Udacity Machine Learning Nanodegree

Capstone Proposal

Classifying Dog Breeds

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Domain Background

Convolutional Neural Networks (CNN or ConvNet) is one of techniques used in machine learning and it is a one of types that used in field of classification . It can be used to classify images, recognize objects or find a particular property in image .

The main purpose of ConvNet is extraction of properties of input image through using small parts of pixels is called kernel . CNNs have been become better than humans at classification problems. Now, CNNs are applied to more and more narrow fields like Banking, Insurance, Document digitization - Optical Character Recognition “OCR”.

Problem Statement

Image classification means to categorize image pixels into specific type of classes. In our case, we have a list of classes of dogs and upon an input of a random dog/human/non- dog image, we would like to return the correct class of dog breed. In the case of human image, we would like to return a class of dog breed lookalike. In the case of non-dog/non- human image we should return an error means that it is strange object .

Datasets and Inputs

The dataset was shared by Udacity. The dataset includes 13233 images of humans and 8351 images of dogs. Every image of humans is of size 250 x 250 x 3 The images of dogs don’t have a constant size.

Solution Statement

The aim is to create a CNN-based classifier that can correctly classify each of the 133 dog breeds. In order to classify the dog breeds properly, I am designing a deep neural network and then training the network on the supplied datasets. In the end, the classifier can differentiate between dog breeds as well as dogs and humans and non-human/non-dogs.

We will use the evaluation metrics to compare the the performance of the classifier against the benchmark models in the next section.

Benchmark Model

For the benchmark model, we will use models that have performed well on a similar dataset of dog breeds from Stanford.

Table 1: Summary of Benchmarks of Stanford Dogs [1]

Method	Top - 1 Accuracy (%)
SIFT + Gaussian Kernel	22%
Unsupervised Learning Template	38%
Gnostic Fields	47%
Selective Pooling Vectors	

Evaluation Metrics

As the notebook from Udacity stated, we will measure all the models with the accuracy metric.

Project Design

- **Data Preprocessing:** We first have to import the datasets and process the datasets so we can work with it.

- **Data Splitting:** We split the data into train, validation and test sets.

- **Model Design/Training:** We will build two models: one from scratch and one with transfer learning from a pre-trained model. Training is done with the train set and validated with the validation set

- **Model Evaluation:** We evaluate the classifier against the test set.

- **Model Testing:** Finally, we will test the model on completely new images of humans,
dogs, and non-humans/non-dogs.

References

http://noiselab.ucsd.edu/ECE228_2018/Reports/Report18.pdf
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http://vis-www.cs.umass.edu/lfw/lfw.tgz
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