

Machine Learning Engineer Nanodegree

Capstone Proposal

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Proposal

Domain Background

Machine learning, a well-known subset of Artificial Intelligence, is widely used to make predictions and decision that help achieving goals without being explicitly programmed to do. Deep learning is known a one of the famous members of machine learning family. Deep learning uses neural network to make decision that affect real life. Deep learning applications include computer vision, speech recognition and social networks filtering.

Dog, also known as man's best friend, have a strong bond with humans in a long bond that traced back at least 15,000 years ago. Dogs have a various number of breeds. One of the difficult tasks are identifying a dog's breed due to large number of breeds. The challenge in this project is using deep learning Convolutional Neural Network to perform image classification to identify a dog breed.

Problem Statement

The objective of this project is designing an algorithm that could be used in either a mobile application of a website that will run by taking a user input data, in this case it is going to an image, and use deep learning Convolutional Neural Network to identify what is found in the picture. If a dog is found in the picture, the algorithm will display the estimated dog's breed. In another case, if human face found in the picture, the algorithm will display the most dog breed resembling.

Datasets and Inputs

In order to begin working on the model, first we need to have a data set that contains dogs and human images. As for, Udacity has provided a large dataset that contains 13233 human images and 8351 dog images referenced with the dog breed that will be used in

this project to classify them into 133 dog breeds. The images will be distributed into three categories include training, validating, and testing. All the images are different in sizes and shapes. As a result, the images will be normalized to be square images with a size equal to 224 by 224 pixels.

Solution Statement

The solution will be as follows, first we need to detect the human face where it will be used to display a dog breed resembling and the detection will be done using OpenCV's implementation of Haar feature-based cascade classifiers. After that, we need to detect the dog images and it will be done using a Pretrained VGG-16 Model. Furthermore, we will create a CNN from scratch, and it will help in classifying the dog breeds. Next, we will use transfer learning to create a CNN that can identify dog breed from images. After that, we will write an algorithm that will takes a file path of an image and determines whether the image contains a human, dog, or neither. Also, it will return the predicted breed if a dog is detected in the image. Moreover, it will return the resembling dog breed if a human is detected in the image. Other than that, it will provide output that indicates an error if neither a dog nor human is detected in the image.

Benchmark Model

In the creation of the Convolutional Neural Network from scratch to classify dog breeds, we attempt to attain a test accuracy of at least 10%. In the step of the use of transfer learning to create a CNN that can identify dog breed from images, we attempt to attain at least 60% accuracy on the test set.

Evaluation Metrics

When it comes to evaluation metrics, we will focus on finding the accuracy which represent the percentage of the correct predictions that has been done on the test data. In, the creation of the Convolutional Neural Network from scratch to classify dog breeds, we attempted to attain a test accuracy of at least 10%. In the step of the use of transfer learning to create a CNN that can identify dog breed from images, we attempted to attain at least 60% accuracy on the test set.

Project Design

The design of this project can be described in a number of steps that are going to be followed in the implementation of this project and they are as follows:

1. Importing all the datasets
 2. Working on the steps of detecting human images.
 3. Pre-processing the dog images dataset to reshape and resize the images.
 4. Working on the steps of detecting dog images.
 5. Creating a CNN to classify dog breeds (from scratch)
 6. Creating a CNN to classify dog breeds (using transfer learning)
 7. Writing an algorithm to process the predictions.
 8. Test the algorithm
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