Building a Dog Breed Classifier
Udacity Machine Learning Engineer Nanodegree
## Capstone Proposal

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Domain Background

Building a dog breed classifier is a computer vision task. Since the ImageNet challenge, image classification task performance using deep learning techniques becomes better and better and even outperforms human performance. Besides better performant neural network architectures coming out each year, one special technique called transfer learning really makes applying deep learning to real life much easier. With transfer learning, we can take one predefined architecture with pretrained weight, and fine-tune only last few layers of the model to quickly bring the new task performance to a quite accurate level.

Problem Statement

In this project, I will apply the transfer learning technique to solve the dog breed classification task. This is a multi-classification problem, since there are multiple dog breeds out there. Besides classifying dog breeds, if a human is inside an input image, we will predict a dog breed that is the most similar to that human. Otherwise, the output will print out a message that indicates error.

Datasets and Inputs

Datasets contain both dog and human images. There are 13223 human images and 8351 dog images(133 dog breeds). Also in dog images, we have training/validation/testing datasets. The image below is the dog breed distribution for the training data
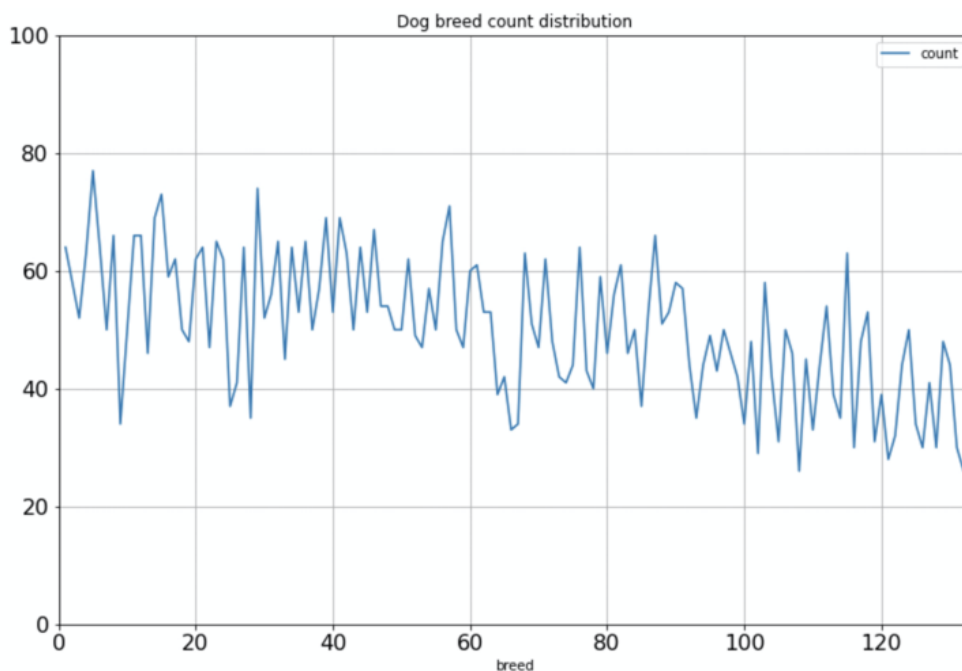
Solution Statement
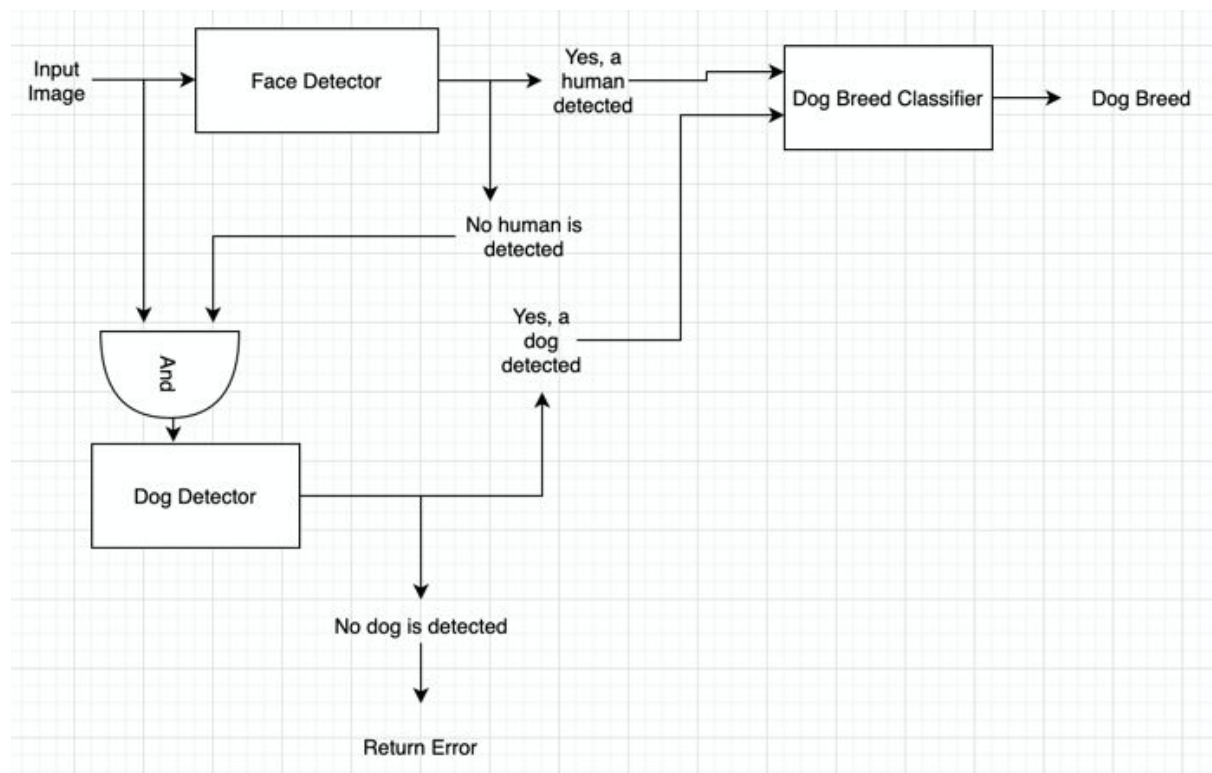
Benchmark Model

The key ingredient of the project is the dog breed classifier, so I will use the same components for the face and dog detector in the benchmark model and my proposed model. The face detector is based on an OpenCV algorithm and the dog detector is based on the pretrained VGG16 model.

For the dog breed classifier, I'll also use the pretrained VGG16 model as the baseline model.

Evaluation Metrics

The evaluation metrics is the dog breed prediction accuracy given test images.

Project Design

According to the solution statement, this is the overall project architecture(pipeline). What I am going to focus is the dog breed classifier. The image below is the more detailed structure:
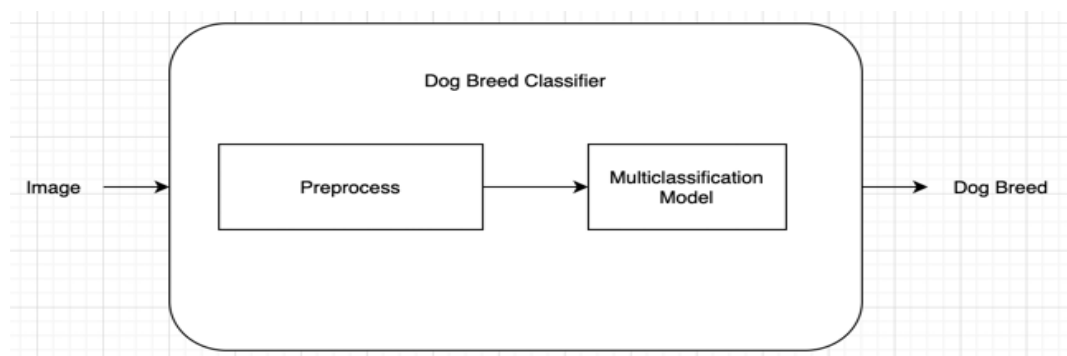
According to transfer learning, I need to find a pretrained model along with pretrained weight. Also I need to be careful to use the the same preprocess steps as the model used. Then I'll finetune the model to suit the project's specific goal: a multiclassifcation problem.