Universidad de las Américas Puebla

Final Project Definition: Fruit-lens

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Mobile App Development - LIS4012

Spring 2025

January 31st, 2025

Problem Statement:

The problem Fruit-Lens aims to solve is the difficulty consumers face in determining the ripeness or freshness of fruits. Many people struggle to identify whether a fruit is ripe, overripe, or rotten, leading to food waste or unsatisfactory eating experiences. This issue is particularly relevant for individuals who lack experience in selecting fruits, such as young adults, busy professionals, or those new to cooking. By leveraging artificial intelligence and computer vision, Fruit-Lens provides an easy-to-use solution to help users make informed decisions about their fruits, reducing waste and improving their overall experience.

Target Audience:

- **General consumers** who want to ensure they purchase or consume fresh fruit.
- **Grocery shoppers** who are looking for an easy way to select the best produce.
- **Farmers and fruit vendors** that are seeking to evaluate fruit quality before sale.
- **Busy Professionals** who want a quick and reliable way to check fruit quality while grocery shopping.
- **Eco-Conscious Users** who want to reduce food waste by identifying fruits that are still edible but may appear overripe.
- **Students and young adults** who may lack experience in selecting ripe fruits and need guidance.

Key Features:

- **Fruit Ripeness Detection:** Users can scan fruits using their smartphone camera, and the app will analyze the fruit's condition (ripe, unripe, or rotten) using a pre-trained neural network.
- **Real-Time Scanning:** The app supports both real-time camera scanning and photo uploads for convenience.
- **Fruit Identification:** The app can recognize a variety of fruits and provide specific ripeness information for each type.
- **User-Friendly Interface:** A simple and intuitive design allows users to quickly scan and receive results without technical expertise.

Technical Approach:

- **Development Platform**: The app will be developed as a cross-platform mobile application to support both Android and iOS.
- **Key Technologies & Frameworks**:
    - Frontend: React Native will be used for building the user interface and ensuring a seamless experience across platforms.
    - AI/ML Model: A pre-trained neural network (e.g., TensorFlow Lite) will be integrated for fruit detection and ripeness analysis. The model will be trained on a dataset of fruit images labeled by ripeness levels.
    - Computer Vision: OpenCV or a similar library will be used for image processing and analysis.
    - APIs: The app may use device-specific APIs for camera access and image capture.

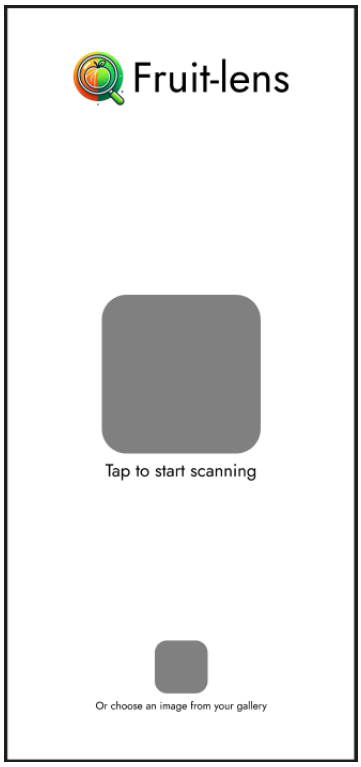
User Interface Sketches

Home Screen: A simple screen with a large camera button for scanning, along with options to upload a photo from the gallery.

Scanning Screen: A live camera view with a bounding box to highlight the fruit being scanned. Real-time feedback (e.g., "Scanning...") will be displayed.

Gallery screen: A phone gallery view where the user can select a photo from their phone gallery to scan.

Results Screen: After scanning, the app displays the fruit name, ripeness status (e.g., "Ripe," "Unripe," "Rotten"), and cooking ideas.



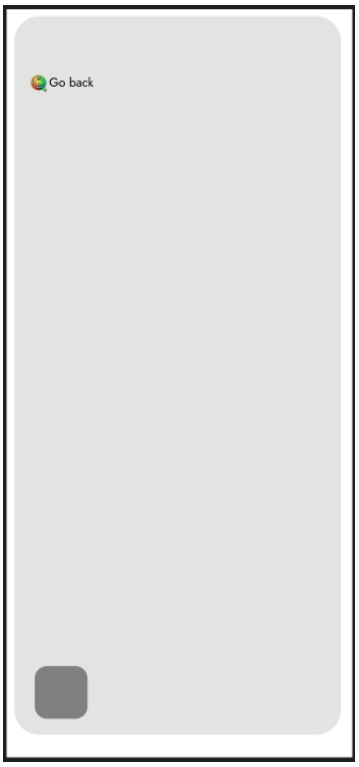


Image 1: home screen (left); image 2: scanning screen (right);

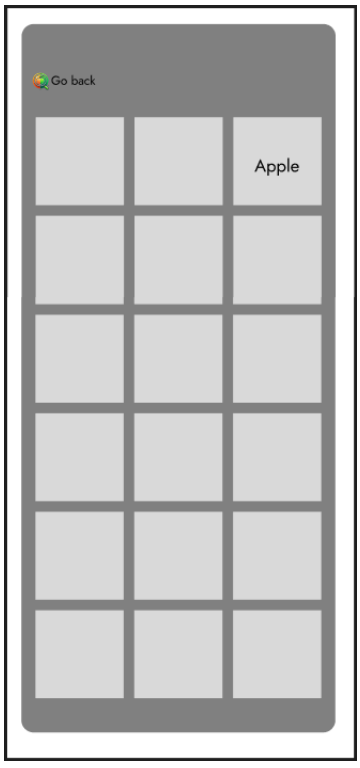


Image 3: gallery screen (left); image 4: results screen (right);

Challenges & Risks

- **Accuracy of the AI Model:**
  - Challenge: The AI model's ability to accurately detect fruit ripeness or spoilage depends on the quality and diversity of the training dataset. If the dataset is limited or biased, the model may produce inaccurate results.
  - Mitigation: Use a diverse dataset of fruits under various lighting conditions and stages of ripeness. Continuously test and refine the model to improve accuracy.

- **Camera Performance Across Devices:**
  - Challenge: Different devices have varying camera qualities, which may affect the app's ability to capture clear images for analysis. Low-light conditions or poor camera resolution could lead to inaccurate results.
  - Mitigation: Optimize the app to work with a wide range of devices. Provide users with guidance on how to capture clear images (e.g., proper lighting, steady hands).

- **Compatibility Issues:**
  - Challenge: Ensuring the app works seamlessly across different operating systems (Android and iOS) and device models can be challenging, especially when using platform-specific features like the camera.
  - Mitigation: Use a cross-platform framework like React Native to ensure compatibility. Test the app on multiple devices and operating systems during development.

- **Battery and Performance Optimization:**
  - Challenge: Continuous use of the camera and AI processing can drain the device's battery and slow down performance, especially on older devices.
  - Mitigation: Optimize the app's performance by reducing the computational load of the AI model. Use lightweight frameworks like TensorFlow Lite for on-device processing.

- **App Store Approval:**

- Challenge: The app may face rejection from the Play Store or App Store if it does not comply with their guidelines, especially regarding camera usage and data privacy.
- Mitigation: Carefully review and adhere to the app store guidelines. Ensure the app requests camera permission properly and does not store user data without consent.

Expected Outcome & Impact

- **Improved Food Waste Reduction:**
  - Impact: By helping users determine the ripeness or spoilage level of fruits, the app will encourage them to consume fruits before they go bad. This will contribute to reducing food waste at the household level.

- **Enhanced User Convenience:**
  - Impact: Users will no longer need to rely on guesswork or manual inspection to determine if a fruit is ripe or spoiled. The app provides a quick and accurate solution, saving time and effort.

- **Health and Nutrition Benefits:**
  - Impact: The app will encourage users to consume fresh and ripe fruits, promoting healthier eating habits. It will also help users avoid consuming spoiled fruits, which can be harmful to health.

- **Cost Savings for Users:**
  - Impact: By reducing food waste, users will save money by making better use of the fruits they purchase. The app will also help users avoid buying overripe or spoiled fruits in the future.

- **Environmental Impact:**
  - Impact: Reducing food waste has a positive environmental impact by decreasing the amount of organic waste that ends up in landfills. This contributes to lower greenhouse gas emissions and a more sustainable food system.