CSCI 1470
Check-in 3 Reflection
Alex Manioudakis, Shruti Panse, Roshan Parikh, Rio Wombacher

Introduction
For our project, we are implementing a paper, Bedi, et al., which uses a hybrid deep learning system consisting of convolutional neural networks (CNNs) and convolutional auto-encoders (CAEs) to detect plant disease based on images. The paper was remarkable for its high testing accuracy (over 98%) and relatively low number of training parameters (fewer than 10,000). Bedi, et al., used peach images from the PlantVillage dataset and trained a classifier to detect healthy versus unhealthy peach plants based on images of their leaves. The unhealthy peaches only had bacterial spot disease. For our project, we expanded the scope of classification in two ways. First, we trained a binary classifier on a much larger subset of the PlantVillage dataset. Second, we trained a multiclass classifier to detect not only if the plants were sick, but also their species and specific affliction.

Progress, Insights, and Challenges
Preprocessing: We started out with 38 classes and 54,303 images. These classes were organized as "Plant Name – Disease (or healthy)." However, some of the species did not have both a diseased and healthy class, so those files were removed, leaving us with exactly 40,000 images and 33 classes. This was our first challenge, but we used os to remove the data before preprocessing. We split these files into train, validation, and test sets with a 70-20-10 split, making sure that each of the 33 remaining classes were equally represented between the sets. This was another challenge, since the dataset came already split with an 80-20 split. We used the ImageDataGenerator class from Keras to preprocess the images into tensors and to split off 12.5% of the data from the training set to form the testing set, creating a 70-20-10 split. Two types of data labels were created: one for binary testing, where labels represented healthy or unhealthy plants, and one for multiclass classification with all 33 class labels.

Training and Testing: We trained and tested the model for two classification tasks. The first was a binary classification problem determining if the plant leaves were healthy or not. This model took 99:33 minutes in real time (5:46 minutes in user time) to train in Oscar with 10 epochs and had final training and validation accuracies of 0.9801 and 0.98188, respectively. The best model had a testing accuracy of 0.9732. The second task was a multiclass classification problem, with all 33 classes. This model took 375:00 minutes in real time (16:10 minutes in user time) to train in Oscar. We increased the number of epochs to 50, but with early stopping the model trained with 38 epochs. The final training and validation accuracies were 0.8558 and 0.81888, respectively, with the best model having a testing accuracy of 0.8074. We used a batch size of 32.

Plan

We need to make our poster and paper. Pretty much everything else is done.