Scientific Report CSE 455/555 Term Project

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Part 1: CV Engineer, Jacob Szczudlik. ResNet500 Pre trained model

Data Analysis: The goal of this part was to use a state of the art pre-trained model to accomplish 2 objectives. 1.) Fine tune a pre trained model to be able to distinguish between, in our case, 4 different classes of fruit, avocado, banana, pineapple and carrot. 2.) Use a second model to classify the images based on variations. For example can our model distinguish between a whole avocado and one that is diced. To accomplish this I chose to use a pretrained Resnet-50 CNN with a set of hyper parameters that ill describe in the next section.

Model set up: As i mentioned for the image classification task I chose to use a resnet50 pretrained model. For task 1 this needed to be trained on 4 input features, and for the variation classification task it needed 12 features. I chose to use cross entropy for the loss function as this seemed the most consistent among both CV tasks. Adam optimizer was applied with a standard learning rate of 0.001. I tried a few runs of different epochs and it seemed that less than 2 wasn't sufficient and more than 5 wasn't improving accuracy enough so I settled in on 5 epochs. After 1 epoch accuracy was around 80%, after 2 around 90%, and after the full 5 settled in around 98%. This was a very pleasing result. Below I've attached the confusion matrices for the data showing a high degree of accuracy for most classifications.
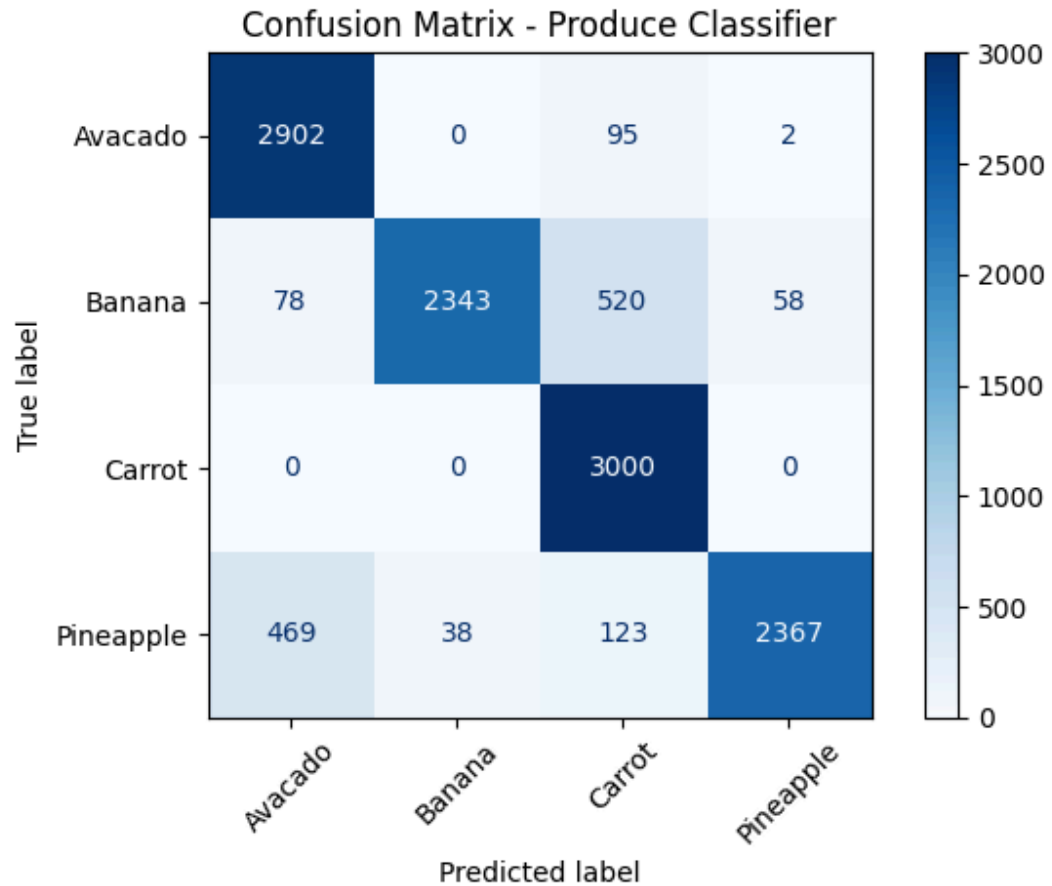
Figure 1: Fruit classification confusion matrix

As you can see by the above chart, there is a high degree of accuracy across the identity diagonal for each class. Most impressive being the carrot with no incorrect predictions. I imagine it is due to multiple factors including image quality and variation, but its probably largely due to its distinction from the other 3 fruits, which are much more similar to each other.
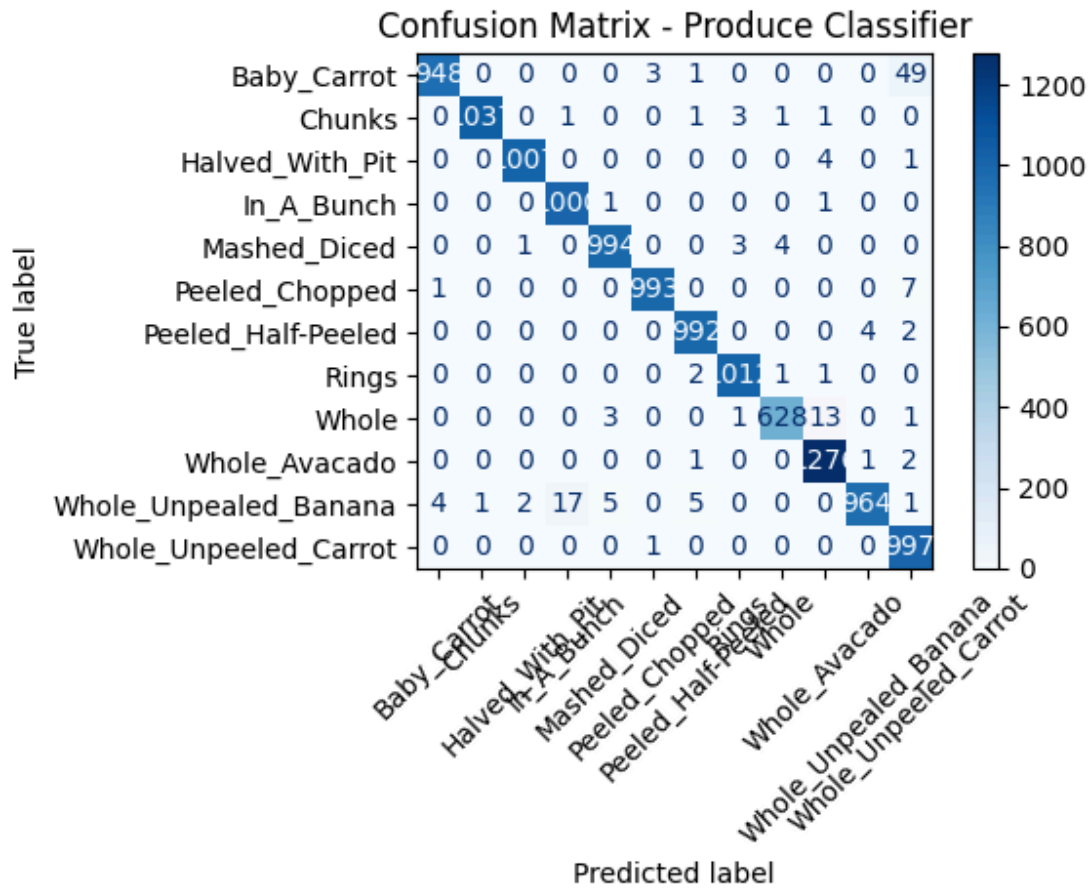
Figure 2:

Figure 1: Fruit classification confusion matrix

The data for the variations is impressive. Aside from mistaking variations of the same fruit a few times, the present model performed very well at distinguishing each variation from other classes. The added context and additional classes seems to have allowed the model to do even better fine tuning and learn the difference between the fruits. Although the simple class identifier worked well on the 4 simple classes, the more refined model worked even better.