A114-Deep learning made easy for microscopy: an introduction to ZeroCostDL4Mic and DeepImageJ

Guillaume Mougeot (guillaume.mougeot@tuta.io)

Abstract : Deep learning methods are the current the state-of-the-art for many image analysis problems. They can notably be used for image classification, object segmentation, pixel classification (also called segmentation), image denoising or image-to-image translation. Unfortunately, these tools are quite difficult to understand and to use in their post-publication format. The goal of ZeroCostDL4Mic and DeepImageJ is to leverage this difficulty. ZeroCostDL4Mic is an online tool for deep learning. It runs on Google Cloud computing platform without the need of any setup on a local machine, a usually tedious step, even for developers. Data are first uploaded on a Google Drive and then a deep learning model can be trained on it through a coding-free graphical interface. This trained model can be then used to process novel unseen sets of data. It can also be exported and used offline directly from the ImageJ software thanks to the DeepImageJ plugin. This plugin let a user unfamiliar with coding using deep learning methods. These can either be models exported from ZeroCostDL4Mic or directly downloaded from DeepImageJ's website. At the end of this workshop the participants will be able to understand the basic underlying concepts behind both tools and to use them to segment a set of 2D and 3D microscopy images.

Keywords : Deep Learning, Bioimage analysis, DeepImageJ, ZeroCostDL4Mic

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A116-Bioimage Analysis: Practice Deep Learning Without Coding

Anaïs Badoual (anais.badoual@inria.fr) Daniel Sage (daniel.sage@epfl.ch)

Abstract : The emergence of deep learning techniques (a.k.a. neural networks) has drastically transformed the field of bioimage analysis and its quest for the understanding of biological processes. Successful use of these learning-based techniques in various biological imaging problems are found on a regular basis and the trend is likely to continue. Unfortunately, the deployment of deep learning models is often riddled with technical challenges for non-expert users, and their appropriate use requires deep learning knowledge and good programming skills. Since 2020, efforts have been made to democratize the use of deep learning with the deployment of notebooks, zoos of pre-trained models and plugins such as DeepImageJ. However, these user-friendly and code-free tools deserve to be better known and disseminated in the biology community.

The goal of this workshop is to contribute to the spread and assessment of deep learning models in life-sciences applications and bioimage informatics. First, we will get an intuitive understanding of deep learning concepts. Then, we will use pre-trained models with DeepImageJ, and finally, we will train neural networks without progamming for image segmentation. For this purpose, we will exploit with DeepImageJ the pre-trained models gathered on the Bioimage Model Zoo. We will also use the notebooks developed by ZeroCostDL4Mic to train neural networks on google Colab. We rely on our long experience in teaching image processing on ImageJ for Master students to guide the biologists throughout the workshop. At the end of this workshop the participants will know how to choose the appropriate pre-trained model according to their application and how to test it on their own images. They will also leave the workshop with basic knowledge on how to train a model from scratch if needed.

This workshop is designed for participants without any skills in programmation and without machine-learning knowledge.

Keywords : Deep learning, bioimage analysis, friendly tools, DeepImageJ, ImageJ, cell segmentation;

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