Gender image categorization using NNs

1 Description

One of the best known application of ML algorithms is image analysis [1]. Combinations of features extracted using unsupervised NNs and traditional classifiers can be applied in this context. Several datasets have been proposed for evaluating image analysis algorithms [2].

2 Objectives

The goal of the project is to solve the task of gender image categorization using NNs and a database with a large number of images of human faces[1]. The classification problem is to predict the gender of the person in the image.

The goal of the project is the application Neural Networks for: I) Find suitable feature representations for this problem that are very usable for other ML classifiers, OR, II) Implement NN-based classifiers for this problem, OR III) The combination of I and II (e.g., using an RBM to find the features and a Multi-layer Perceptron to classify the problem using the extracted features). In case II), the students are free to decide which feature representation is more appropriate for the data. In case I), they can use any classifier with the NN-based features. The student should: 1) Propose the representation and/or classifier. 2) Implement the solution of the classification problem. 3) Evaluate and discuss the results of the classifier. 4) Answer to the following questions in the report:

- What class of problems can be solved with the NN? (e.g., supervised vs unsupervised problems)
- What is the network architecture? (e.g., type and number of layers, parameters, connectivity, etc.).
- What is the rationale behind the conception of the NN?
- How is inference implemented? (e.g., How is the information extracted from the network?). Type of prediction or type of inference process.
- What are the learning methods used to learn the network ? Algorithms used for learning the network.

As in other projects, a report should describe the characteristics of the design, implementation, and results. A Jupyter notebook should include calls to the implemented function that illustrate the way it works.

3 Suggestions

- Read previous approaches to image classification using ML algorithms.
- Implementations can use any Python library.
- Visualization of the features learned by the network is encouraged as an additional step after classification.

[1]The Database of Gender categorization of images can be downloaded from `https://www.crowdflower.com/data-for-everyone/`.

References

[1] Yoshua Bengio. Learning deep architectures for AI. *Foundations and trends® in Machine Learning*, 2(1):1–127, 2009.

[2] Alex Krizhevsky, Ilya Sutskever, and Geoffrey E Hinton. Imagenet classification with deep convolutional neural networks. In *Advances in neural information processing systems*, pages 1097–1105, 2012.