Applied Machine Learning Systems ELEC0132 Assignment

Maryam Habibollahi
Department of Electronic and Electrical Engineering
University College London
zceemha@ucl.ac.uk

Abstract

Brief overview of the methodology/results presented.

I. Introduction

The aim of this assignment is to train machine learning models on a large dataset of images to complete the tasks of binary and multiclass classification.

The tasks are performed on a dataset of 5000 Portable Network Graphic (PNG) image files consisting of pre-processed subsets from the **CelebFaces Attributes Dataset (CelebA)**, a celebrity image dataset , and the **Cartoon Set**, an image dataset of random cartoons/avatarts , as well as a number of noisy images (mainly of natural backgrounds) to be detected and removed from the training data. All images are labelled with hair colour, and whether the subject is wearing glasses, is smilining, or is classified as human.

In order to train a suitable modle for the required classification tasks, facial landmarks were extracted via various detection methods using Python's Dlib and Open Source Computer Vision (OpenCV) libraries; namely the Histogram of Gradients (HoG) Face Detector accessible via Dlib, Haar Cascade Face Detector accessible via OpenCV, and the Deep Learning-based Face Detector, which can be implementable via both libraries. A comparative analysis of the performance of each method with respect to the labaled noisy images (where all labels are defined as -1) facilitated the selection of the most appropriate feature extraction method for the given dataset.

Prior to each feature extraction method, a number of preprocessing techniques were carried out on the images to improve both the performance and the processing power during the later stages of the extraction, training and classification procedures. Some of the techniques that are often applied for this purpose include colour space transformation, capable of significantly reducing processing complexity, gamma correction or power-law equalisation, a non-linear function, used to normalise illumination by raising the input value to the power of γ, mean normalisation, etc.

II. Proposed algorithms

Algorithmic approach used to solve the problem.

Explain rationale behind choices, i.e. detail your *reasons for selecting a particular model*.

III. Implementation

Provide name and use of *external libraries* and explain how *model parameters* were selected.

Thorough discussion on the training convergence and stopping criterion (use learning curves graphs).

IV. Experimental result

Describe and discuss results, compare to other approaches in literature or variations of ML solutions.

Include *accuracy prediction scores on a separate test dataset, provided by the module organisers, but not used during training and validation*.

V. Conclusion

Summaries all findings and suggest direction for future improvement.

VI. Related Work

Summarise latest reserach on the topic, discussing merits/disadvantages of diff approaches.