

**Udacity ML Nanodegree  
Capstone Project**

Of

**Dog-Breed Classification**

by

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## **Domain background:**

The research area focuses on providing the computer with the ability to distinguish between things as if it has an eye like human beings.

In the social media field, there is a try to generate an automatic description of images.

This generation is done by collecting each description of each image, then to use these descriptions to predict the description of further images.

Here we are combining these two aspects in this project, so this is a computer vision problem, and we are solving a dog breed classification problem.

## **Problem statement:**

The problem is a multi-label classification problem.

The input data should be an image of a human or a dog.

The model is to predict which is the image of.

If the image contains a dog, then predict its breed, and if it contains a human, then the model is to assign the most similar dog breed.

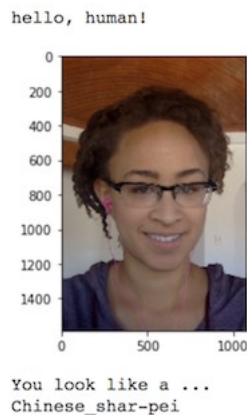
## **Dataset and inputs:**

The data set saved in Udacity storage.

It includes 13233 images of human and 8351 images of dogs of 133 breeds.

- 1) The training data set contains 6680 images.
- 2) The validation data set contains 835 images.
- 3) The test data set contain 836 images.

## Data samples and expected output:



## Solution statement:

It's a multi-label classification problem to be solved by the CNN algorithm.

Firstly, to classify the image to a human or a dog by a pre-trained model.

In the case of a dog, the model is to classify it to its correct breed.

In the case of a human, the model is to find the closest breed similar to him.

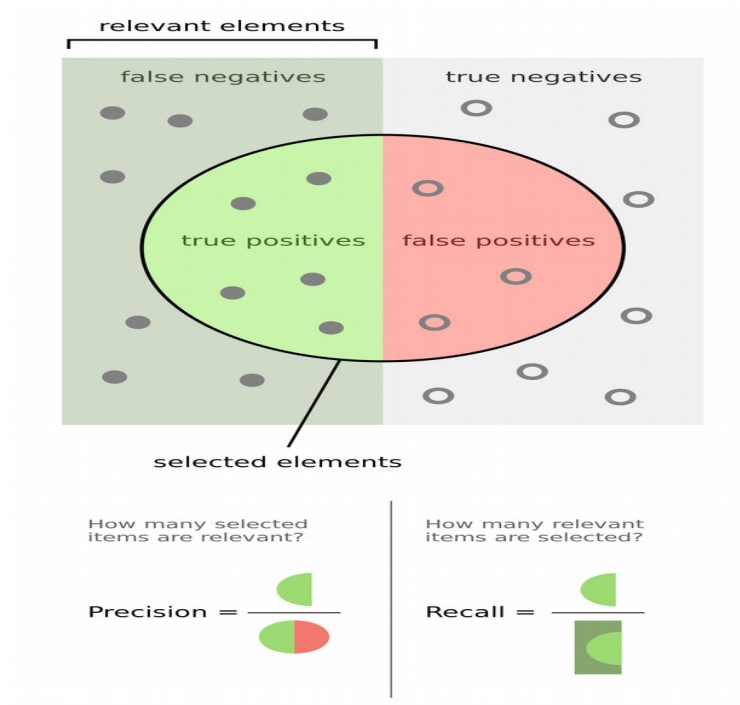
## Benchmark Model:

We will use a simple CNN model implemented from scratch and with few layers as a benchmark model.

## Evaluation Metrics:

We will evaluate the model according to accuracy, precision and recall.

$$accuracy = \frac{correct}{correct + incorrect}$$



## Project Design:

- 1- Import Datasets
- 2- Detect Humans by openCV library
- 3- Detect Dogs by pre-trained model (VGG-16 model )
- 4- Create a CNN to Classify Dog Breeds (from Scratch)
- 5- Create a CNN to Classify Dog Breeds (using Transfer Learning)
- 6- Model evaluation against accuracy, precision and recall.