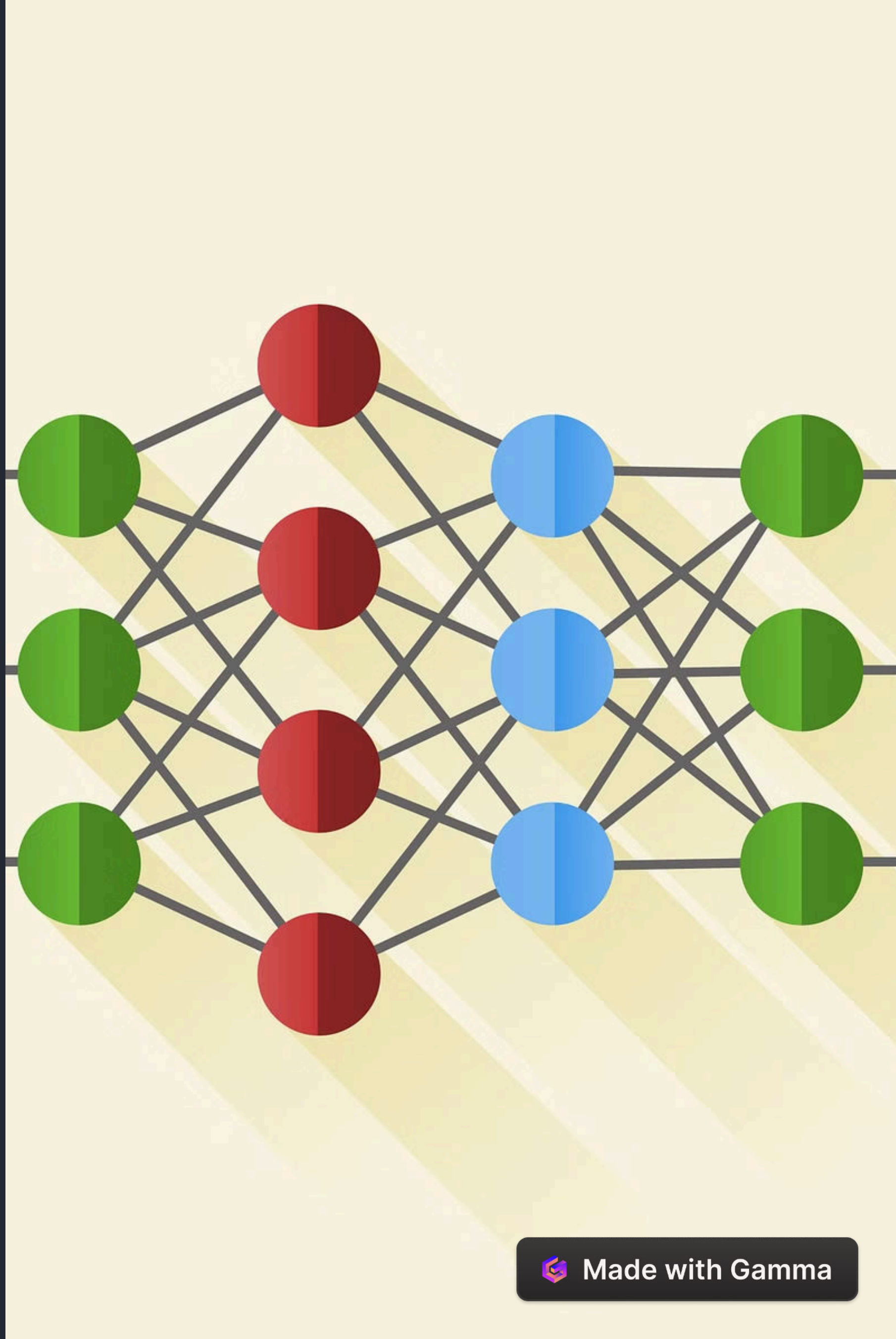
AI-Based Plant Disease Classification System

This project report focuses on the development of an AI-based system for classifying plant diseases. The system utilizes advanced technology to accurately identify and classify various plant diseases, contributing to the enhancement of agricultural practices and crop management.



CHAPTER 1

INTRODUCTION

The "AI-Based Plant Disease Classification System" is a cutting-edge tool in the field of agriculture that uses deep learning and artificial intelligence to automatically identify and categorise plant diseases.

This technology aims to transform agricultural practices, improve crop output, and encourage sustainable farming for a better agricultural future by offering timely insights about crop health.

The primary objective is to empower farmers with a reliable tool for early disease detection, thereby enhancing crop management practices and optimizing agricultural productivity.

This introduction clarifies the significance of early disease identification and lays the groundwork for a thorough examination of the disease classes and their descriptions.

CHAPTER 2

Disease Classes Table:

Plant Name	Diseases
Apple	Apple scab, Black rot, Cedar apple rust, Health
Blueberry	Healthy
Cherry	Healthy, Powdery mildew
Corn	Cercospora leaf spot Gray leaf spot, Common rust, Healthy, Northern Leaf Blight
Grape	Black rot, Esca (Black Measles), Healthy, Leaf blight (Isariopsis Leaf Spot)
Orange	Haunglongbing (Citrus greening)
Peach	Bacterial spot, Healthy
Pepper bell	Bacterial spot, Healthy
Potato	Early blight, Healthy, Late blight
Raspberry	Healthy
Soybean	Healthy
Squash	Powdery mildew
Strawberry	Healthy, Leaf scorch
Tomato	Bacterial spot, Early blight, Healthy, Late blight, Leaf Mold, Septoria leaf spot, Spider mites Two-spotted spider mite, Target Spot, Tomato mosaic virus, Tomato Yellow Leaf Curl Virus

CHAPTER 3

PROBLEM STATEMENT

AI Based Smart Plant Disease Classification System for Indian Farmers. The project addresses the challenge of manual identification and classification of plant diseases, which is labour-intensive and prone to errors. By automating this process using AI, the system aims to provide a more efficient and accurate solution for farmers and agricultural experts.

CHAPTER 4

WORKING

The methodology section outlines the development process of a plant disease classification system using a convolutional neural network (CNN). It begins with data preprocessing, including resizing images, augmentation, and splitting into training and validation sets. Next, a CNN model architecture is designed, featuring convolutional and max-pooling layers, dropout regularization, and softmax activation for classification. The model is trained using the Adam optimizer and categorical cross-entropy loss function, with performance monitored using metrics like accuracy. After training, the model is evaluated on unseen data, and performance metrics such as accuracy, precision, recall, and F1-score are computed. Finally, the trained model is deployed using a Flask API for real-time inference, enabling users to upload images of plant leaves and receive disease predictions, thus facilitating practical agricultural monitoring and management.

CHAPTER 5

HARDWARE AND SOFTWARE REQUIREMENTS

Hardware Requirements

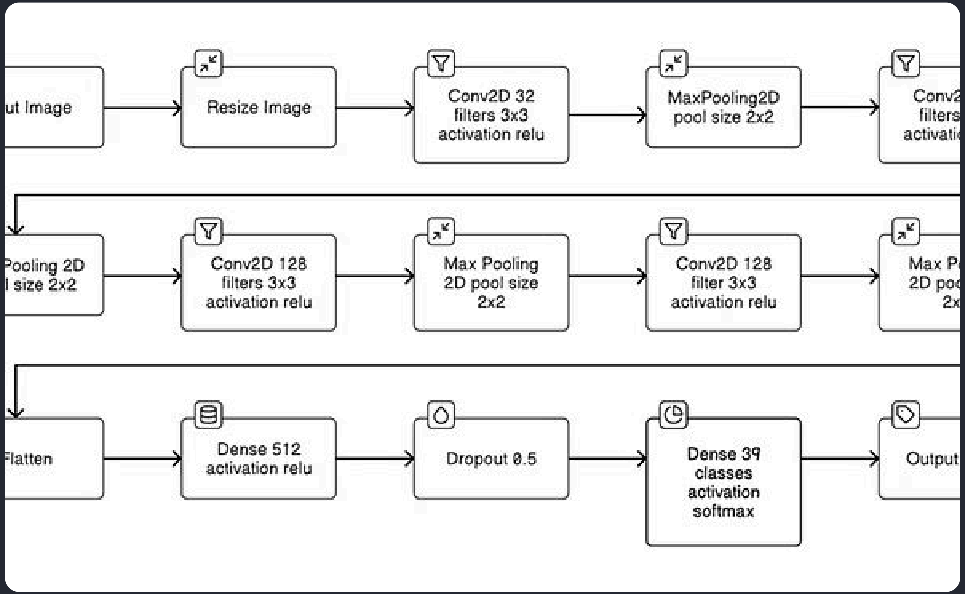
- Processor: Intel Core i5 10th generation or equivalent
- RAM: Minimum 8GB
- Storage: Minimum 512GB SSD or HDD

Software Requirements

- Programming Language: Python 3.10, JavaScript
- IDE used: VS Code
- Libraries: TensorFlow, Keras, PIL, Flask (for web application development), Numpy, Pandas (for data manipulation)
- Dataset: PlantVillage
- OS: Windows 11

CHAPTER 6

FLOWCHART



The model flowchart illustrates the sequential steps involved in preprocessing the dataset, designing and training the convolutional neural network (CNN) model, and deploying the model for inference.

CHAPTER 7

Advantages

Improved Disease Detection Accuracy

Applying deep learning methods, specifically Convolutional Neural Networks (CNNs), improves the accuracy of plant disease identification, resulting in faster and more accurate disease detection.

Efficiency and Speed

CNN-driven automated plant disease classification systems provide quick analysis of massive plant image collections, speeding up the decision-making process in agricultural activities.

Cost-Effectiveness

Implementing automated disease detection systems minimizes labour expenses related to manual inspection and reduces the need for pricey chemical treatments.

Scalability

Deep learning-based plant disease categorization systems can be implemented in a variety of agricultural contexts, from small-scale farms to massive commercial plantations, due to their scalability.

Remote Monitoring

Plant disease categorization systems facilitate remote crop monitoring through the integration of IoT devices and remote sensing technologies, making it easier to manage plant health in real time.

CHAPTER 7

Results and Discussions

The plant disease classification model achieved 96.44% accuracy on the validation dataset. It effectively diagnoses various plant diseases with high precision and recall scores. The model's ability to generalize to new data was confirmed. Discussion highlights the role of Convolutional Neural Networks (CNNs) in detecting minor disease patterns. Training techniques like data augmentation, oversampling, and preprocessing addressed challenges such as overfitting, data imbalance, and image quality variability. The results demonstrate the model's efficacy in diagnosing plant diseases, paving the way for practical applications in agriculture. Further refinements can enhance its performance in real-world scenarios.

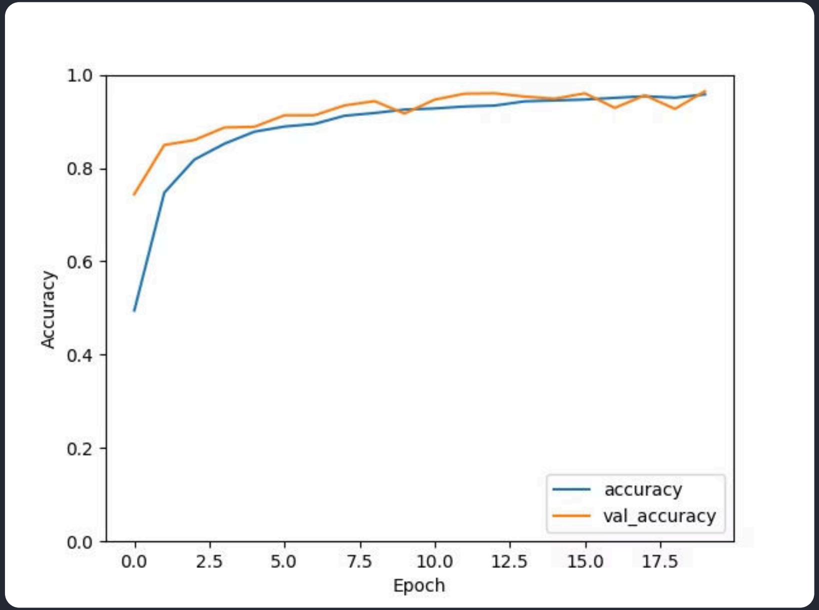
CHAPTER 8

Training Accuracy Graph

The graph indicates a generally positive trend in accuracy, suggesting that the model is learning and improving as it progresses through training epochs.

We can see a sharp increase in accuracy in the early epochs, which is typical for machine learning models.

Till the end of training, after 20 epochs model came up with accuracy of 96.44%.



Thank You!

Thank you for your attention and for being a part of this presentation. We hope you found the information valuable and insightful.

If you have any questions or would like to learn more, please feel free to reach out to us. We appreciate your time and interest.