

Convolutional Neural Networks

Project: Write an Algorithm for a Dog Identification App

domain background

Image classification is a field within Machine Learning.

problem statement

The goal within this project is to classify images of dogs according to their breed. If the Human face is given as input it will suggest a dog breed.

datasets and inputs

Analysing the given Dataset:

<https://s3-us-west-1.amazonaws.com/udacity-aind/dog-project/dogImages.zip>

There are 133 total dog categories.

There are 8351 total dog images.

There are 6680 training dog images.

There are 835 validation dog images.

There are 836 test dog images.

In the dataset there is an average of about 63 pictures per breed including all type of coloured Labradors.

Yellow Labrador



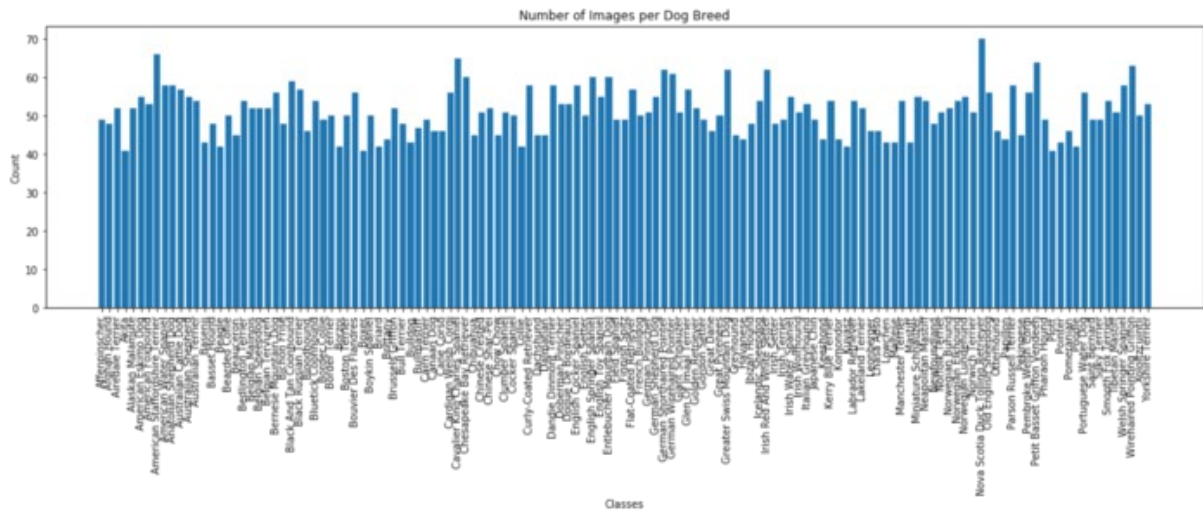
Chocolate Labrador



Black Labrador



We now have a detailed look at the distribution of the images over the various dog breeds. Within the training set we have an average of 51 images per breed with a minimum of 41 images, a maximum of 70 images and a std deviation of about 6. Therefor we can consider the dataset classes to be closely balanced.



solution statement — the solution proposed for the problem given;

We will use Convolutional Neural Networks (CNN) to make a model. CNN is a part of deep neural networks and can be used for classifying images.

Two different Convolutional Neural Networks (CNN) are trained within this investigation:

- A simple CNN
- A pretrained ResNet50

A CNN basically is a large set of tables that stores all the informations on how to link a feature set to some labels. The tricky part is to select the number of tables, the sizes and how to mathematically link them together. This structure can be thought of as filters that are applied to our images. Each of this filters point out a certain feature of the image i.e. a horizontal line and lead to a classification of the image.

VGGnet and Resnet proved to be very good for image classification in the ImageNet Large Scale Visual Recognition Challenge (ILSVRC): <https://image-net.org/challenges/LSVRC/>

The ResNet50 about 75%. Again its important to note that in the case of the ResNet we used transfer learning.

benchmark model

10% does not seem much at first. But as there are 133 different dog breeds random guessing would only result in less 1% correct guesses.

evaluation metrics

As we have shown the dataset classes are closely blanced therefor as metrics the accuracy is used.

You can find out more about different metrics here: <https://towardsdatascience.com/20-popular-machine-learning-metrics-part-1-classification-regression-evaluation-metrics-1ca3e282a2ce>

project design

The workflow is already defined in the Jupyter Notebook given by Udacity:

1. Step 0: Import Datasets
Load the image datasets for dogs and humans.
2. Step 1: Detect Humans
OpenCV is used to detect human faces.
3. Step 2: Detect Dogs
A Pre-trained VGG-16 Model is used to detect dogs in images.
4. Step 3: Create a CNN to Classify Dog Breeds (from Scratch)
Create a CNN that classifies dog breeds from scratch.
5. Step 4: Create a CNN to Classify Dog Breeds (using Transfer Learning)
Use transfer learning to create a CNN that can identify dog breeds.
6. Step 5: Write your Algorithm
Write an algorithm to solve the problem statement.
7. Step 6: Test Your Algorithm
Test of the algorithm on self-provided images.