deRSE25 and SE25 Timetables



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siibra: A Comprehensive Toolsuite for Reproducible Neuroscience Workflows Handling Big Image Data

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An investigation of the intricacies of the human brain is contingent upon the ability to encompass the diverse array of its structural and functional organization within a common reference framework. Despite the substantial advancements in brain imaging and mapping, a significant challenge persists in using information from different scales and modalities in a coherent manner within the prevalent neuroscience workflows. In particular, with the massive increase in resolution and throughput in microscopic imaging, there is a clear need to access and use multi-resolution image data from cloud resources, which requires different handling than classical file-based data. This demands software solutions that unify access to image data regardless of format and size, and harness the wealth of information at hand, from visually guided exploration to computational workflows for analysis and simulation. We present siibra, a toolsuite that facilitates the seamless integration of data from a multitude of modalities and resources with anatomical structures, even at the terabyte scale. It provides users with convenient access to a comprehensive range of reference templates at varying spatial resolutions, complementary parcellation maps, and multimodal data features.

The suite consists of a web-based 3D viewer (siibra-explorer), a Python library (siibra-python) designed to address a diverse range of use cases, and a REST API (siibra-api) to facilitate access to siibra-python features. We report how siibra was designed to implement a multilevel atlas of the human brain, linking macro-anatomical concepts and their inter-subject variability with measurements of the microstructural composition and intrinsic variance of brain regions, and allowing their study in a reproducible and robust manner. The framework employs EBRAINS as a data sharing platform and cloud infrastructure, and incorporates interfaces to a range of other neuroscience resources. Furthermore, siibra enables users with the ability to conveniently extend its configuration to incorporate additional neuroscience datasets, including potentially sensitive patient data, through the use of straightforward JSON schemas. This allows for the seamless sharing of these datasets with collaborators, along with the scripts that utilize them for a reproducible workflow.

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Primary author: DICKSCHEID, Timo (Forschungszentrum Juelich, INM-1)

Co-authors: Dr SIMSEK, Ahmet Nihat (Forschungszentrum Juelich, INM-1); Dr SCHIFFER, Christian (Forschungszentrum Juelich, INM-1); Prof. BJAALIE, Jan G. (Neural Systems Laboratory, Institute of Basic Medical Sciences, University of Oslo); MANGIN, Jean-Franois (Neurospin, CEA); Prof. AMUNTS, Katrin (Forschungszentrum Juelich, INM-1); CHERVAKOV, Pavel (Forschungszentrum Juelich, INM-1); BLUDAU, Sebastian (Forschungszentrum Juelich, INM-1); Prof. LEERGAARD, Trygve B. (Neural Systems Laboratory, Institute of Basic Medical Sciences, University of Oslo); Prof. JIRSA, Viktor (The Institut de Neurosciences des Systèmes, INSERM, Aix-Marseille University); Dr GUI, Xiaoyun; Dr LEPRINCE, Yann (NeuroSpin, CEA)

Presenter: Dr SIMSEK, Ahmet Nihat (Forschungszentrum Juelich, INM-1)

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