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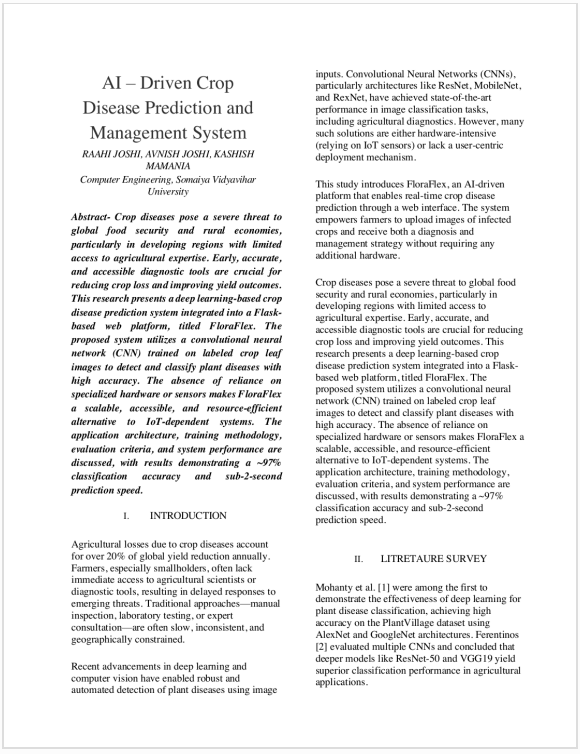

AI – Driven Crop Disease Prediction and Management System

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Abstract- Crop diseases pose a severe threat to global food security and rural economies, particularly in developing regions with limited access to agricultural expertise. Early, accurate, and accessible diagnostic tools are crucial for reducing crop loss and improving yield outcomes. This research presents a deep learning-based crop disease prediction system integrated into a Flask-based web platform, titled FloraFlex. The proposed system utilizes a convolutional neural network (CNN) trained on labeled crop leaf images to detect and classify plant diseases with high accuracy. The absence of reliance on specialized hardware or sensors makes FloraFlex a scalable, accessible, and resource-efficient alternative to IoT-dependent systems. The application architecture, training methodology, evaluation criteria, and system performance are discussed, with results demonstrating a ~97% classification accuracy and sub-2-second prediction speed.

I. INTRODUCTION

Agricultural losses due to crop diseases account for over 20% of global yield reduction annually. Farmers, especially smallholders, often lack immediate access to agricultural scientists or diagnostic tools, resulting in delayed responses to emerging threats. Traditional approaches—manual inspection, laboratory testing, or expert consultation—are often slow, inconsistent, and geographically constrained.

Recent advancements in deep learning and computer vision have enabled robust and automated detection of plant diseases using image inputs. Convolutional Neural Networks (CNNs), particularly architectures like ResNet, MobileNet, and RexNet, have achieved state-of-the-art performance in image classification tasks, including agricultural diagnostics. However, many such solutions are either hardware-intensive (relying on IoT sensors) or lack a user-centric deployment mechanism.

This study introduces FloraFlex, an AI-driven platform that enables real-time crop disease prediction through a web interface. The system empowers farmers to upload images of infected crops and receive both a diagnosis and management strategy without requiring any additional hardware.

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II. LITRETAURE SURVEY

Mohanty et al. [1] were among the first to demonstrate the effectiveness of deep learning for plant disease classification, achieving high accuracy on the PlantVillage dataset using AlexNet and GoogleNet architectures. Ferentinos [2] evaluated multiple CNNs and concluded that deeper models like ResNet-50 and VGG19 yield superior classification performance in agricultural applications.