Fresh Eyes

Team B3

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Use Case

- The United States wastes approximately **40 million tons of food per year** (219lbs per person) [1]
- We want to reduce **residential waste** which largely occurs from discarding expired produce
  - This also costs $$$!
- Propose vision-based tracking system to collect statistics on fresh produce
  - Remind users about expiring foods
  - Suggest appropriate recipes

1. Environmetal Protection Agency (2018). https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/advancing-sustainable-materials-management

Use-Case Requirements

- We want to reduce the amount of food waste per person by ~ 1 fruit/vegetable a week
  - ~ $1.50/week saved
  - 25 pounds per year
- Each scan (assume 7 items/wk)
  - 85% accuracy (< 1/wk)
  - 2 seconds (CV -> UI)
  - At least 10 different items
- General-purpose (semi-permanent add-on)
  - < 2hrs installation and uninstallation
  - Minimal maintenance (< 30 mins/month)
- Intuitive UI
  - < 2 sec avg modification time

Use-Case Requirements: Justification

$65/ year!

In a week, assuming 7 items bought

Time - 30 seconds

2 seconds / scan
2 seconds / modification

Interaction Cost - $0.25

Median salary: $0.50 / min
0.5 min * $0.50 / min = $0.25

Cost Savings - $1.50

1 item = ~ $1.50 saved

User Savings - $1.25

Cost Savings - Interaction Cost
$1.50 - $0.25 = $1.25

Technical Challenges

CV System

Object Detection and Segmentation

Classification: Speed + Accuracy

White background during training

Potential dataset collection

UI Interface, Back-end

Intuitive

Fast and robust communication between front and back end

Attachment System

Removable

Easy to maintain

Solution Approach (General)

- Take advantage of computers and computer vision technologies to track use of food
  - Identify items, their purchase dates, and their expiration dates
- Remind users about items that will expire soon
- Recommend recipes for the user to make use of expiring items
- Collect statistics on what food frequently expires

Solution Approach (Specific)

- Hardware:
  - Jetson Nano
  - Android Tablet
  - USB Webcam
- Software:
  - Computer vision on Jetson Nano for detection
    - Fruits 360 dataset
    - Training on dedicated desktop
    - Communicates to Backend via Web API
  - Backend on Jetson
  - UI on Android Tablet
    - Communicates to Backend via Web API
    - Extensible to other devices (mobile phone)
    - Easy touchscreen

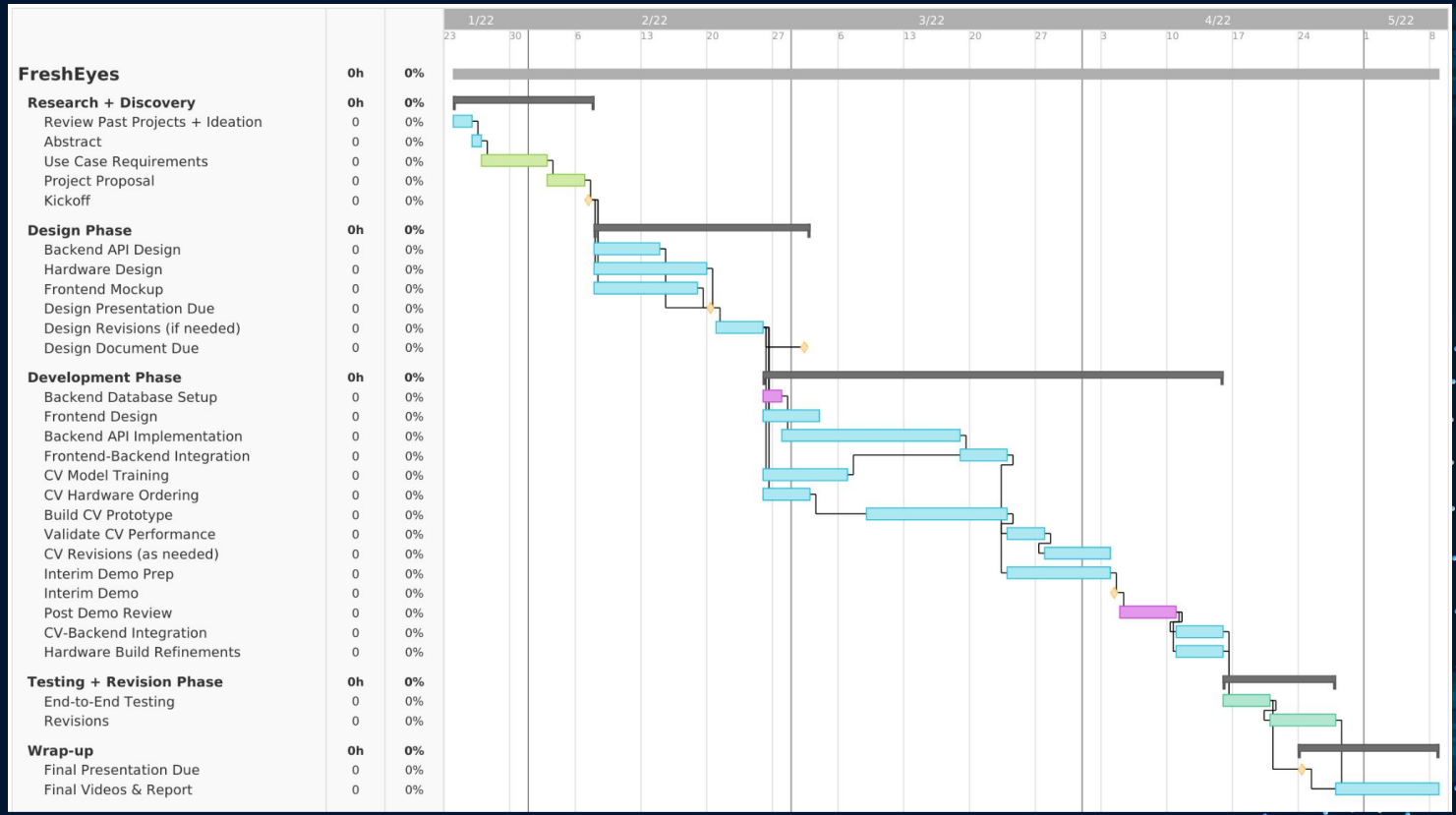
Testing, Verification, and Metrics

- CV Accuracy
  - We will purchase a selection of fruits and vegetables and test them under simulated real-world usage conditions
  - Target of >85% accuracy and <2s response time
- Front-end and back-end
  - Write automated tests to ensure correctness of API endpoints
  - Collect feedback throughout development process on front-end UX design, system performance, and ease of use, including the installation process

Tasks and Division of Labor

- Samuel
  - CV System
  - Testing
  - Helps with front-end
- Alex
  - Front-end
  - Helps with CV system, back-end
- Oliver
  - Back-end, APIs, Hardware
  - Administration

Schedule



FreshEyes	**0h**	**0%**
Research + Discovery	**0h**	**0%**
Review Past Projects + Ideation	0	0%
Abstract	0	0%
Use Case Requirements	0	0%
Project Proposal	0	0%
Kickoff	0	0%
Design Phase	**0h**	**0%**
Backend API Design	0	0%
Hardware Design	0	0%
Frontend Mockup	0	0%
Design Presentation Due	0	0%
Design Revisions (if needed)	0	0%
Design Document Due	0	0%
Development Phase	**0h**	**0%**
Backend Database Setup	0	0%
Frontend Design	0	0%
Backend API Implementation	0	0%
Frontend-Backend Integration	0	0%
CV Model Training	0	0%
CV Hardware Ordering	0	0%
Build CV Prototype	0	0%
Validate CV Performance	0	0%
CV Revisions (as needed)	0	0%
Interim Demo Prep	0	0%
Interim Demo	0	0%
Post Demo Review	0	0%
CV-Backend Integration	0	0%
Hardware Build Refinements	0	0%
Testing + Revision Phase	**0h**	**0%**
End-to-End Testing	0	0%
Revisions	0	0%
Wrap-up	**0h**	**0%**
Final Presentation Due	0	0%
Final Videos & Report	0	0%

Q&A