

Udacity Machine Learning Capstone Project Proposal

Dog Breed Classifier

- **Domain Background**

Computer Vision has played very important role in solving critical problems in different industries like automobile, health care, security services etc. One of the well-known examples for image classification is dog breed classification. One can classify dog breeds based on characteristics like color, hair, shape of tail or face, however with breeds which are very close in terms of these characteristics there is need for automation. Machine learning supervised learning comes in play in such scenario. Many times, when people who are looking to get dog as pet might want to know breed of dog. e.g. Labradors come in yellow, chocolate, and black with machine learning we should be able to identify this intra-class variation.

My interest in selecting this project is to learn about image classification using CNN. Coming from data engineering background this project would give me opportunity to learn to create model, test and validate its accuracy. Use various techniques, pre trained models like ResNet50, VGG16. This pipeline will accept the image of dog and identify its breed.

- **Problem Statement**

Goal of this project is to estimate dogs breed for the image provided. If the human image is provided instead dog it will show closest matching dog breed for human face.

- **Datasets**

Datasets for this project is image since we are classifying dogs breed based on input image. Images are provided on Kaggle website which includes both human and dog images. There are total 8531 dog images which is split into train, test and valid folders. Images are of different size & backgrounds. Number of images provided varies for each breed in each folder. Total 133 dog breed images are provided.

Human dataset contains 13233 image files. All images are of size 250X250.

- Solution Statement

To perform multiclass image classification, CNN (Convolutional Neural Network) is one of the best or most popular technique in computer vision. There are 3 steps in project. First step is to detect human images. For this purpose, I have used OpenCV's haar feature based cascade classifier.

2nd step is to identify dog images. For this I have used pretrained VGG16 model. Finally, once image is identified as dog/human this image is passed to CNN model to predict the closest matching breed out of 133 breeds.

- Benchmark Model

The CNN model created from scratch with accuracy of more than 10% will be used for benchmark. This should be enough because random guess would be 1 in 133 which are less than 1%. CNN model created from transfer learning should have accuracy of 60% or above.

- Evaluation Metrics

For this project I will compare performance of my model with benchmark model. Therefore accuracy. Is used as an evaluation metrics.

- Project Design

Following are the steps/strategy

1. Import dataset. Dataset was available on Kaggle. I downloaded data and then uploaded to S3. It was then downloaded from S3. Datasets mentioned above is used.
2. As step 2, I have created function to detect human images. For this purpose OpenCV model provided by Haar Cascade is used. haarcascade_frontalface_alt.xml model is used.
3. Then I have used pretrained VGG16 model to detect dog images. This is trained model on ImageNet dataset.
4. Create CNN model from scratch to classify dog breeds. Then will train, validate and test the model.
5. Then I will create CNN using transfer learning to classify dog breeds. ResNet50 pretrained model is used. Model is trained with dog dataset and fined tuned.
6. Writing algorithm- In this step all above steps are built together. By providing input as image it will detect if its human or dog image and then it will estimate dog breed using model from step 5.
7. In this step algorithm in step 6 will be tested by providing input image.

References

<https://www.kaggle.com/subhagatoadak/dog-breed-classifier-udacity>
<https://www.kaggle.com/c/dog-breed-identification>

https://docs.opencv.org/3.4/db/d28/tutorial_cascade_classifier.html