these challenges by providing a multilingual, voice-interactive, AI-powered assistant capable of both plant disease detection and crop recommendation. The proposed system accepts both speech and text input from the user, enabling ease of access for non-technical and illiterate users. It starts by detecting the user's language automatically, then provides options to either perform crop recommendation, plant disease detection, or both. For disease detection, the user uploads or captures a plant leaf image, which is analyzed using a MobileNet Convolutional Neural Network (CNN) to classify the disease. The detected result is further processed by an offline AI chatbot powered by LLaMA, which generates relevant organic and chemical treatment suggestions. For crop recommendation, the system uses a custom-created dataset with parameters like soil type, water availability, and climate to predict the best crop for that region and season. The entire system is built using Python 3.10, without any web dependency, and includes offline functionalities such as speech-to-text using the speech_recognition library and speech output using Google's gTTS. Language translation is handled via googletrans, enabling real-time interaction in over 80 languages. Results from experiments show the CNN model achieves high performance with an accuracy of 94.2%, and the response time remains under a few seconds even on low-resource machines. This system provides a low-cost, efficient, multilingual, and AI-driven solution that can revolutionize how farmers interact with digital tools for sustainable agriculture.*

Keywords: Smart Agro, Plant Disease Detection, MobileNet, LLaMA Chatbot, Multilingual, google text to speech, Crop Recommendation, Convolutional Neural Network, Voice Assistant