

ABSTRACT
ON
**RAG-Enhanced Global Assistant for Agricultural Pest and
Disease Management**

Submitted to
DEPARTMENT
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ABSTRACT

Agricultural productivity is often hindered by crop pests and diseases, which require timely and accurate identification to prevent yield losses. Recent advancements in large multimodal models (LMMs), such as Agri-LLaVA, have shown potential in automating pest and disease detection through image and text-based analysis. However, Agri-LLaVA faces two key challenges: misinformation due to hallucinations in model outputs and limited generalization caused by an imbalanced and insufficient dataset.

To address these issues, we propose an enhanced agricultural assistant that integrates **Retrieval-Augmented Generation (RAG)** to ground model responses in verified agricultural knowledge bases, thereby reducing misinformation and improving reliability. Additionally, we expand and diversify the dataset by incorporating real-world images of crops, pests, and diseases from multiple sources and environmental conditions. This ensures better representation and coverage of rare cases while improving model accuracy.

Our approach aims to create a robust, scalable, and trustworthy system capable of accurately diagnosing crop diseases and suggesting actionable solutions. Experimental results demonstrate improved performance compared to the baseline Agri-LLaVA model, highlighting the effectiveness of RAG and data enrichment. This work contributes to the development of reliable AI-driven agricultural tools to assist farmers, agricultural experts, and policymakers in disease management and sustainable crop production.

KeyWords: Agricultural AI, Pest and disease detection, Multimodal model, Retrieval-Augmented Generation (RAG), Dataset expansion, Knowledge grounding, Crop disease diagnosis, Deep learning, Hallucination reduction, Sustainable agriculture, Image-text analysis, Precision farming, Large Language Model (LLM), Plant health monitoring, Computer vision in agriculture.

Signature of Guide

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