

Open Ph.D. projects

Announcer: Péter Horváth

Doctoral School: University of Szeged, Faculty of Science and Informatics, Doctoral School of Computer Science

Title of the research topic: 3D image analysis and machine learning methods using deep learning for understanding neuron cell communication

Description of the research topic: Understanding cellular complexity is a key element of better disease treatment and answering fundamental questions of biology (Horvath, 2016, Nature Drug Disc., 15, 751). Recent advancements in systems microscopy and computational cell biology made possible to automatically and objectively analyse images even in scales as large as millions of images and billions of cells (Badertscher, 2016, Cell Reports, 13, 12, 2879). One of the most demanding of these tasks is to analyse label-free 3D microscopy images at the single-cell level. The aim of this project is to develop a system that first corrects imaging problems caused by imperfections of the microscope's optical system (Smith, 2015, Nature Methods, 12, 404). On the corrected images, we perform a reconstruction step that reverts the imaging model of the microscope and the result is suitable for image segmentation. Cellular phenotypes are identified using deep machine learning algorithms. We presented an automated patch clamp control method, that calibrates the needle (Koos, SCIA, 2017, accepted) and navigates it to an arbitrary position. The aim will be that using this system automatically target a single neuron cells and measure their communication.