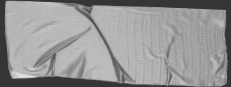

The Campus Food Classifier



Liam Donnelly's Final Year project

— 

Facts: Adults between 19-64 consume 12.1% of their daily recommended calories through sugar. That's 2.4 times too much sugar! (3.12 for children)

Facts: Campus for is Expensive!

Inspiration



Problem:

Difficult to keep track of spending and nutrition on campus.

Why?

Solution:

An app to easily record food intake using ML image recognition



1. Steps involved

→ Create Dataset

This required many hours of collecting videos and then processing to create dataset.

→ Train a NN to Classify the items

Load dataset, build, optimise and export model.

→ Implement in an app

Load model in and use camera as input.

Steps I've taken

- Theory Learning
- Practical Learning and experimentation
 - Make initial Dataset
- Understand the pre-processing stage and importing the data
 - Binary Classification
 - Multiclass classification
 - Construct better Dataset ~138,000 images
- Optimise and debug
 - Implement in template app
 - Transfer learning
- Implement in own app
- Bayes Inference

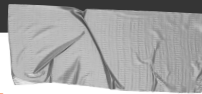


Expectation vs Reality

- **SLOW START!**
- **Not a linear progression**
- **Many things to consider**

Considerations, decisions and Trade-offs

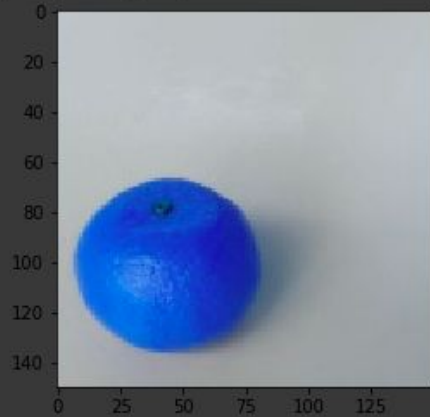
- **Lighting and environment** : surface, time of day shadows, how old the fruit is, crumpling, juice half empty, angle, distance
- **Pre-processing** : self code, num videos, duration, cropping, rotating, scaling, mounting, regularising
- **Hardware constraints** : storage, processing power, google colab
- **Hyperparameter testing**
- **Overfitting** : step
- **Pre-trained model**
- **Library Choices**
- **App functionality** : number of items, camera, continuous, how to present data, location, storage



Hyperparameters

- Filter sizes
- Number of blocks
- Epochs
- Batch size
- Optimiser
- Learning rate
- Step size
- Augmentation setting
- Dropout
- Input shape

(150, 150, 3)



Prediction: CrispsBlue

Main Difficulties

- Data Collection
- Multi-class classification
- Implementing in the app

(150, 150, 3)



Prediction: CoffeeSmall

App features

- Detect images using the view finder
- Both cameras
- View of items nutritional and price information
- Guess item based on given location and save
- Re-detect
- Save
- Accumulated stats and last item
- Slide activities



Guess the item

Given the location what's the most likely food?

The app will calculate the probability distribution of the food items based on the user's location. Over time it will develop a better knowledge of how the users eats in each location.

This is implemented through bayesian inference. Bayes Theorem works to update a prior probability distribution each time the user records a food item in a location.

This way the user can gain a better understanding of how they eat before scanning the food item. It will also increase the ease of recording items.

Bayes theorem

$$P(A|B) = \frac{P(B|A) P(A)}{P(B)}$$



Reflection

It went to plan, harder than expected

Many considerations

Developed knowledge in python, tensorflow,
and android development

Extensions

More items, more data

App - torch, location, notifications, online
access

Model learns over time

Evolutionary Algorithms