



Integrating IoT and Machine Learning for Efficient Pest Management in Greenhouses

A thesis submitted for the Degree of Master of Computer Science

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ABSTRACT

This thesis proposes a novel design for a pest management system that increases agricultural productivity by integrating Internet of Things (IoT) technologies and Machine Learning (ML) methodologies. It describes the development of an innovative system to improve productivity in greenhouses through the use of IoT and ML. The system uses an economical and user-friendly mobile application for capturing plant images with a smartphone. These images are then processed with pre-trained TensorFlow Lite models to accurately classify pest infestations.

A custom-designed tripod, equipped with Arduino, Bluetooth module, servo motor, environmental sensors, and cameras, is used to capture images and data on humidity and temperature, enabling automated and comprehensive scanning of the plantation. The data, which include pest identifications with more than 90% confidence, are synced in real time with a Firebase Realtime Database.

Farmers can use the mobile application to select crops that require monitoring, enabling targeted pest management. A web application performs deep analytics, presenting insights through various charts on pest metrics, detection timelines, and the correlation of pest detections with environmental conditions and their impact on different crops. The system also provides custom pest control recommendations and real-time alerts, powered by Firebase Cloud Functions.

The developed system represents a significant advancement in precision agriculture, offering a scalable and efficient solution for pest management in greenhouses or home gardens, utilizing cutting-edge IoT and ML technologies.

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