

Dog Breed Classifier using CNN

Domain Background

The project is based on creating a classifier to classify different breeds of dogs using deep learning techniques such as a Convolutional Neural Network (CNN).

The project can be used to classify stray dogs and help with NGOs who work with Animal adoption and animal shelter to help people with the adoption and donation process.

Problem Statement

The main problem of the project is doing the necessary data cleaning and bringing the images in the format for the model to understand and predict. The end goal is to deploy the model as an end point to a web app and predict images of dogs that people upload.

Datasets and Inputs

The dataset is provided to us by Udacity. It includes images of dogs and humans and their corresponding labels.

- **Dog images dataset:** The dog image dataset has 8351 total images which are sorted into train (6,680 Images), test (836 Images) and valid (835

Images) directories. Each of this directory (train, test, valid) have 133 folders corresponding to dog breeds. The images are of different sizes and different backgrounds, some images are not full-sized. The data is not balanced because the number of images provided for each breed varies. Few have 4 images while some have 8 images.

- **Human images dataset:** The human dataset contains 13233 total human images which are sorted by names of human (5750 folders). All images are of size 250x250. Images have different background and different angles. The data is not balanced because we have 1 image for some people and many images for some.

Solution Statement

The solution is provided by a deep learning algorithm called Convolutional Neural Network (CNN) that understands various features of an image and can classify the images with capabilities of multiclass classification. The output will be a softmax of various classes. The solution is divided into three steps:

1. Understand the difference between dogs and human faces
2. Create a benchmark model with a pretrained model such as VGG16
3. Create my own model with hyperparameter tuning

Benchmark Model

The benchmark model will be a transferred learning model with a pretrained general purpose deep model. We can use the weights and build our model upon that. This model is not customized to understand our specific dataset. We need to then compare this model with our customized model and try to beat the score.

Evaluation Metrics

For this multi class classification, multi class soft prob will give a good indication of the probability of the value being in various classes and we can set a threshold or take the max and see which class shows the highest probability.

Project Design

Step 1: Import the necessary dataset and libraries, Pre-process the data and create train, test and validation dataset. Perform Image augmentation on training data.

Step 2: Detect human faces using OpenCV's implementation of Haar feature based cascade classifiers.

Step 3: Create dog detector using pretrained VGG16 model.

Step 4: Create a CNN to classify dog breeds from scratch, train, validate and test the model.

Step 5: Create a CNN to Classify Dog Breeds using Transfer Learning with resnet101 architecture. Train and test the model.

Step 6: Write an algorithm to combine Dog detector and human detector.

References

1. <https://towardsdatascience.com/a-comprehensive-guide-to-convolutional-neural-networks-the-eli5-way-3bd2b1164a53>
2. <https://towardsdatascience.com/applied-deep-learning-part-4-convolutional-neural-networks-584bc134c1e2>