Dog Breeds Classifier

Group members: Yao Zhong and Hui Hu

Overview:

Dogs are cute, and there are so many breeds of them. Humans can easily classify a dog by their features, but how did this process happen? In this project, we want to be able to design and train a deep network that can classify dog breeds.

Research Material:

We have a 20k image dataset, the "**Stanford Dogs Dataset**" that has been labeled into 120 breeds of dogs with bounding boxes. We will split the set into a "training set" of 14k(70%), a "validation set" of 3k(15%), and a "test set" of 3k(15%). For the computing resource, if needed, we will apply for access to Northeastern's Discovery cluster system and run our model on it.

Model design:

Many works have been done with this dataset. We will do some literature research to see if there are any similar problems and what models are used. We will choose a pre-trained model or create our own novel model as our baseline model.

Model Training:

Experiment 1: We will try several pre-trained models and test their performance on this classification task, and we will choose the model with the best performance as our baseline model.

Experiment 2: We will test how the convolution layers affect the performance of the task. We will try to visualize the filters and their result after applying them to the images. We will use this information to see how the feature computation work, and what kind of information the dogs are emphasized when generating embeddings.

Experiment 3: We will test different hyperparameters' effects on performance. The possible choice of dimensions includes the learning rate, number of epochs, and batch size.

Model evaluation and metric design:

After training each model, we will evaluate their performance(the accuracy of classifying) on the test set. With the result, we will compare different variations and find out which variation is best for improving the performance of the model.

Model analyses:

We will iterate the model with the result of the experiment and then analyze the optimal model. We will visualize the activations and filters to see how this model works.

Possible Exploration:

There are individual differences inside each breed, such as color, age, and even hair styling, is our model robust enough to handle these variations?

Some breeds look similar but different in some small places, is our model good enough to differentiate them?