Friedrich-Alexander-Universität
Medizinische Fakultät

Friedrich-Alexander-Universität
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Open Master Thesis

Computational Connectomics – sensory-motor neurobiology meets artificial neural networks

Neuronal networks in all animals process sensory information and compute the appropriate motor output to promote specific behaviors. In most cases, the precise architecture of such networks is still unknown and the circuits underlying sensory processing are considered a black box. This is now changing as the first more complex neuronal network of an entire brain comprising about 10,000 functional neurons has been mapped with synaptic resolution. This blueprint allows precise modeling of a functional neuronal network, which in combination with biological data (functional imaging and behavior) can provide novel insight into nervous system computation.

The aim of this Master's thesis is to build a computational model network based on the connectome (i.e. reconstructed neuronal network) of the *Drosophila* larval somatosensory system, which comprises sensory (input), multiple processing, and motor (output) layers. This network is able to process different types of sensory inputs (e.g. for temperature, touch,…) and create specific outputs (e.g. escape behavior). In combination with available functional information, the goal is to create a predictive network model that allows us to better understand sensory input-specific computations to identify critical processing nodes required for functional output.

Your required background:

- Master student in molecular medicine with affinity to computational methods, computer science, artificial intelligence and/or medical engineering
- Advanced programming skills in Python and familiarity with numpy and scipy
- Knowledge of artificial neural networks and their connectivity scheme/underlying mathematics

More information and inquiries:

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