Apple Diseases Recognition using TensorFlow & Android

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Abstract

This project presents a deep learning-based mobile application designed to automatically detect six types of apple diseases using image classification techniques. The system was developed using TensorFlow, Teachable Machine, and Android Studio. A trained Convolutional Neural Network (CNN) model was converted into TensorFlow Lite format and deployed in an Android environment for real-time disease prediction. The proposed system achieved an average classification accuracy of 99.11%, outperforming several previous research works.

Objectives

- Develop an automated system for apple disease detection.
- Achieve higher accuracy compared to existing research works.
- Deploy the trained model into an Android mobile application.
- Assist farmers and agricultural stakeholders with early disease identification.

Dataset Description

Total Images: 1770
Image Size: 224 × 224 pixels

Classes:
• Alternaria Leaf Spot (230 images)
• Collar Rot (300 images)
• Powdery Mildew (300 images)
• Scab (350 images)
• Sooty Blotch & Flyspeck (290 images)
• Healthy Apple (300 images)

Methodology

1. Data Collection: Images were collected from local markets and online sources.
2. Preprocessing: All images were resized to 224×224 pixels.
3. Model Training: CNN-based model trained using Teachable Machine.
4. Model Export: TensorFlow model converted to TensorFlow Lite format.
5. Deployment: Integrated into Android Studio for real-time disease prediction.

Performance Evaluation

The system was evaluated using confusion matrix, sensitivity, specificity, precision, and false positive/negative rates.

- Average Accuracy: 99.11%
- Highest Accuracy: 99.56%
- Lowest Accuracy: 98.67%
- Sensitivity: 97.27%
- Specificity: 99.40%

Technologies Used

TensorFlow, TensorFlow Lite, Teachable Machine, Android Studio, Convolutional Neural Networks (CNN), Support Vector Machine (SVM).

Comparative Analysis

The proposed system's accuracy (99.11%) is superior to several existing research efforts, such as Yan et al. (89%), Zhong and Zhao (93.51%), and Pandiyan et al. (97.35%).

Conclusion & Future Work

The proposed system demonstrates the effectiveness of deep learning techniques in agricultural disease detection. With high classification accuracy, the system can significantly support farmers in early disease identification. Future improvements include expanding the dataset, adding more disease classes, and developing a web-based deployment for broader accessibility.