

Fresh Eyes

Team B3

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What is Fresh Eyes?

Integrated smart fridge attachment system

Vision-based Tracking System

Easy way to scan fresh produce before putting them into fridge



Intuitive Interface + Reminder App

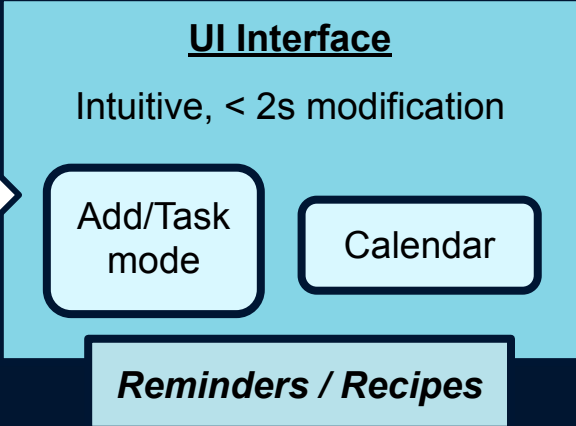
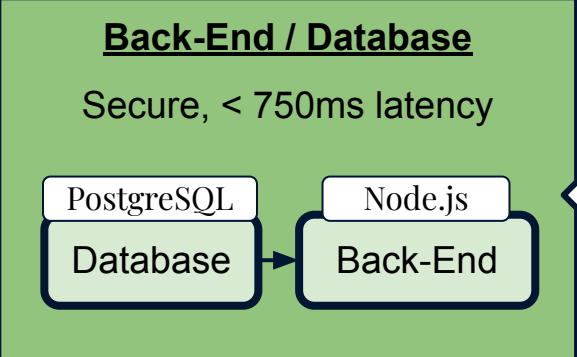
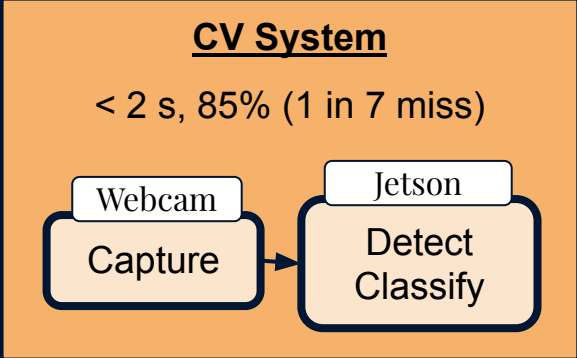
Allows user to intuitively track food
Reminds user when fresh produce is expiring

**25lb/
year!**

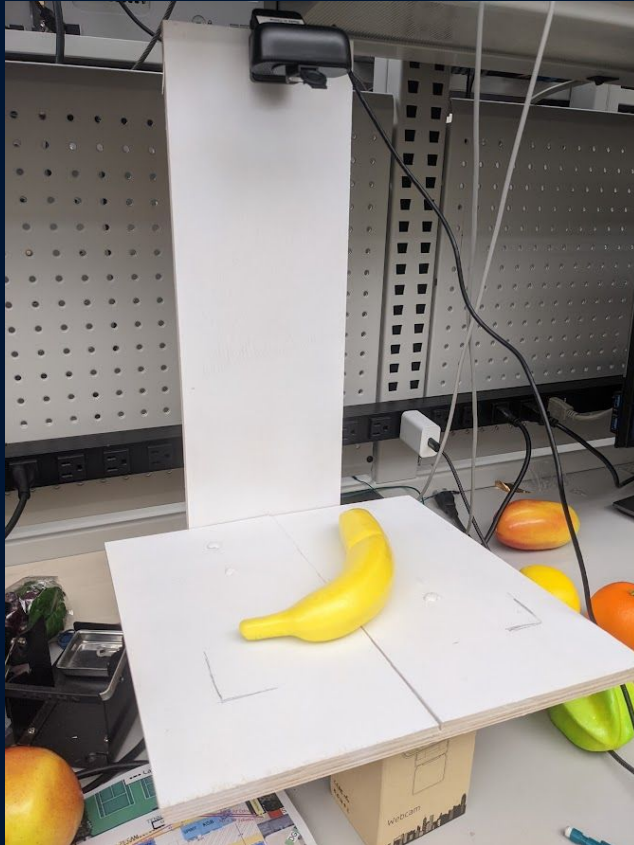
**\$65/
year!**

**Reduce Food Waste
Save Cost**

Solution Approach & Requirements



What we've built



Integrated

Everything on one large board
Can be installed/removed with
standard 3M tape - easy setup!

Non-intrusive

Low profile: Platform folds up
when not in use

Easy to use

Ample Space: Large platform
UI accessible from any internet
connected device
Markings on platform to indicate
scanning area

What you'll see

Scan

Fruit is scanned and placed into the fridge

This simulates a user loading the fridge after a grocery trip

Confirmation

CV generates a list of predictions for each item which is sent to the front end

The user confirms the exact item and quantity

Inventory Lookup

The user sees the expiration dates for their fruits, as well as a list of all fruits in the fridge

We can also find the nutritional information for the fruits

Removal

Some fruits are removed from the fridge

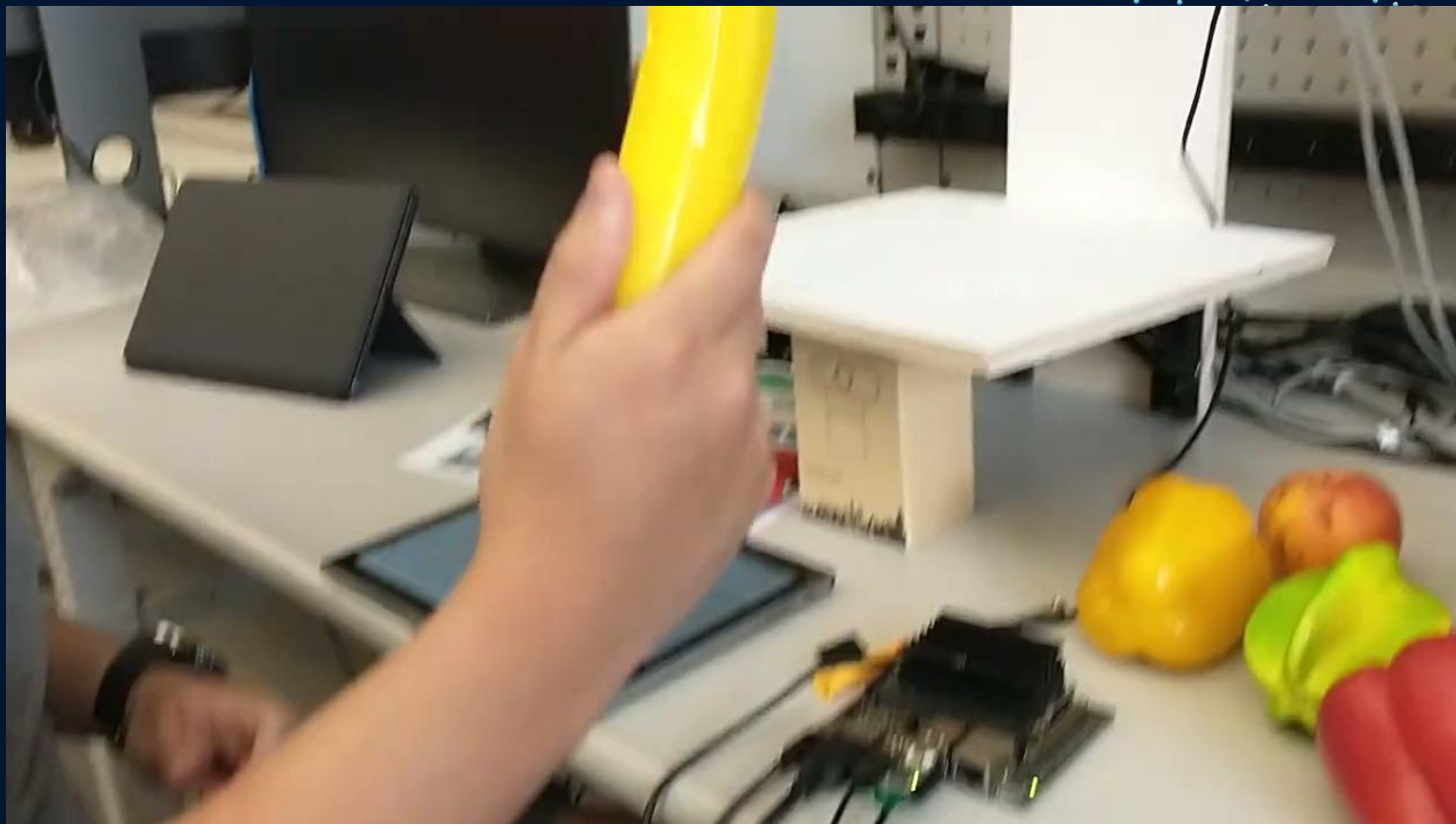
The quantities and expiration dates are updated automatically

Replacement

Didn't eat everything you took out?

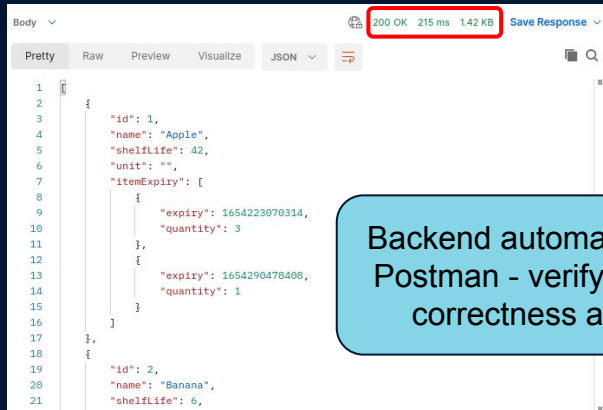
No problem! Simply replace them into the fridge, and Fresh Eyes is smart enough to remember the previous expiration date of the fruit!

Item Confirmation & Addition



Item Removal

Testing, Validation, and Verification



```
Body
200 OK 215 ms 1.42 KB Save Response
Pretty Raw Preview Visualize JSON
1 {
2   {
3     "id": 1,
4     "name": "Apple",
5     "shelfLife": 42,
6     "unit": "",
7     "itemExpiry": [
8       {
9         "expiry": 1654223076314,
10        "quantity": 3
11      },
12      {
13        "expiry": 1654290478406,
14        "quantity": 1
15      }
16    ]
17  },
18  {
19    "id": 2,
20    "name": "Banana",
21    "shelfLife": 6,
```

Backend automated tests with Postman - verifying response correctness and latency

Frontend tested on a variety of devices, e.g. tablets, PCs, and phones

As well as combined, end-to-end testing!



Testing, Verification, and Metrics

Interface (Front-Back-End + API)

Automated tests: API endpoints pass all tests

UI Feedback surveys: still need to be sent, but current estimates place approval time ~1.5 seconds

p99 API latency (over 24 hours): 246ms

CV System

Accuracy: 18/20 correct (first choice), 1/20 second choice, 1/20 third choice

Speed: 1.67 seconds average across 10 trials

Use Case Metric Validation

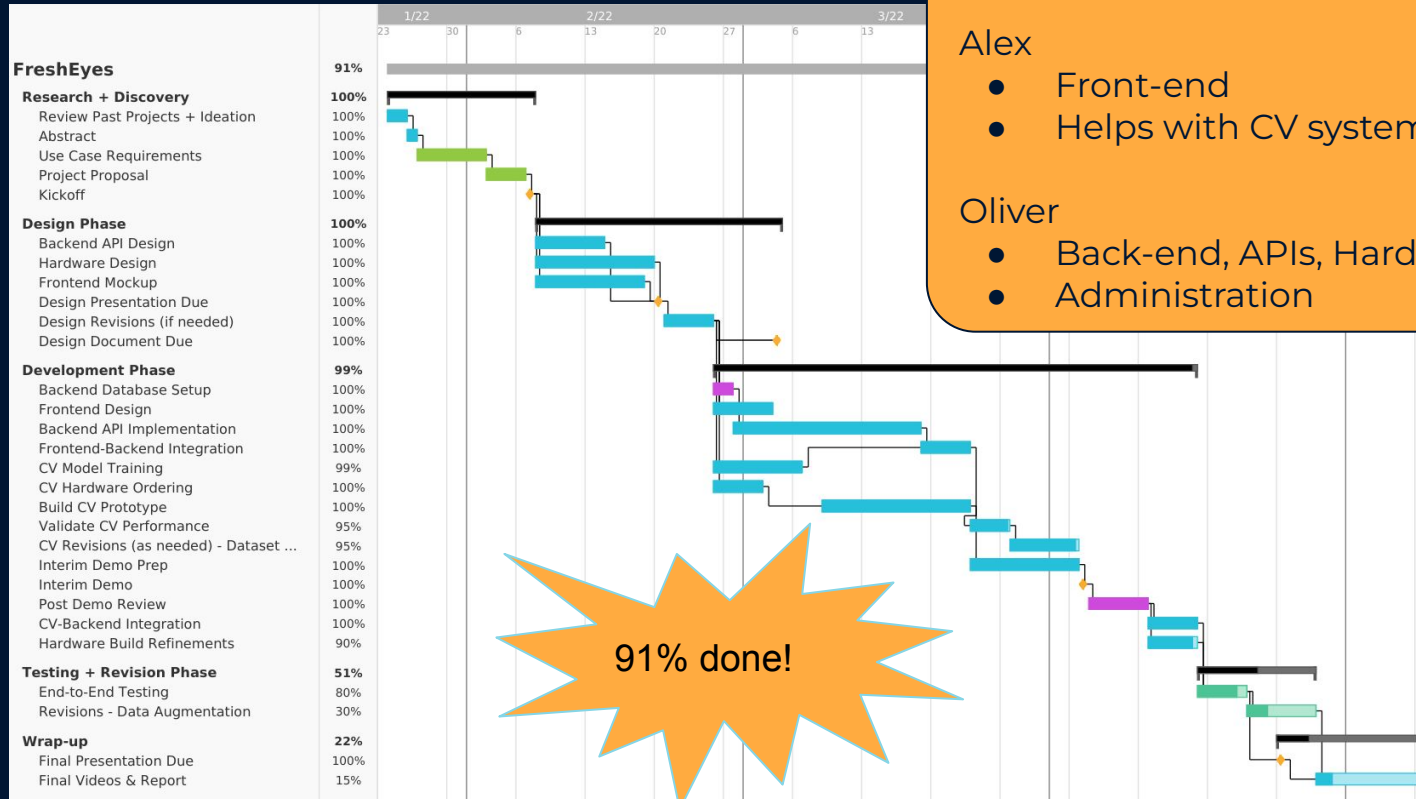
| Use Case Metric | | Requirement | Measured | Status |
|-----------------|--|-------------|----------|-----------|
| CV | Accuracy | 85% | 90% | Achieved! |
| | Speed | 2s | 1.67s | Achieved! |
| Backend | Latency | 750ms | 246ms | Achieved! |
| Frontend | Confirmation dialog user response time | 2s | ~1.5s | Achieved! |

Design Trade offs

- Usability <> Complexity
 - Limit switch eliminated
- Speed <> Cost
 - High memory usage in Jetson Nano
 - In production: Jetson TX2 NX Module with 2x the RAM at a comparable cost
- Generalizability <> Accuracy
 - 16 fruits had very high accuracy, but adding certain fruits caused issues
 - Supported as many fruits as possible (without eliminating any common fruits)
- Space <> Accuracy
 - White platform improves CV accuracy, but occupies more space
 - Approximately 50cm x 50cm, mitigated using the folding platform



Schedule



Samuel

- CV System
- Testing
- Helps with front-end

Alex

- Front-end
- Helps with CV system, back-end

Oliver

- Back-end, APIs, Hardware
- Administration