

Dog Breed Classifier Project Overview



Definition

Classification is the process of classifying things based on the similarity of features. It is a supervised learning approach in which the computer program learns from the data input given to it and then uses this learning to classify new observations. Classification is one of the several methods intended to make the analysis of very large datasets effective.

Some of the examples of classification using machine learning are:

- Sign Language Identification
- Speech Recognition
- Object Classification

Problem Statement

Dogs are people's best friends. However, there is literally countless number of dog breeds in the world. How can one tell what the breed of a dog is if first met or given a picture/video clip? This project aims to develop a deep leaning model using convolutional neural network framework that can distinguish a breed of a dog given a picture of the dog. The finished model should firstly feature the ability to distinguish whether the supplied picture is a dog or not. Secondly, the model should accurately identify dog breeds.

Metrics

The information is part into train, test and substantial dataset. The model is prepared utilizing the train dataset. We utilize the testing information to foresee the exhibition of the model on inconspicuous information. We will utilize precision as a measurement to assess our model on test information.

Accuracy = Number of things accurately characterized/All grouped things

Additionally, during model preparing, we contrast the test information forecast and approval dataset and figure Multi class log misfortune to locate the best performing model. Log misfortune assesses vulnerability of expectation dependent on the amount it fluctuates from real name and this will help in assessing the model.

Introduction

In this venture, I constructed and prepared a neural system model with CNN (Convolutional Neural Networks) move getting the hang of, utilizing 8,351 canine pictures of 133 varieties. CNN is a kind of profound neural systems, which is normally used to examine picture information. Regularly, a CNN engineering comprises of convolutional layers, actuation work, pooling layers, completely associated layers and standardization layers. Move learning is a method that permits a model created for an undertaking to be reused as the beginning stage for another assignment.

The prepared model in this venture can be utilized by a web or portable application to process genuine world, client provided pictures. Given a picture of a canine, the calculation will foresee the variety of the pooch. On the off chance that a picture of a human is provided, the code will recognize the most taking after pooch variety of that individual.

Fascinating and troublesome things in the task:

It was astounding to perceive how CNN calculation functions so well in pictures. There are 133 classifications and CNN does so well in anticipating those classes. The most troublesome part is building my own CNN calculation. Neural system has such a large number of parameters that it is hard to tune them. Be that as it may, on account of udacity's example model, which helped me to assemble my model with more prominent than one percent exactness.

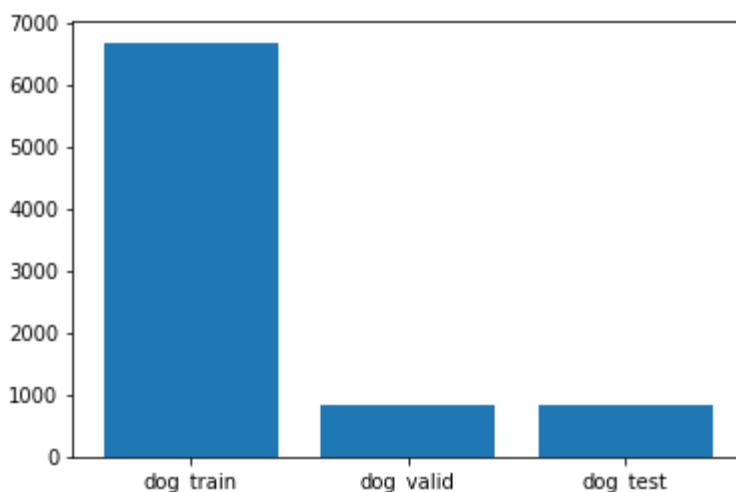
Load Datasets

The full dataset utilized by this task contains 8,351 pictures of 133 classifications of mutts. The information is isolated into three envelopes for preparing, approval, and test set. The `load_files` work from the scikit-learn library is utilized to import the datasets.

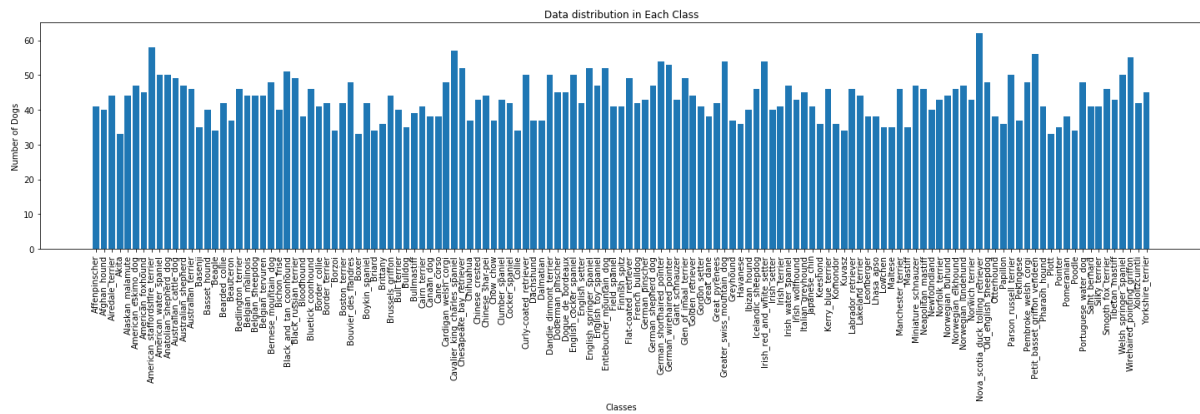
Analyze :

Here, in the Dog Breed Classification, the dataset contains the pictures of Dogs and Humans. There are a sum of 133 varieties, 8351 pictures for hounds. Utilizing these pictures as information, it must be handled by our requirements and a model must be intended to prepare our machine.

On making the investigation on the information, we see that the goals of the pictures are not the equivalent for all pictures of pooches in thier particular varieties. The pictures have a shifted goals and they should be resampled dependent on the necessity of our model. Here are some expamples of the pictures examined as far as goals:



The investigation on the circulation of information gives us the data on equalization or irregularity in the information. In the event that there is a loose side in the information past a specific edge, we should see that the information is adjusted by including applicable pictures. On the off chance that the equalization in the information is relatively close to the edge, it is acceptable to convey forward with the activity. Let us perceive how it functions with our information in the beneath figure. The plot shows an away from on breed class with the quantity of mutts.



Benchmarks

The benchmark for the model can be referenced to the Kaggle leaderboard for dog breed identification competition. The target for this model is to reach a multiclass loss score less than 0.01, which is in the top 100 of the competition. The other benchmark will be 80% prediction accuracy, which will be used as the upper limit. The benchmark set by Udacity will be 60% prediction accuracy, which will be used as the lower limit. The final performance of the model will sit in between the two limits.

The CNN model created from scratch must have accuracy of at least 10%. This can confirm that the model is working because a random guess will provide a correct answer roughly 1 in 133 times, which corresponds to an accuracy of less than 1%

Detect Humans

Since we need to recognize the most taking after pooch breed for an individual, a capacity should be composed to identify whether a human face exists in a picture. This undertaking utilized a preprepared face locator gave by OpenCV. If it's not too much trouble note that the information picture is changed over to grayscale before it is taken care of into the face course classifier.

Classify Dog Breeds using Transfer Learning with CNN

The full dataset has 8,351 pictures of dog, which isn't sufficiently enormous to prepare a profound taking in model without any preparation. Subsequently, move learning with VGG-19 (a convolutional neural system that is prepared on in excess of a million pictures from the ImageNet database) is utilized to accomplish generally great exactness with less preparing time.

Model Architecture

The last convolutional yield of VGG-19 is taken care of as contribution to the model. We just need to include a worldwide normal pooling layer and completely associated layers as pooch classifiers.

Train Model

The model is prepared utilizing the pre-registered bottleneck includes as info. A model check pointer is utilized to monitor the loads for best approval misfortune. At the point when all ages are done, the model loads with the best approval misfortune are stacked into the VGG19_model, which will be utilized later for expectations.

Predictions

At last, it is prepared to make forecasts. The VGG19_predict_breed work accepts a picture way as info, and returns the anticipated pooch breeds. The dog_breed_pred work is based on the past one, and profits anticipated outcomes depending for whether a pooch or a human is recognized in the info picture.

Results

The exactness of the last model on test dataset is about **83%**, which isn't terrible. Initially, I prepared a CNN model without any preparation without utilizing Transfer Learning. At that point, I made a CNN model utilizing move learning and VGG-19 with just one completely associated layer, and had the option to arrive at a precision of about 49%. At long last, I included a second completely associated layer to the classifier, and had the option to accomplish **83%** exactness.

The benchmark set was 80% of the accuracy and we got 83% so the benchmark is met.

Human Face indicator: The human face identifier work was made utilizing OpenCV's execution of Haar highlight based course classifiers. 98% of human faces were distinguished in initial 100 pictures of human face dataset and 17% of human faces distinguished in initial 100 pictures of canine dataset.

Dog Face locator: The canine identifier work was made utilizing pre-prepared VGG16 model. 100% of canine appearances were identified in initial 100 pictures of pooch dataset and 1% of canine appearances identified in initial 100 pictures of human dataset.

CNN using Transfer learning: The CNN model made utilizing move learning with ResNet101 design was prepared for 5 ages, and the last model delivered an precision of 83% on test information.

Precision on test information: 83%

Justification

I think the model performance is better than expected. The model created using transfer learning have an accuracy of 83% compared to the CNN model created from scratch which had only 13% accuracy.

Improvement

The model can be improved by adding more training and test data, currently the model is created using only 133 breeds of dog. Also, by performing more image augmentation, we can avoid overfitting and improve the accuracy. I have tried only with ResNet 101 architecture for feature extraction, May be the model can be improved using different architecture.

Some of the predictions from the model are:

There is no human or dog detected in this picture.



This dog looks like a `ages/train/037.Brittany`.



Conclusion

Because of the exchange learning strategy, I had the option to prepare a model with generally little dataset, and accomplished really great exactness. Moreover, the model was prepared inside a brief timeframe, which is very proficient. The fundamental explanation is we can reuse the loads prepared by AI specialists utilizing a great many pictures.

There are a couple of potential enhancements for the model. To begin with, the parameters of completely associated layers, for example, number of layers, number of hubs, dropout rates, may be changed to show signs of improvement results. Second, utilizing an alternate analyzer or assessment metric may likewise improve model execution. Third, information

expansion could likewise improve the last model exactness, as it will produce all the more preparing information.

Github Repo : <https://github.com/avkolte/Dog-Classifier-Project>