Deep learning for analysis of single-cell time-lapse microscopy data

The group of Prof. Erik van Nimwegen is seeking a post-doc or engineer that is interested to work on an exciting and challenging project within the field of computational analysis of bioimages. You should be motivated to develop image analysis software for high-throughput segmentation and tracking of time-lapse microscopy data from experiments on single-cells grown in microfluidic devices.

The van Nimwegen group is a highly interdisciplinary group of researchers with backgrounds ranging from theoretical physics and computer science to molecular biology. Our main research interests concern the structure, function and evolution of gene regulatory networks, and quantitative laws in genome evolution (see our google scholar page for a list of publications). Originally, our group has focused on theoretical method development and computational modelling using a wide-range of methods including Bayesian inference, statistical physics, information theory, dynamical systems theory, and population genetics, for analysing large-scale biological datasets. Over the last 6 years, the group has also incorporated a wet lab component where we use bacteria to study gene regulation at the single-cell level (e.g. Wolf et al. Elife 2015 and Kaiser et al. Nat Comm 2018).

Your responsibilities
The new project will build on recent work we performed in collaboration with the group of Gene Myers and Florian Jug of the MPI-CBG in Dresden, in which we developed a new tool, MoMA, for segmenting and tracking time-lapse microscopy data from experiments in which single-cells grow inside microfluidic devices (Kaiser et al. Nat Comm 2018). In particular, cell segmentation and cell tracking are performed jointly in MoMA using a global optimisation approach. Your task will be to go beyond MoMA's current capabilities, e.g. by incorporating neural network based segmentations, with the aim of enabling high-throughput analysis without the need of human curation. Your contributions will enable us to build the first high-throughput analysis pipeline, enabling screening applications at the single-cell level, and allowing unprecedented quantitative analysis of single-cell regulatory responses to environmental changes. Extended visits to the Jug lab in Dresden are envisioned as part of the project.

Your profile
We are looking for candidates with a background computer science, mathematics, or physics, with extensive experience in programming. Prior experience in dealing with larger software projects and a strong proficiency with Java (or other object oriented languages such as C++ or C#) are expected. Experience with bioimage analysis and/or neural networks (deep learning) will help but are not a requirement. From candidates without a biological background we expect a strong motivation to learn about the science of bacterial growth and gene expression. Good knowledge of English is required, German is helpful but not necessary. The starting date will be determined by mutual arrangement, but earlier starting dates are preferred.

We offer
The salary is generous and is set according to the guidelines of the Swiss National Science Foundation. The duration of the project is initially set to be 18 months, but might be extended. Basel is a very international city and a center of life science research, with over 900 life science research companies in the area, including Novartis and Roche. The Biozentrum of the University of Basel is one of the leading institutes worldwide for molecular and biomedical basic research and teaching. It is home to more than 30 research groups with scientists from over 40 countries. Research at the Biozentrum focuses on the areas of Cell Growth & Development, Infection Biology, Neurobiology, Structural Biology & Biophysics and Computational & Systems Biology. With its more than 500 employees, the Biozentrum is the largest department at the University of Basel's Faculty of Science. Several other academic institutions are also in the city, including the Friedrich Miescher Institute, the ETH Zurich Biosystems Science and Engineering Department, and the Swiss Tropical Institute. The city is less than 5km from both France and Germany and an hour and a half from the Swiss Alps.

Application / Contact
To apply, please send a single pdf containing your application letter, CV, and the names of at least two references to erik.vannimwegen@unibas.ch

Review of applications will begin immediately.