

# Project Proposal – Fruit and Vegetable classifier

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## Dataset(s):

The data to be used for the project is available here: <https://www.kaggle.com/moltean/fruits>  
It contains labels and pictures of fruit.

There are 65,429 photos of 95 fruit. Photos are 100 x 100 pixels. The photos contain only 1 fruit each, except 103 photos which contain multiple fruit.

## Abstract:

Being able to recognize different fruit and vegetables in photos and video feed can be useful for grocery stores. In particular, adding this process to self-checkouts could improve the user experience and speed of the checking out process.

## Overview

Self-checkout grocery aisles have become more popular. When purchasing fruit and vegetables, typically the user needs to select the item from a list. This can be clunky, with some difficulty of finding certain items. E.g. Is it 'Onion (Red)' or 'Red onion'.

In addition, it is possible that people may not know which fruit they picked up. Fruit and vegetables can have many similar types. For example, many different types of apple available. People may forget whether they picked up a gala or a pink lady up to an hour prior to paying. Providing a short list of the most likely products can improve the accuracy of the product being selected.

The dataset contains a large number of different fruits (95) – although fewer than in a typical store. Using image recognition techniques, I look to be able to provide back to the user the most likely item that is being presented.

## Research Questions / Hypothesized Outcome

At the end of my project I am aiming to have created a program that can determine the likelihood of different fruit and vegetables.

A bonus would to have some of the following:

- Ability to recognize fruit and vegetables that are in the hands.
- Ability to recognize fruit and vegetables that are in a see-through bag (my data is not in a see through bag).
- A working mock up of a checkout using either a laptop camera or Raspberty Pi.

- An ability to add photos to a datasource from people correcting the model. This way, more data can be added to the model to improve future predictions in the future.

### Planned Methodology

The plan is to use a neural network to classify photos. I would like to look at a couple of architectures such as CNNs and Resnet. Both of these are available in Keras.

In a grocery store, using knowledge of the relative number of fruit and vegetable sold a better likelihood estimate may be possible. For example, a given photo might indicate both plantains and bananas with a 50% likelihood. But we have a prior assumption that bananas are 10x more often purchased than plantains. This could provide better recommendations for a typical user.

### Potential Challenges

The following are a list of potential issues:

- Fruit obscured by the hands – or other fruit. May be able to generate pictures with some hands in the fruit.
- What will happen when there is no fruit in the photo? Will I need to provide/ generate blank or null photos as an extra classifier. Perhaps it would be easier to only generate a prediction on press of a button?
- There are a large number of photos. The training of neural networks could be quite time consuming. Using good hardware (a GPU) will be useful. Complete much of the initial training using smaller data sets or running only few epochs.
- There a large number of categories available. There is some concern that the number of photos is not large enough. It may be possible to generates additional training samples (through rotations, mirroring) to improve the modelling.
- The photos are 100 x 100. This is probably a good size for machine learning. Some down-sampling of my mock-up will need to be downgraded. Some differences between the color pallettes used in the different groups could cause some issues. Converting to a low color resolution could reduce this impact.