Contribution ID: **56**   Type: **Hands-on session**

Working with quantitative cortical cell densities using siibra

Monday 27 October 2025 11:00 (1h 30m)

The regional microstructure of cortical brain areas, along with their connectivity to other regions, is linked to their functional profile. Consequently, microstructure varies significantly between different brain region. Along with modern image analysis methods, the BigBrain provides a unique resource for quantifying microstructure in terms of numbers, densities, and distributions of cell bodies at different locations in the brain. In this tutorial, we demonstrate how the siibra toolsuite can be used to access micrometer resolution BigBrain image data and extract cortical image patches for custom regions of interest. We will show how locations can be specified or sampled in interactive and scripted workflows, and demonstrate how state of the art AI models can be used to extract and quantify cell instances from extracted image patches in a reproducible fashion. We will present a dataset of layer-specific cell densities for areas defined in the Julich-Brain cytoarchitectonic atlas, which has been created on the basis of these ideas and is available through siibra.

Timo Dickscheid is a Professor for Microscopic Image Analysis at Heinrich-Heine University Düsseldorf, and head of the "Big Data Analytics" group at the Institute of Neuroscience and Medicine (INM-1), Forschungszentrum Jülich, Germany. He is a computer scientist by training and earned his PhD in the field of Computer Vision and Photogrammetry at the University of Bonn in 2011. Dickscheid joined Forschungszentrum Jülich as a post-doc in 2010 to develop image analysis methods for microscopic imaging. After accepting a position as the head of Information Technology at the German Federal Institute of Hydrology in Koblenz in 2012, he returned to Jülich in 2014 to setup his own research group. Aiming to build a cellular resolution multimodal model of the human brain, his work addresses distributed data management for high throughput imaging, AI methods for large-scale biomedical image analysis, and software interfaces for working with very large image data. Dickscheid leads the development of brain atlas

Sebastian Bludau is a senior researcher at at the Institute of Neuroscience and Medicine (INM-1), Forschungszentrum Jülich. He graduated with a diploma as a biologist at the Heinrich-Heine University in Duesseldorf and received a PhD in theoretical medicine from the RWTH Aachen University in 2011, where he studied the cytoarchitecture of the frontal pole of the human brain. Subsequently he became post-doc at the INM-1 (Structural and functional organization of the brain) at the Institute of Neuroscience and Medicine at the research center Jülich. His current research is mainly about the cytoarchitecture of the human brain, the integration of different imaging modalities into high resolution reference spaces, high-throughput optical microscopy and developing and testing of new prototype software for the analysis of histological images.

Requirements: A laptop with an up-to-date web browser (Chrome or Firefox is recommended) is required for the hands-on examples. All examples will be run on pre-built Jupyter notebooks, which will be provided for downloading. Please register for an EBRAINS account in advance.

Presenters: BLUDAU, Sebastian (Forschungszentrum Jülich - INM1); DICKSCHEID, Timo (Forschungszentrum Jülich)

Session Classification: Hands-on Session 1