

### Project Milestone 1: Abstract

For our project, we want to train a convolutional neural network to recognize different variations of fruit from images. We are using two datasets. The first contains 44406 images of 15 different types of fruit with a resolution of 320 x 258 pixels. During the collection of this dataset, the creators note that they introduced certain elements such as, “light, shadow, sunshine, pose variation” to simulate conditions in a supermarket or produce stall. Some of the images are taken with hands partially covering the fruit. This dataset is from Kaggle and includes a couple of notebooks training a deep learning model on the dataset. The [most downloaded one is by a user called 'Datalira' and compares 27 pre-trained models](#). She finds that DenseNet201 from Keras gives the most accurate result. The second dataset contains 90483 fruit and vegetable images of size 100 x 100 pixels. This dataset covers 131 different types of fruit/vegetables. This dataset is called 'Fruit360'. In June 2018, Horea Muresan and Mihai Oltean published a paper titled '[Fruit Recognition from images using deep learning](#)' in Acta Universitatis Sapientiae, Informatica. They used a convolutional neural network with 11 layers, seen in Table 2 on page 18.

Table 2: The structure of the neural network used in this paper.

Layer type	Dimensions	Output
Convolutional	5 x 5 x 4	16
Max pooling	2 x 2 — Stride: 2	-
Convolutional	5 x 5 x 16	32
Max pooling	2 x 2 — Stride: 2	-
Convolutional	5 x 5 x 32	64
Max pooling	2 x 2 — Stride: 2	-
Convolutional	5 x 5 x 64	128
Max pooling	2 x 2 — Stride: 2	-
Fully connected	5 x 5 x 128	1024
Fully connected	1024	256
Softmax	256	131

We believe this neural network could be used in grocery stores to identify different fruits during the checkout process. Instead of using a barcode, cameras in the checkout machine could identify the type of fruit, weigh it, and then charge the customer accordingly. This would speed up the process of checkout and reduce the amount of wasteful packaging needed for produce. It could also be used to assist people with visual impairments, so they can identify fruit using a mobile application on a smartphone or similar device.