

AgriVision: Deep Learning Based Potato Disease Classification

1. Introduction

AgriVision is an AI-powered system for potato leaf disease classification. Using Convolutional Neural Networks (CNNs), it identifies diseases from images of potato leaves and integrates with APIs, web, and mobile interfaces for real-world application.

2. Objectives

- Build a CNN-based model for potato disease detection - Provide a REST API for predictions - Develop React web and React Native mobile apps for easy access - Convert trained models into TF Lite for mobile deployment - Enable cloud deployment using Google Cloud Functions

3. Project Structure

The repository is organized as follows: - training/: Jupyter notebooks and model training scripts - api/: FastAPI backend for inference - frontend/: React web app - mobile-app/: React Native mobile app - saved_models/: Trained models (.h5 format) - tf-lite-models/: TF Lite converted models - gcp/: Deployment scripts for Google Cloud Functions

4. Methodology

The CNN model was trained on potato leaf images (PlantVillage dataset). Images were preprocessed, augmented, and used to train a custom deep learning model. The trained model was saved and integrated into an API, with additional conversion into TF Lite format for edge deployment.

5. Deployment

- Local: FastAPI server (uvicorn) - With Docker: TensorFlow Serving integration - Cloud: Google Cloud Functions for scalable HTTP endpoints - Mobile: TF Lite models running on Android/iOS devices

6. Results

The CNN model achieved ~97% validation accuracy. TF Lite versions showed comparable accuracy with reduced model size, enabling deployment on mobile devices.

7. Future Enhancements

- Extend to multiple crops beyond potato - Integrate IoT sensors for real-time farm monitoring - Implement Explainable AI (XAI) for transparent predictions - Deploy using Kubernetes for large-scale farming applications

8. Conclusion

AgriVision demonstrates the power of deep learning in agriculture by enabling fast and accurate potato disease classification. Its modular design allows easy integration with different platforms, making it scalable and farmer-friendly.