PREDICTING DOG BREEDS USING CONVOLUTIONAL NEURAL NETWORKS

Efehan Danışman

20.10.2020

1.Domain

Image classification is a growing field with recent breakthroughs. Dog breed classification is a problem that comes from this domain and aim to classify dog breeds. Certain models that can used as pre-trained models are behind this breakthrough as state-of-the-art models such as ImageNet, VGG-16, ResNet50 and EfficientNet[1].

I would like to work in this field since I am relatively inexperienced in image classification and see this as a way to improve my skills. The problem is also interested since it is harder to solve than binary problems with two-classes.

2. Problem

Problem I would like to solve is classifying dogs according to their breeds that can be used in an app or website. End product (our model) has two main tasks: estimate the dog's breed and in case of a human face, estimate the most similar dog breed to that person.

3. Dataset

Since the project is suggested by Udacity, datasets are given.

For the dogs dataset, there are 8351 images with 6680 of them for training, 836 of them for testing and 836 of them for validation. Data is not balanced due to variety of dog breeds and images are not standard with one format. There are also various backgrounds.

For the humans dataset, we have 13233 images with 250x250 size.

4. Proposed Solution

Besides using pretrained VGG16 which is required at the project rubric for detecting dog images, I will also try at least one other pretrained model along with a custom CNN architecture in order to find the best model.

I will first try to detect human images using a pretrained model then detect dog images and lastly classify according to dog breeds.

5. Benchmark to Beat

Benchmark is 10% accuracy which looks low, however reasonable given the high number of dog breed categories.

6. Evaluation

[1]https://github.com/onnx/models#image_classification

Different evaluation metrics will be checked such as accuracy, precision, recall and F1 score in order to find the optimal model. Since this is an imbalanced dataset, I will also consider multiclass logloss.

7. Project Design

a) Import dataset and libraries

b) Load images and preprocess them

c) Detect human faces

d) Detect dogs

e) Classify dog breeds

f) Combine the models to produce the final output