Capstone Project
Machine Learning Engineer Nanodegree

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Dog Breed Classifier

Domain background

A dog breed classifier is a **computer vision classifier** that uses Convolutional Neural Networks (CNN) to build a pipeline to process real-world, user-supplied images.

In the real world, there are a lot of different dog breeds. While Humans can detect few dog breeds, The classifier can detect more than 100 different dog breeds.

The concept of computer vision classification using CNN was used in different fields in real life
For example :
Detecting the type of vehicles (car, bus, truck ...etc) in transportation
Detecting Celebrity actors between groups of people.

For a reference paper :

ImageNet Classification with Deep Convolutional Neural Networks by Alex Krizhevsky

Problem statement

The goal is to create a dog breed classifier based on a dog or human image

The output will be the Input Image labeled with the predicted dog class.
The Input will be an RGB image of a dog or a human.

Machine learning will be used to capture the features for the Input image and use those features to predict the dog class.

Datasets and inputs

For dog data sets:
https://s3-us-west-1.amazonaws.com/udacity-aind/dog-project/dogImages.zip

For Human data sets:
https://s3-us-west-1.amazonaws.com/udacity-aind/dog-project/lfw.zip

Solution statement

Using convolution Neural Networks and transfer learning concepts, the CNN model will use a pre-trained model like VGG and use it to classify the Dog breeds.

The expected output from the model will be the predicted dog breeds label for the input image with a range from 0 to 133 different dog breeds.

And we will use the predicted label and compare it with the true labels to get how accurate is the model.

Benchmark model

I will create a CNN model from scratch and measure the model accuracy on unseen test data. After that, I will make the new model using transfer learning and compare the new test results.

I expect to get low accuracy for the model that I will create from scratch but It will be a good start to move to transfer learning.

Evaluation metrics

Accuracy is a common metric for multi-class classifiers; it takes into account both
true positives and true
negatives with equal weight.
accuracy =(true positives + true negative) / size of dataset

Also, we could use log loss If the classes are imbalanced.

project design

The project will be developed by completing the following tasks:

1. Download the input data
2. Preprocess the data and see If the classes are imbalanced

3. Create a Human Face detector using open cv library haar cascades
4. Create a general dog detector using a pre-trained model like VGG which is basically a sequence of convolution and pooling layers

5. Using transfer learning to create the dog breed classifier after dropping the classifier layer in the pre-trained model and attach the new one after changing the output number.
6. Take a raw image and return the dog breed.

The results will be obtained by comparing the model predict results with the True labeled result and measure the model accuracy
We will target an accuracy better than 60%