

Masters Internship Position

« Dendrite spine detection »

Where: I3S, Sophia Antipolis (near Nice on the Côte d'Azur), France.

Research group: Morpheme (joint I3S/IBDC/INRIA) <http://www.inria.fr/morpheme>

Internship advisors

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Context:

Neurons establish communication through connections between a synapse and a dendrite spine. Therefore, the number of dendrite spines represents the potential number of partners a neuron can have. This parameter is thus clearly linked to the network connectivity. We have obtained 3D volumes using X-ray micro-tomography and a golgi marker of dendrite network. On these images, spines appear as small spheres along the dendrites.

Goal of the internship:

In this project, we will propose a detection algorithm for counting the dendrite spines and studying their repartition in the space along the dendrites. We face a multiple object detection problem for which the marked point process framework is well adapted. In this internship, we will propose a marked point process model based on spheres. Some prior information such as non-overlap constraint and localization of spines with respect to the dendrite will be embedded in the model. The data term will consist of a locally adapted filter. We consider large volumes of data. Therefore, the efficiency of the optimization algorithm will be carefully studied.

Multiple births and deaths and/or RJMCMC tools will be adapted to the observed scene for proposing new objects in the current configuration. The goal is to provide an operational solution in Java language, as a plugin for the freeware ImageJ.

The validation will be performed in collaboration with biologists from CerCo in Toulouse.

Profile

The ideal candidate should have knowledge of image processing and applied mathematics, and be able to programme in Java.

Salary and conditions:

The duration of the internship will be five to six months. Salary is from €1100 per month net, including health care.

PhD continuation: possible if good results are obtained.