Undergraduate Internship/Master's project

Understanding Brain Development

Synopsis

The goal of this project is to identify unique features and extract meaningful data from images taken with biological imaging platforms, such as microscopes and micro-computed tomography (μ-CT) scanners. Broadly, we are interested in understanding mechanisms of brain development and how cellular organelles (such as the microtubule cytoskeleton) function to drive cell behavior.

We use the fruit fly as model organism to understand how gene mutations prevent brains from reaching the correct size. Entire flies are imaged using μ-CT, then the brains from these images are segmented individually in 3D to measure their volume. Automating the identification, segmentation, and measurement of the fly brain using image recognition methods is the goal of this project. Ultimately, the produced systems will be applied to images of human brains to help develop new treatments for e.g. cancer.

You will

- become familiar with an existing system that was developed in the past year for this based on deep neural networks;
- identify opportunities for changing/extending the existing code to increase performance and robustness;
- assist in the scientific evaluation of this system and gathering data for a scientific publication.

What you should bring to the project

You should be self-motivated and able to work independently, have strong programming and analytical skills, basic machine learning knowledge, and ideally some experience with deep neural networks and image recognition. Experience with a Linux environment and using large-scale computational resources such as Teton is not required, but a plus.

What you will get out of it

You will become familiar with state-of-the-art methods in deep learning and image recognition and hone your data science skills on a real-world project. Such experience is highly sought-after in industry. Depending on the obtained results, this project may lead to a scientific publication. This is a project with lots of details to be defined as part of it – you can bring in your own ideas and make it your own.

Interested? Talk to Lars Kotthoff <larsko@uwyo.edu>. Joint project with Todd Schoborg (Molecular Biology).