The Julich-Brain Atlas at EBRAINS - Introduction, Concepts and Hands-on Sessions

Report of Contributions

Contribution ID: **1** Type: **not specified**

The multilevel human brain atlas in EBRAINS - an overview

Monday 17 June 2024 13:00 (1h 30m)

Brain atlases enable the localization and analysis of data from different sources in a common reference system, making them an essential research tool for understanding the structural and functional organization of the brain. EBRAINS offers a multilevel atlas of the human brain, which captures different principles of brain organization in a comprehensive anatomical framework. It integrates the Julich-Brain probabilistic cytoarchitectonic maps and the BigBrain microscopic 3D model as core elements, and links them with multimodal data features describing microstructure, connectivity and function. The atlas is deeply integrated into the EBRAINS infrastructure, making use of its sustainable data sharing capabilities and cloud resources. This session provides a conceptual introduction to the multilevel human brain atlas, and an overview of the EBRAINS research infrastructure as a sustainable platform for accessing, operating and developing the atlas.

Presenters: AMUNTS, Katrin; DICKSCHEID, Timo (Forschungszentrum Jülich)

Contribution ID: **2**   Type: **not specified**

Using the EBRAINS interactive atlas viewer to analyse the brain

Tuesday 18 June 2024 13:00 (1h 30m)

Using the atlas to analyse the brain (part 1)

Understanding how the brain works is one of the grand challenges in science and requires the integration of huge amounts of heterogeneous and complex data. Numerous research publications present experimental data at various levels of granularity and describe a wide range of structural and functional aspects of the brain. In this context, reference atlases of the brain are important tools for assigning location to data captured with the many methods and instruments used to study the brain. With a new generation of three-dimensional digital reference atlases, new solutions for integrating and disseminating brain data are being developed. During the talk, possibilities will be shown to explore brain regions in an interactive 3D viewer, as well as ways to spatially anchor your own volumetric data in a high-resolution reference space. Furthermore, it will be presented how to access linked multimodal data features from the EBRAINS Knowledge Graph with published and freely available tools. The steps and tools shown will be applied in practice in a subsequent hands-on session "Browsing reference atlases online (~30min).

Hands-on: Browsing reference atlases online (Part2)

The first level of HBP data integration is achieved by spatial mapping of all data into a common anatomical reference atlas space. This mapping can be semantic by use of specific atlas structure names, or spatial by registration of image data to a 3-D reference atlas template. The hands-on session, will demonstrate the BigBrain dataset as reference brain visualized using different viewer / interaction concepts. I.e. the HBP Big Brain viewer; the HBP interactive atlas viewer including different atlases and reference spaces;
The goal of the hands-on session is to provide basic skills to view and download different brain maps along with their metadata and matching data from different modalities using the HBP interactive atlas viewer and the EBrains KnowledgeGraph infrastructure.

Presenters: LOTHMANN, Kimberley (Forschungszentrum Juelich INM-1);   BLUDAU, Sebastian (Forschungszentrum Jülich - INM1); THÖNNISSEN, Julia (Forschungszentrum Jülich - INM1)

Contribution ID: **3**   Type: **not specified**

Using the multilevel human brain atlas in reproducible workflows with siibra-python

Wednesday 19 June 2024 13:00 (1h 30m)

siibra is a software tool suite that allows to access the multilevel human brain atlas by providing access to reference templates at different spatial scales, complementary brain parcellations maps, and multimodal regional data from different sources which is linked to brain anatomy at different spatial scales. Besides interactive exploration in the 3D web viewer siibra-explorer, the framework can be leveraged for scripting, reproducible workflows and application development using the siibra-python programming library.

This session will introduce the core concepts of siibra-python and demonstrate a range of typical programming patterns to use the atlas. It will cover practical coding exercises demonstrating how to fetch brain region maps, access high-resolution microscopy data including the BigBrain dataset, and extract multimodal regional features such as cortical thicknesses, cell and neurotransmitter densities, gene expressions, and connectivity data. Participants will gain first insight of the features of siibra-python to enhance their ability to perform advanced neuroimaging analyses with data coming from different modalities and resolutions.

Presenter: DICKSCHEID, Timo (Forschungszentrum Jülich)

Contribution ID: 4   Type: **not specified**

Share, explore, and reuse data and knowledge in EBRAINS - an overview

Thursday 20 June 2024 13:00 (1h 30m)

EBRAINS is an open, digital research infrastructure (RI) where scientific researchers, clinicians, and other experts from various disciplines converge to share, explore and reuse complex, heterogeneous data in the field of neuroscience. At its core, EBRAINS aims to establish a user-friendly FAIR data and knowledge implementation in a centralized management system, called EBRAINS Knowledge Graph (KG), that empowers other services and researchers to seamlessly connect and integrate various neuroscience data into a suite of specialized tools, computational models, and workflows.

This session is divided into two parts. The first part will introduce how to interactively and programmatically explore and reuse data and knowledge shared through EBRAINS. It will cover demonstrations of the search and filter functionalities of the KG Search User Interface (UI), and corresponding programming patterns in the KG Core Python Software Development Kit (SDK). The second part will provide an overview on how to share data and knowledge through EBRAINS via its curation service. It will demonstrate common data management principles, guidelines for data descriptors, and linked data representations in database systems. For the latter, the session will give an introduction to the openMINDS metadata framework, and demonstrate respective tooling for entering linked data representations into the EBRAINS KG.

Presenter: ZEHL, Lyuba (Jülich Research Centre, INM-1)