UDACITY MACHINE LEARNING ENGINEER NANODEGREE

A Capstone Proposal on
the Dog Breed Classifier Project.

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Domain Background

Generally, the dog is one of the most varied species of animals on the planet. Therefore, having a well-classified dog breed would help us to determine an exact dog with its unique characteristics.

Problem Statement

To identify the particular breed of a dog successfully, these were the steps that had to be put into consideration.

1. It must recognise an image to ensure it is a human or a dog in it.
2. A successful classification of the dog breeds with an algorithm accuracy of nothing less than 60% is desired.

Dataset and Inputs

The datasets used in this project were provided by Udacity and they are:

1. The dog dataset comprises of 8,351 dog images which are sorted into the "train", "test" and "validation" folders that contain images for "133" dog breeds. There are also "6680" dog images in the training set,

"836" images in the test set, and "835" images in the validation set. Link to the dataset:- https://s3-us-west-1.amazonaws.com/udacity-aind/dog-project/dogImages.zip

2. The human dataset comprises 13,233 dog images. Also, this dataset is not balanced because we have 1 image for some people and many images for others. Link to the dataset:- https://s3-us-west-1.amazonaws.com/udacity-aind/dog-project/lfw.zip

Solution Statement

The solution is to design a Convolutional Neural Network (CNN) that can estimate the breed of a dog in any of the images appropriately and these were the steps taken:

1. The needed datasets are obtained and downloaded first as mentioned in the "Datasets and Inputs" section.

2. I made use of Open Cv's implementation of "Haar feature-based cascade classifiers" to detect human faces in images.

3. I made use of a pre-trained model, "Resnet-50" from ImageNet to process the images and predict the breed that matches the best out of the 133 breeds.

4. Lastly, an algorithm is written to classify whether an image is human to return the resembling dog breed, a dog breed, or neither.

Benchmark Model

1. The CNN model created from scratch must have an accuracy of more than 10% at least.
2. The CNN model created using "transfer learning" that can identify dog breeds from images must attain at least more than 60% accuracy

Evaluation Metrics

The accuracy percentage of 60% is sufficient to judge how well the model is performing.

Project Design

This represents the workflow of the completed project:
1. Getting the datasets: The human and dog datasets were obtained and downloaded to be used for this project.

2. Detecting humans: Once the data has been gotten successfully, human faces are detected by using the Open Cv's mode of implementation, and the pre-trained face detector extracts the number of faces that are found.

3. Detecting dogs: The pre-trained model from ImageNet - Resnet-50 is used to identify dog breeds from images.

4. Classification of the dog breed: Built a classifier using CNN to classify the dogs whilst using Pytorch and transfer learning models.

5. Writing an algorithm for output: To determine and test which of the images contain a human so as return the resembling dog breed, a dog breed, or an error that indicates neither.

References:

1. *Sean Kane, Dogs are the most bizarre species on Earth, and these photos prove it [Blog post]. https://www.businessinsider.com/dog-breed-diversity-same-species-2016-2?IR=T*