

Udacity Nanodegree

Machine Learning Engineer

Capstone Project Proposal

CNN Project: Dog Breed Classifier

Domain Background

In this capstone project I will build a machine learning model which will process images. If an image of a dog is provided, the model will identify its breed. If an image of a human is provided, the model will identify the most resembling dog breed.

Problem Statement

Images of dog and humans will be provide as an input to the machine learning model.

1. **Dog Image:** If an image of dog is given, then the algorithm will identify it as a dog. It will then detect the breed of that dog.
2. **Human Image:** If an image of human is given, then the algorithm will identify it as human. After that the model will match it with the most resembling dog breed.

Datasets and Inputs

2 datasets will be used. These are provided by Udacity.

```
In [11]: ▶ import numpy as np
          from glob import glob

          # Load filenames for human and dog images
          human_files = np.array(glob("/data/lfw/*/"))
          dog_files = np.array(glob("/data/dog_images/*/"))

          # print number of images in each dataset
          print('There are %d total human images.' % len(human_files))
          print('There are %d total dog images.' % len(dog_files))

          There are 13233 total human images.
          There are 8351 total dog images.
```

1. **Human Dataset:** There are 13233 total human images
2. **Dog Dataset:** There are 8351 total dog images

Solution Statement

A Convolutional Neural Network (CNN) model will be built as a solution. This CNN model will estimate the breed of the provided dog image. If image of human is provided, instead of a dog image, then it'll mark it as human and will find the most resemblance with a dog breed.

Benchmark Model

1. **CNN Model created from scratch:** It must have an accuracy of 10%.
2. **CNN Model created using Transfer Learning:** It must have an accuracy of 60%.

Evaluation Metrics

I am planning to use accuracy as an evaluation metric, compared to the benchmark model.

Project Design

I'll complete the project with below 7 steps.

1. **Import Datasets**
Import and pre-process data. Define test, train and validation set.
2. **Detect Humans**
Using OpenCV's implementation of Haar feature-based cascade classifiers to detect human faces.
3. **Detect Dogs**
Using Pre-trained VGG-16 model for dog detection.
4. **Create a CNN to Classify Dog Breeds**
Create from Scratch and attain a test accuracy of at least 10%.
5. **Create a CNN to Classify Dog Breeds**
Create using Transfer Learning and attain accuracy of 60%.
6. **Write Algorithm**
An algorithm will be written. It will analyze an image and determine whether the image contains a human or dog.
 - a. If a dog is detected in the image, the predicted breed will be returned.
 - b. If a human is detected in the image, the resembling dog breed will be returned.
 - c. If neither is detected in the image, an error will be provided.
7. **Test Algorithm**
In this part I will test the algorithm with some real-life images.