

Machine Learning II Final Project Proposal

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What problem did you select and why did you select it?

For this project, we are looking to classify fruits and vegetables based on images while also providing an estimate of confidence with the classification based on which parts of the images the model is giving most weight to during training. The motivation for this problem is to identify fruits and vegetables to aid those who may be visually impaired to shop for produce. Potential applications could be as part of a phone application so someone could hover their phone over an item and have the model tell them what the item is. This is particularly relevant for produce where barcodes are less common on the items, so traditional scanners can't solve that gap.

What database/dataset will you use? Is it large enough to train a deep network?

For this project we will be using a [dataset of 21,000 images](#) which are split into test, train, and validation datasets. Each image is a 224x224 image and we are classifying 15 types of vegetables, resulting in 1,400 images per vegetable. This should be sufficiently large to train a deep network, but additional data augmentation can be done to increase the size of the dataset if necessary.

What deep network will you use? Will it be a standard form of the network, or will you have to customize it?

At a baseline we intend to develop a relatively standard convolution neural network. Customization may be necessary to improve model performance, but is not being actively pursued unless necessary.

What framework will you use to implement the network? Why?

We will use PyTorch for flexibility and customization and because it is based heavily in numPy, making it easy to understand and work with.

What reference materials will you use to obtain sufficient background on applying the chosen network to the specific problem that you selected?

We will refer to PyTorch documentation on building a model using that framework. Additionally, we will need to familiarize ourselves with [LIME](#) to work on the interpretability of our chosen model. PyTorch and CNNs are commonly used for image classification. While we will refer to PyTorch documentation for the development of the model framework, we are confident that the chosen network is applicable to the selected problem. Similar image classification work has been done previously, and we will consult other notebooks on Kaggle or PapersWithCode as

necessary for additional background, specifically [Lu 2016](#), which uses CNNs for general food image recognition.

How will you judge the performance of the network? What metrics will you use?

We will use accuracy, precision, f1_macro, and AUC as our metrics for evaluation, with accuracy as the primary training metric for optimization. For loss we will likely use categorical cross entropy, but may explore other loss functions as needed.

Provide a rough schedule for completing the project:

11/8/22: Finish proposal, create GitHub

11/9/22-11/16/22: Download the dataset and set up base CNN model to obtain baseline metrics

11/17/22-11/23/22: Continue to up base CNN model to obtain baseline metrics, work on interpretability, consider augmentation of training data, performance improvements

11/24/22-11/26/22: Break

11/27/22-11/30/22: Work on interpretability, consider augmentation of training data, performance improvements

12/01/22: Start report

12/12/2022: Submit project