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Automated machine learning in 3D/4D biological image data

Supervisors

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Presentation of the project

In modern biology imaging is a key element of all research, especially in developmental biology. New imaging techniques like two-photons microscopy or light-sheet microscopy can provide high-quality data of developing embryos, but these techniques are not yet routine microscopy. More standard microscopy like confocal or spinning-disk are more common, but provide data with lower quality. We showed that using machine learning techniques we could however extract meaningful information from 4D data (GulMohammed, BMC bioinformatics 2014). We would like to pursue this research by completely automating the process of learning and segmentation of data.

Expected deliverables

Data quality is not uniformly distributed in the data, images are usually far better quality with higher contrast at the beginning of the experiment for 3D+t data (4D), and at slices closer to the objective. We would like to use this information to incrementally update the learning set, starting with unsupervised classification for easy steps, then use this information for later stages. The classification could be done at two different levels, either pixels for distinguishing between background and objects, and also at objects level to classify the cells in the different states of division.

Keywords

Machine learning, segmentation, 3D, 4D.

Applicant profile

- Master Degree or Engineer Student (last year of studies).
- Skills in programming, Matlab, or Java.
- Familiarity with machine learning algorithms.
- Strong motivation towards this challenging project.
- Availability for 5 to 6 months starting in the first semester of 2015.

Gratification: About 800€ net per month

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