
Plankton 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].

Plankton comprises diverse small microscopic organisms such as protozoans and small crustaceans that are the basis of the food chain in the sea. Classifying the different species that form plankton from images is a difficult problem.

2 Objectives

The goal of the project is to design a convolutional network that outputs the probability that a given image belongs to one of the possible microorganisms that forms the plankton. 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.

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

- You could review a number of previous approaches to plankton classification with convolutional networks as the following
http://cs231n.stanford.edu/reports/2015/pdfs/rohitm92_final.pdf
<http://ieeexplore.ieee.org/abstract/document/7560334/>
- Implementations can use any Python library that implements DNNs.

References

- [1] Dan C Ciresan, Ueli Meier, Jonathan Masci, Luca Maria Gambardella, and Jürgen Schmidhuber. Flexible, high performance convolutional neural networks for image classification. In *IJCAI Proceedings-International Joint Conference on Artificial Intelligence*, volume 22, page 1237. Barcelona, Spain, 2011.
- [2] Yangqing Jia, Evan Shelhamer, Jeff Donahue, Sergey Karayev, Jonathan Long, Ross Girshick, Sergio Guadarrama, and Trevor Darrell. Caffe: Convolutional architecture for fast feature embedding. In *Proceedings of the 22nd ACM international conference on Multimedia*, pages 675–678. ACM, 2014.
- [3] Yoon Kim. Convolutional neural networks for sentence classification. *CoRR*, abs/1408.5882, 2014.

¹The data is available from <https://www.kaggle.com/c/datasciencebowl/data>

- [4] 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.
- [5] Karen Simonyan and Andrew Zisserman. Very deep convolutional networks for large-scale image recognition. *arXiv preprint arXiv:1409.1556*, 2014.