

Udacity Machine Learning Capstone Project

Dog Breed Project

Proposal

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## Domain Background:

Dog Breeds identification importance can exceed the problem itself. First of all, its a direct examination that can tell how far the accuracy of CNN can reach. It's a direct application of using CNN in real life application. Furthermore, Identifying the breeds of dogs is important in many other applications. Many features of dogs can vary from a breed to another. Identifying the breed itself is step 0 in figuring out many deeper information about the dog. For example, its age, medical state, from the bio metric features could indicate its instantaneous psychological state if he sad, happy, angry ... etc. As stated previously any other further application on extracting whatever information of dogs out of its images is basically dependent on breeds classification.

## Problem Statement:

The problem is divided into two basic tasks. Firstly, Identifying whether object in the image is a dog or a human Secondly, if the object is a dog, the breed of the dog is identified.

## Data sets and Inputs:

The Data set used contains 8351 images for dogs of 133 different breeds. Data is divided into:

training	6680 images	nearly 50 images for each class
testing	836 images	nearly 6 images for each class
validation	835 images	nearly 6 images for each class.

Also there are 13233 images of Humans.

## Solution Statement:

CNN is one of the most Artificial Neural Networks as regularized versions of MLP (Multi layer Perceptrons) [1]. In image classification, CNN is considered to score the state of art as they achieve higher accuracy. This high score comes from its ability to extracting features from images. Furthermore, CNN uses relatively little preprocessing compared to other image classification algorithms. It takes advantage of the hierarchical pattern in data and assembles more complex patterns using smaller and simpler patterns. With the help of CNN, we can use the large amount of data more effectively and accurately[1]. However, since the problem is not just classifying Dogs and humans, we are further interested in identifying the breed of dogs. Therefore, the algorithm of detecting the breed could be more sophisticated. Firstly, we would identify humans and dogs using openCV. Afterwards, the implemented CNN's main role is to classify images predicted to be of dogs to the suitable dog breed.

## Benchmark Model:

two models were investigated. Both of the models share some similarity in their methodologies. These two models are chosen specifically since their score has a gap in between. it's intended to study their methodologies to compare their project design solution and compared to mine, I will study the effect of each parameter on the model accuracy. Both of the models used CNNs. Furthermore, they both used ResNet50 pre-trained weights to detect human faces and dogs. Also, They both used OpenCV's implementation of Haar feature-based cascade classifiers is used to detect human faces from images. Despite this, the first model scored 86% test accuracy while the second model scored only 76% test accuracy. The critical differences between the both methodologies is going to be further examined. More details about both models can be found in [2] and [3].

## Evaluation Metrics:

Since the number of sample images is nearly evenly distributed among the different breeds of data in the training set, it's better to use accuracy as the evaluation metrics.

## Project Design:

The project Design is intended to be as stated in the original notebook offered by Udacity. The flow is divided into 6 main steps as follows:

Step 0: Import Datasets

Step 1: Detect Humans

Step 2: Detect Dogs

Step 3: Create a CNN to Classify Dog Breeds (from Scratch)

Step 4: Create a CNN to Classify Dog Breeds (using Transfer Learning)

Step 5: Write your Algorithm

Step 6: Test Your Algorithm

## References:

[1] <https://mc.ai/dog-breed-classification-using-cnn/>

[2] <https://towardsdatascience.com/deep-learning-build-a-dog-detector-and-breed-classifier-using-cnn-f6ea2e5d954a>

[3] <https://towardsdatascience.com/dog-breed-classification-using-cnns-f042fbe0f333>