Transfer Learning for Identifying Rotten Fruits and Vegetables

Introduction

NutriGaze is an AI-powered web application developed to classify fruits and vegetables as Healthy or Rotten using image processing and deep learning techniques. The system replaces manual inspection with automated prediction to improve accuracy and efficiency. It aims to reduce food wastage and enhance quality control in retail and agricultural sectors.

Ideation Phase

During the ideation phase, various real-world problems related to food quality and waste management were discussed. After brainstorming and prioritization, freshness detection was selected due to its practicality and impact. The idea was validated by identifying customer pains and proposing an AI-based solution.

Requirement Analysis

The system requires image datasets of healthy and rotten produce for model training and testing. Functional requirements include image upload, prediction display, and confidence scoring. Non-functional requirements include performance, scalability, usability, and system reliability.

Project Design

The project follows a web-based architecture integrating a trained deep learning model with a Flask application. The system includes modules for image preprocessing, prediction, and result display. The design ensures modularity, scalability, and easy deployment.

Project Planning and Scheduling

The project was planned in stages including dataset collection, preprocessing, model training, testing, and deployment. Each phase was allocated a defined timeline to ensure structured development. Regular validation and testing were performed before final deployment.

Functional and Performance Testing

Functional testing ensured proper image upload, navigation, and accurate prediction output. Performance testing evaluated response time and model accuracy. The system successfully produced predictions in under one second with high classification accuracy.

Results

The trained model achieved high accuracy in distinguishing between healthy and rotten produce. The web application successfully displayed predictions with confidence scores. The system demonstrated consistent performance during multiple test cases.

Advantages and Disadvantages

The system provides fast, accurate, and automated freshness detection, reducing human effort and food waste. It improves operational efficiency and customer trust. However, accuracy may vary with poor-quality images or unseen fruit categories**.**

Conclusion

NutriGaze successfully demonstrates the application of deep learning in solving real-world quality detection problems. The system reduces food wastage and enhances decision-making for retailers and consumers. It serves as a scalable foundation for future smart agriculture solutions.

Future Scope

The project can be extended to multi-class fruit classification and real-time camera-based detection. Cloud deployment and mobile application integration can enhance accessibility. Advanced deep learning techniques can further improve prediction accuracy.

Appendix

The appendix includes dataset details, model architecture summary, performance metrics, screenshots of the application, and test case results. It also contains system configuration and software dependencies. These supporting materials validate the project implementation.