

Capstone Proposal: Machine Learning Engineer Nanodegree

Dog Breed Classifier using CNN

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Domain Background

Image classification is one of the fundamental and the trending topic in the field of Machine Learning and Deep Learning. This also include real world image processing and computer vision problems. Today, researchers are trying to classify different objects in an image. Classifying of animal and its breed is also one of them and is highly appreciated among animal lovers. In this project, we will be using Convolutional Neural Network (CNN) to predict the breed of the dog in the given image. Also, if a human image is given, we will be predicting the label that closely resembles dog breed.

Problem Statement

The primary goal of this project is to do the following tasks using CNN:

- i. Given an image of the dog, the model should predict its breed
- ii. If human is detected in image, the model should predict resembling dog breed

Datasets and Inputs

For this project, the dataset is provided by Udacity. The dataset contains the image of dogs and humans.

Dog Dataset: The dog dataset has 8351 images and is saved in the location /dog_images. The dimension of each image is not same. We have 133 types of dog breed and the dataset is imbalanced

Human Dataset: The human dataset has 13233 images and is saved in the location /lfw. The dimension of each image is same i.e. 250X250

Solution Statement

For this problem, I will be using Convolutional Neural Network (CNN) model to predict the breed of the dog. I will use multiple convolutional layer each followed by max pooling. This will reduce the complexity of the model. I will consider using Rsenet50 library for improving feature engineering and transfer learning for the dog breed classification.

Benchmark model

Pre-trained VGG-16 model can be a benchmark model. VGG-16 model, with weights that have been trained on ImageNet (a well-known very large and popular dataset used for image classification and other computer vision problems).

Evaluation Metrics

Evaluation metrics include accuracy and F1 score.

F1 score will be used as the data is imbalanced.

Project Design

We will be using the following steps as project design.

Step 1: Importing necessary dataset and libraries.

Step 2: Explore and pre-process data and split data into train and test.

Step 3: Use OpenCV's implementation of Haar feature-based cascade classifiers to detect human faces

Step 4: Use pretrained VGG16 model to create dog detector

Step 5: We will apply customized-built CNN model to train the dog images for dog breed classification

Step 6: We will apply Resnet50 and transfer learning to compare the performance of the customized CNN model and the transfer learning results

Step 7: Create an algorithm to combine Dog detector and human detector

References

Original repo for Project - GitHub: <https://github.com/udacity/deep-learningv2pytorch/blob/master/project-dog-classification>

Pytorch Documentation: <https://pytorch.org/docs/master/>

Resnet101: <https://pytorch.org/docs/stable/modules/torchvision/models/resnet.html#resnet101>

ImageNet training in Pytorch:

<https://github.com/pytorch/examples/blob/97304e232807082c2e7b54c597615dc0ad8f6173/imagenet/main.py#L197-L198>