UDACITY MACHINE LEARNING NANODEGREE CAPSTONE PROPOSAL

YUSUF OLODO

APRIL 27TH, 2020

DOMAIN BACKGROUND

The domain chosen for this capstone project is convolutional neural networks for image classification. The aim is to build a pipeline that can be used within a web or mobile app to process real-world, user-supplied images. Given the image of a dog, the algorithm will make a prediction on the breed of the dog and when supplied a human image as input, it will make a prediction on the most resembling dog breed.

Image classification is one of the most exciting fields in machine learning and deep learning because it can be used in a plethora of applications such as self-driving cars, face-recognition, chess-playing competitions and many more.

The convolution neural network (CNN) developed in recent years has been widely used in the field of image processing because it is good at dealing with image classification and recognition problems and has brought great improvement in the accuracy of many machine learning tasks. It has become a powerful and universal deep learning model [1].

PROBLEM STATEMENT

The main objective to solve in this project is to improve dog breed classification. This application can be useful in veterinary medicine for identifying the different breeds of dogs,including pet shelters. This will also help in search engines, as the algorithm can easily detect dog breed pictures accurately. As a fun element to the project, the algorithm will also predict the closest resembling dog breed to an human image. Accuracy of predictions can be easily measured and models can be trained to reduce loss function using gradient descent and backpropagation methods.

DATASETS AND INPUTS

- Dog images Dataset containing 133 folders with each folder, a different dog breed, there are 8351 dog images.
- Human images dataset consists of 13233 images.

These images will be pre-processed into tensor float point values that can be passed into the model input.

SOLUTION STATEMENT

The proposed solution is to apply deep learning techniques such as convolutional neural network (CNN) and to classify the dog images and predict the breed of the dogs. Implement the CNN model architecture, specify the loss function and the optimizer, train and validate the model and finally test the model.

Also use transfer learning with pre-trained models such as VGG16 and resnet50 to compare the performance of the built-model with the pre-trained model.

Build an app that will take in dog and human images as input and output the breed of the dog or the closest dog breed the human image resembles.

BENCHMARK MODEL

For the benchmark model, we will use Pytorch's pre-trained models using the transfer learning approach:

- Resnet50
- VGG 16
- Inception V3

EVALUATION METRICS

The evaluation metric for the built model is the test accuracy. The main goal whilst training the model is to minimize the Cross Entropy Loss function.

PROJECT DESIGN

- Import Datasets for Human and Dog Images
- Detect Humans Images using pre-trained Pytorch models
- Detect Dogs Images using pre-trained Pytorch models
- Create a CNN to Classify Dog Breeds (from Scratch)
- Create a CNN to Classify Dog Breeds (using Transfer Learning)
- Write your Algorithm that accepts an image as input and first determines whether the image contains a dog, human or neither and then goes on to determine the breed of the dog it is a dog, return a resembling dog breed if it's human or return an error if it's neither.
- Test the Algorithm on a test dataset.

REFERENCES

1. Xin, M., Wang, Y. Research on image classification model based on deep convolution neural network. J Image Video Proc. 2019, 40 (2019). https://doi.org/10.1186/s13640-019-0417-8