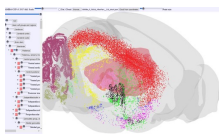
EBRAINS TOOLS FOR TEACHING

Atlases



MeshView is a web application for real-time 3D display of surface mesh data representing structural parcellations from volumetric atlases, such as the Waxholm Space Atlas of the Sprague Dawley Rat Brain.
The tool can, among other things, render user defined cut surface as if meshes were solid objects, render point-clouds and orbit views with toggleable opaque/transparent/hidden parcellation meshes.
This system is also compatible with QuickNII.

siibra-explorer is a frontend for visualising volumetric brain volumes at high resolutions. Using its connection to siibra- api it offers access to brain atlases of different species and their brain region hierarchies, maps in different coordinate spaces, and linked regional data features. It provides metadata integrations with the EBRAINS Knowledge Graph, different forms of data visualisation, and a structured plugin system for implementing custom extensions.

Modelling and Simulation

NEST Desktop is a web-based Graphical User Interface (GUI) application for NEST Simulator, an advanced simulation tool for the computational neuroscience. The app enables the rapid construction, parametrisation, and instrumentation of neuronal network models.

NESTML is a domain-specific language for spiking neuron models and synaptic plasticity rules. It is designed to support researchers in computational neuroscience by allowing them to specify models in a precise and intuitive way. These models can subsequently be used in dynamical simulations of small or large-scale spiking neural networks, by means of high performance simulation code generated by the NESTML toolchain.

Elephant is a Python library that contains a large number of reference implementations for analysing electrophysiology data from simulation and experiments. By building on the Neo data model, Elephant can be used in teaching concepts of data analysis in electrophysiology as the functions can be readily applied to data from a large number of file types and simulation tools such as NEST Desktop. Numerous tutorials are available to get started.

The Virtual Brain (TVB) is an open-source platform for constructing and simulating personalised brain network models and generating sufficiently accurate neuroimaging signals.

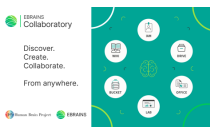
The TVB EduPack is an officially approved and growing list of EduCases – giving users a head start with video lectures and step-by-step tutorials. TVB external resources are also provided on the INCF Training Space and EBRAINS Wiki.

FAIR Data

Health Data Cloud (HDC) is a set of EBRAINS services for sensitive data based on the existing GDPR-compliant and EBRAINS interoperable Virtual Research Environment (VRE), that provides a secure and scalable data platform enabling multi-institutional research teams to store, share, and analyse complex multi-modal health datasets.

A HDC Public Wiki provides learning resources for current HDC users, as well as information for researchers and programmers that are interested in learning more about the HDC. Video lectures with a step-by-step tutorial are also provided.

Collaborative Platform

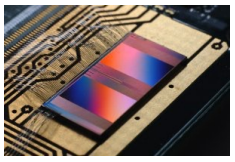


The Collaboratory offers researchers and developers an environment to work in teams and share their work with users, teams, or all of the internet. The Collaboratory consists of six services to make all of this possible. IAM - EBRAINS Authentication and Authorisation. The Lab - Online processing and code execution with a built in toolset. The Drive - Hot file storage. The Bucket - Cold storage. The Wiki - An online publishing platform that brings everything together in “collabs”.

Computing infrastructure

SpiNNaker – The SpiNNaker system is a neuromorphic computing system based on numerical models running in real time on custom digital multicore chips using the ARM architecture. Tutorial material is available for use in the EBRAINS Lab or via our own Jupyter notebooks. These give an introduction to PyNN for use with SpiNNaker, and help users build their own neural networks, as well as use live input and output with the system. https://ebrains.eu/nmc.

EBRAINS High-Performance Computing – EBRAINS provides access to high-performance computing (HPC) and storage solutions at Europe's top supercomputing and data centers. The tools and applications of the EBRAINS Software Distribution (ESD) are available for teaching, training, and research activities. https://ebrains.eu/hpc



BrainScaleS – The BrainScales system is a neuromorphic computing system based on physical (analogue or mixed signal) emulations of neuron, synapse and plasticity models with digital connectivity. Tutorial notebooks are available running interactively in the Collaboratory and using the BrainScaleS hardware systems. Starting from showing features of a single artificial neuron up to the training of a neuronal network with gradient descent methods. There are also notebooks available (in German) suitable for school children from around grade 7. https://ebrains.eu/nmc.

EBRAINS is a collaborative digital European Research Infrastructure that enhances and accelerates progress in neuroscience and brain health. Emerging from the Human Brain Project (HBP), EBRAINS provides access to a free and open database of neuroscience data, access to neuromorphic computing hardware systems, computational models and software tools for researchers, clinicians, scientists and students. Besides research purposes its tools are also a valuable resource for education and training. In this poster we want to give you an overview of the EBRAINS tools that are specifically suitable for teaching purposes. The documentation of each tool can be accessed via the QR codes. All tools can be found on **ebrains.eu**.

Co-funded by the European Union

The EBRAINS 2.0 project has received funding from the European Union's Research and Innovation Program Horizon Europe under Grant Agreement No. 101147319