Project Overview:

The project focuses on classifying the breed of a dog with the help of VGG model from Pytorch, a customized CNN and Resnet with the help of Transfer learning. The problem statement is to solve the recognition of dog breed from images provided to it.It should recognize whether the object present in an image is a dog or a human.
It should also identify the type of dog(breed)
It should also detect human if present and detect the breed of dog that human resembles to.
The solution aims to do this by means of following ways as provided to us in the provided jupyter Notebook:
1. Do the classification with the help of pretrained model(VG Net)
2. Do it with the help of a CNN (defined layers).
3. Do it by means of transfer learning on Resnet.

Problem Statement:

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Metrics:
Evaluation metric plays an important role for assessing the problem.
This is a computer vision problem that includes classification.
Here in our dataset there is class imbalance and some other critical parameters due to which Precison and Recall can be great choice for evaluating our model

Data Exploration:

Data plays a major role in the accuracy of the trained model.It is a well known phrase "Garbage in Garbage out". So Data plays a major role in

determining the accuracy of the model.The data set used for this problem consists of images of Dogs , Humans. The model is trained on this dataset which contains images of dogs of different breeds which eventually helps us to make predictions with our model.

The Dog Images dataset has 8351 images with 133 categories and the Human Images data set has 13233 human images.

After some analysis I discovered that

Dog Images Dataset:

This dataset has 8351 images with around 133 new categories.
The images are of different sizes.The dataset is not balanced because no of images provided each class differs. On class may have different no of images while the other class may have different no of images.

Human Images Dataset:

The human images dataset consists of 13233 total images. These images are furthur sorted by names of humans in 5750 folders. The dimensions of images is 250 by 250 pixels. This data set is also not balanced. All the images have different angles and background.

Algorithms and Techniques:

In order to solve this problem, I have used the technique called Deep Learning and Computer Vision. The algorithms which I have use for solving the problem include VGG net, Customised CNN, Resnet with transfer learning.In Deep learning and Computer Vision a CNN or Convolutional Neural Network is a class of deep neural networks which are used to solve problems related to visual imagery. It is an algorithm which can take in an input image and extract the features train on such images and then predict and recognize objects from such similar images.A CNN consists of Convolution layer, pooling layer, padding layer and fully connected layer.In this particular problem, The CNN is fed with the

training images of dogs and humans and then when the CNN is trained it is tested on data for predicting the breed of dog among the 133 classes.

Benchmark:
The benchmark model for this problem can be Resnet model trained using transfer learning. It should predict dog breeds with high precison which means our dog classifier is trained well.It should possess atleast 60 percent accuracy.The CNN model which I have created should possess some accuracy to understand that the model is working.It should be able to classify one dog breed from 133 classes.This makes sure that the model is working.It should be able to predict with high precison and high recall.

Data Preprocessing:

First of all the data that is all the image are resized to a uniform size. After that in order to reduce overfitting the Image Augmentation is done in which the images are rotated and flipped randomly. After that images are converted to tensors before feeding to the model.

Implementation:

Here I have firstly used the pre trained VGG model , then customized CNN and then The Resnet with transfer learning. The customized CNN which I have implemented consists of three convolutional layers.The kernel size in in convolutional layers is three and the stride size is one.The first convolutional layer takes the input image and the last convolutional layer gives the output as 128. The activation function which I used is Relu .I researched a lot about which activation function I should use.Finally I came up with Relu function. The Pooling layer is used which reduces the input size by 2. At the end there are fully connected layers which classify the dog breed from 133 categories.

Refinement:

The customized Convolutional Neural Network which I have implemented has above 75% accuracy . It meets the benchmark but it can be improved by various methods. We can use Image augmentation of data. I have used transfer learning. I have improve the accuracy by means of transfer learning. In order to implement transfer learning I have used the model Resnet with the help of pytorch library.The Resnet model consists of 101 layers. It is pretrained on the Image Net data and has decent accuracy. It is a Deep Neural Network.The output of the last convolutional layer of Resnet is fed as an input to our model.I have added a fully connected layer so that it can classify among the 133 categories.The model then did well and as compared to customized CNN it gave around 7-8% accuracy

Model Evaluation:
 Human Face detection : The human face detection is done with the help of the library Open CV. There are haar cascades in Open CV which are pre trained classifiers. It detected faces with around 99 percent accuracy which is good.
Dog face detection: The dog face detection was done using the VGG pretrained model It performed pretty well.Almost every dog face was deteted in the first hundered images of dogs.

Convolutional Neural Network with the help of Transfer Learning:

The Convolutional Neural Network that is created using Transfer learning performed in a great manner. It had an accuracy above 75 percent .
Because of using Resnet for transfer learning the results were good as compare to the customized CNN.

Justification:

According to me the performance of the model is great. It performed very well as compared to the customized CNN. The accuracy of the model with transfer learning is above 75 per cent which is great as compare to the CNN.

Improvement:

The improvement in the performance can be done in various ways. Like more training and test data can be used to increase the accuracy of the model. Along with that Image augmentation can also be done. There may be a possiblity that some other architecture may perform better in case of transfer learning.I have used Resnet may be another architecture may perform well.

References:

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