Capstone Project
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Machine Learning Engineer Nanodegree
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Dog Breed Classifier using CNN

Domain Background

This Dog breed classifier is a notable issue in ML. The issue is to distinguish a type of canine if a dog picture is given as information, whenever provided a picture of a human, we need to recognize the looking like dog breed. Here, the main thought is to fabricate a pipeline that can procedure true client provided pictures and distinguish a gauge of the canine's breed. This is a multi-class arrangement issue where we can utilize managed AI to take care of this issue. Subsequent to finishing this model, I am wanting to manufacture a web application where the client can include a picture and get predictions from this model. This venture offers me a chance to fabricate and send ML models, thus I have picked this as my capstone project.

Problem Statement

The major goal behind this project is to build a machine learning model that can be used within web app to process real-world, user-supplied images. The algorithm has to perform two tasks:

Dog face detector: Given an image of a dog, the algorithm will identify an estimate of the canine's breed.

Human face detector: If supplied an image of a human, the code will identify the resembling dog breed.

Datasets and Inputs

For this project, the info group must be of picture type, since we need to enter a picture and recognize the type of the canine. The dataset for this task is given by Udacity. The dataset has pictures of canines and people.

 Dog images dataset: The canine picture dataset has 8351 all-out pictures which are arranged into a train (6,680 Pictures), test (836 Pictures) and substantial (835 Pictures) catalogs. Every one of this index (train, test, legitimate) has 133 envelopes comparing to dog breeds. The pictures are of various sizes and various foundations, a few pictures are not full-sized. The data appears to be unbalanced because the number of pictures accommodated each breed changes. Few have 4 pictures while some have 8 pictures.

 Human images dataset: The human dataset contains 13233 total human images which are sorted by

names of human (5750 folders). All images are of size 250x250. Images have different background and different angles. The data is not balanced because we have 1 image for some people and many images for some.

Solution Statement

For playing out this multiclass order, we can utilize the Convolutional Neural Network to take care of the issue. A Convolutional Neural Network (CNN) is a Profound Learning calculation that can take in an information picture, allocate significance (learnable loads and inclinations) to different angles/questions in the picture and have the option to separate one from the other. The arrangement includes three stages. To begin with, to recognize human pictures, we can utilize existing calculations like OpenCV's execution of Haar highlight based course classifiers. Second, to distinguish dog pictures we will utilize a pre-prepared VGG16 model. At long last, after the picture is distinguished as canine/human, we can pass this picture to a CNN which will process the picture and anticipate the breed that coordinates the best out of 133 breeds.

Benchmark Model

- The CNN model made without any preparation must have a precision of in any event 10%. This can affirm that the model is working in light of the fact that an irregular supposition will give a right answer approximately 1 of every multiple times, which compares to the exactness of under 1%.

- The CNN model made utilizing move learning must have an exactness of 60% or more.

Evaluation Metrics

For this multi-class classification, Multi-class log loss will be utilized to evaluate the model. Due to the awkwardness in the dataset, the precision can't great marker here to quantify the presentation. Log loss considers the vulnerability of forecast dependent on the amount it changes from the real name and this will help in evaluating the model.

Project Design

Stage 1: Import the fundamental dataset and libraries, Pre-process the information and make train, test and validation dataset. Perform Image augmentation in preparing information.

Stage 2: Distinguish human faces utilizing OpenCV's usage of Haar feature based cascade classifiers.

Stage 3: Make a Dog identifier utilizing a pre-trained VGG16 model.

Stage 4: Make a CNN order dog breeds from scratch, train, validate and test the model.

Stage 5: Make a CNN to Order dog Breeds utilizing transfer Learning with resnet101 design. Train and test the model.

Stage 6: Compose a calculation to consolidate the Canine detector and human detector.

- If dog is detected in the image, return the predicted breed.

- If human is detected in the image, return the resembling dog breed.

- If neither is detected, provide output that indicates the error.

References

1. Original repo for Project - GitHub:
https://github.com/udacity/deep-learning-v2-pytorch/tree/master/project-dog-classification

2. Resnet101:
https://pytorch.org/docs/stable/_modules/torchvision/models/resnet.html#resnet101

3. Pytorch Documentation: https://pytorch.org/docs/master/

4. Imagenet training in Pytorch:
<https://github.com/pytorch/examples/blob/97304e232807082c2e7b54c597615dc0ad8f 6173/imagenet/main.py#L197-L198>

5.
https://adeshpande3.github.io/A-Beginner%27s-Guide-To-Understanding-Convolutional-Neural-Networks/