Project Title: Plant Disease Detection from Images

Objective:

Develop a comprehensive Streamlit application that allows users to upload images of plant leaves and accurately predict the presence and type of plant disease using a Convolutional Neural Network (CNN) model. This project involves designing, implementing, and optimizing a solution that integrates machine learning, computer vision, and user interface development.

Project Scope:

- **End-to-End Development:** Take responsibility for all aspects of the project, from setting up the image upload interface in Streamlit to training the CNN model and delivering a functional, user-friendly application.
- **Real-World Relevance:** Address practical applications in agriculture, providing a tool that helps farmers or gardeners quickly diagnose plant diseases and take appropriate actions.

Key Components:

1. **User Interface Development:**
   - Design a Streamlit Application: Create a web interface that allows users to upload images of plant leaves (check for the type of file uploaded).
   - **Interface Usability:** Ensure the application is intuitive and user-friendly, with clear instructions and feedback for users.
2. **Image Preprocessing:**
   - **Data Preparation:** Implement image preprocessing steps such as resizing, normalization, and augmentation to improve model performance.
   - **Dataset Handling:** Use the New Plant Diseases Dataset from the Kaggle, which contains images of plant leaves with labeled diseases**.**
3. **Disease Classification:**
   - **CNN Model:** Develop and train a Convolutional Neural Network (CNN) model to classify plant diseases based on the uploaded images.
   - **Model Training:** Utilize the dataset from Kaggle for training and testing, applying techniques such as data augmentation and transfer learning to enhance model accuracy.

- Compare the performance of your model with at least 3 pretrained models. Your model should outperform the existing models

4. **Performance and Optimization:**
   - **Model Evaluation:** Assess the CNN model's performance using metrics like accuracy, precision, and recall.
   - **System Optimization:** Ensure the application performs efficiently with minimal latency for real-time predictions.
5. **Deployment and Testing:**
   - **Application Deployment:** Deploy the Streamlit application for accessibility by end-users.
   - **Testing:** Conduct extensive testing to ensure the application correctly predicts plant diseases and handles various image inputs effectively.

Expected Results:

- **Functional Application:** A Streamlit-based web application where users can upload images of plant leaves and receive predictions about plant diseases.
- **Model Performance Report:** A detailed analysis of the CNN model's performance, including accuracy and other evaluation metrics.

- **User Guide:** Documentation covering how to use the application, interpret predictions, and provide feedback on potential issues.

Tools and Technologies:

- **Programming Language:** Python
- **Frameworks and Libraries:** Streamlit, OpenCV, TensorFlow/Keras or PyTorch
- **Dataset:** [New Plant Diseases Dataset]

Deliverables:

1. **Streamlit Application:** A web application for plant disease detection from uploaded leaf images.
2. **Codebase:** Well-documented Python scripts for the CNN model, image preprocessing, and Streamlit interface.
3. **Trained Models:** CNN models trained to classify plant diseases, including any pre-trained or fine-tuned models.
4. **Project Report:** A comprehensive document covering the system's design, implementation details, model performance, and user feedback.
5. **User Guide:** Instructions for setting up and using the application.

Project Guidelines:

- **Independent Work:** Complete all project components independently, demonstrating proficiency in CNNs, image processing, and web application developments.
- **Final Presentation:** Present the application to faculty, showcasing its functionality, the CNN model's performance, and any challenges faced during development.

This project provides a valuable opportunity to apply CNN techniques to a real-world problem, offering practical benefits in the agricultural sector through automated plant disease detection.