
Galaxy classification using convolutional networks

1 Description

Convolutional neural networks [1, 2, 3] are ones of the most employed DNN architectures. They are particularly efficient for computer vision tasks such as image classification [4, 5].

Galaxy classification [6, 7] consists of, given an image, predict the probability that it belongs in a particular galaxy class (generally determined by its morphology).

2 Objectives

The goal of the project is to design a convolutional network that outputs the probability that a given galaxy image belongs to one of the possible categories. This is a supervised classification problem. The dataset was used for one of the Kaggle challenges¹, as commented in class.

The student should: 1) Preprocess the images. 2) Design the network architecture and train it. 3) Validate the network.

Not all images in the training set have to be necessarily used for the project. The student can decide whether to use all or a subset of them. Around 10000 should be sufficient.

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

- Review the description of the galaxy morphology classification problem <https://arxiv.org/pdf/1308.3496.pdf>.
- You could review a number of previous approaches to the galaxy classification problem with convolutional networks as the following <https://arxiv.org/abs/1709.02245> <https://arxiv.org/pdf/1711.04573.pdf> <https://arxiv.org/abs/1711.05744>
- Implementations can use any Python library that implements DNNs.

References

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¹The data is available from <https://www.kaggle.com/c/galaxy-zoo-the-galaxy-challenge/data>

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