Enhanced Crop Disease Symptom Detection in Corn (Zea mays) Using Drone Aerial Imagery and AI for Symptom Mapping

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This research addresses the pivotal role of the agricultural sector in the Philippine economy, constituting 9.43 percent of the GDP and engaging 30 percent of the labor force. Corn, the second-highest consumer of agricultural resources after rice, faces significant challenges due to diseases impacting crop yield. Daily monitoring and a scarcity of farmers, exacerbated by an aging population, compound these challenges. The study's procedures encompassed the development, building, and programming of a drone prototype, image data collection, exploratory data analysis, AI model and system programming, deployment, and interpretation of hardware data. The research systematically developed and evaluated a drone-based crop mapping system for binary identification of corn crop disease symptoms using neural network artificial intelligence. Optimal hyperparameters—image size, batch size, and epochs—were determined to be significant ($p = 0.0000$), aligning with existing literature. The identified optimal hyperparameters were an image size of 256 by 256, a batch size of 16, and 15 epochs, yielding a composite score of 0.94. The testing metrics surpassed deployment metrics ($p < 0.00001$) due to dataset disparities. While successfully demonstrating the potential for classifying and mapping corn disease symptoms, the study acknowledged the need for improvements, particularly in dataset size and variety. The findings offer valuable insights into drone-based crop mapping, advancing the use of artificial intelligence in corn crop disease management. Future research addressing limitations identified, including unexplored hyperparameters and dataset enhancements, will contribute to the practical implementation of this technology in real-world agricultural settings.

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