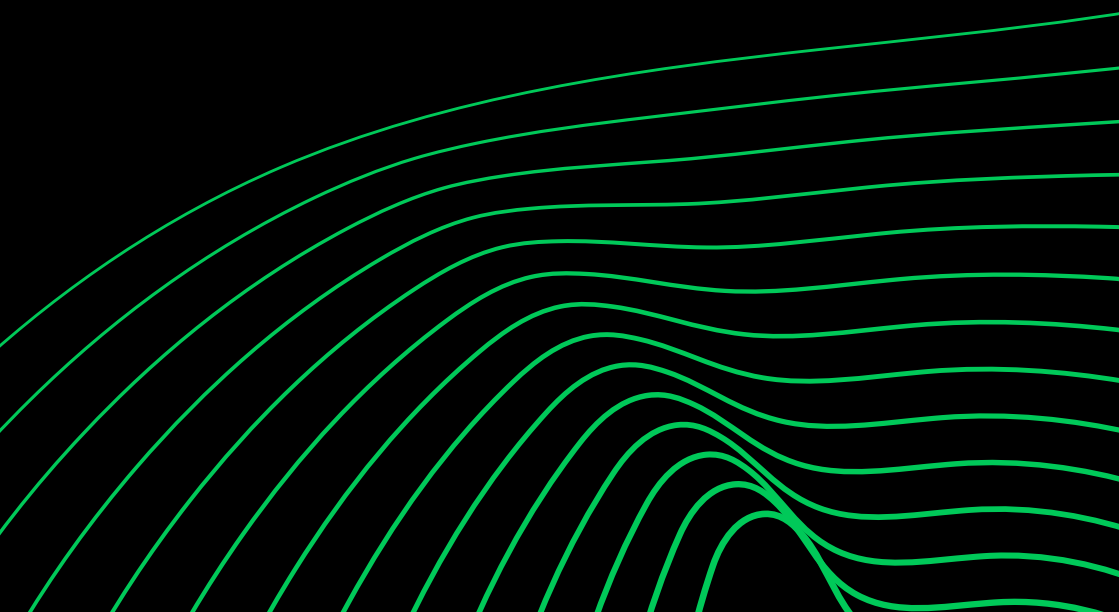
EBRAINS

Tools for teaching



EBRAINS tools for teaching

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.

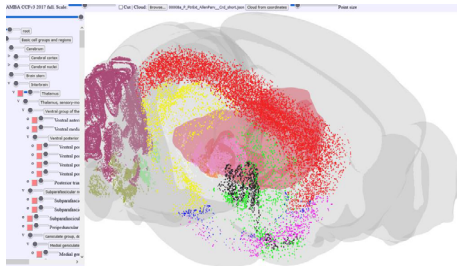
In this booklet we want to give you an overview of the EBRAINS tools that are specifically suitable for teaching purposes. The documentation of each tool can be accessed via the QR codes. All tools can be found on ebrains.eu.

Contents

Atlases

MeshView

MeshView is a web application for real-time 3D display of surface mesh data representing structural parcellations from volumetric atlases.



Explore MeshView

siibra-explorer

siibra-explorer is a frontend for visualizing 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.

siibra EXPLORER

Explore siibra-explorer

Modelling and simulation

NEST Desktop

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

Explore NEST Desktop

NESTML

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.

nest::ml

Explore NESTML

EBRAINS

Elephant

Elephant is a Python library that contains a large number of reference implementations for analyzing electrophysiology data from simulation and experiment. 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.

Explore Elephant

The Virtual Brain

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

The TVB EduPack is an officially approved and growing list of EduCases – giving users a headstart with video lectures and step-by-step tutorials. Some of our EduCases come with a research paper as baseline, plus ready-made Python notebooks, and even datasets for importing! A TVB dedicated documentation website is offered to cover from installation and step-by-step tutorials to developer guides for modifying and contributing code. TVB external resources are also provided on the INCF Training Space and EBRAINS Wiki.

Explore The Virtual Brain

See the documentation

FAIR data

Health Data Cloud

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 analyze complex multi-modal health datasets. A HDC Public Wiki provides learning resources for current HDC users, including project members, platform administrators and developers, as well as information for researchers and programs that are interested in learning more about the HDC. HDV video lecture with step-by-step tutorial is also provided.

Explore Health Data Cloud

Watch the tutorial

Collaborative platform

The Collaboratory

The Collaboratory offers researchers and developers an environment to work in teams and share their work with users, teams, or all of the internet.

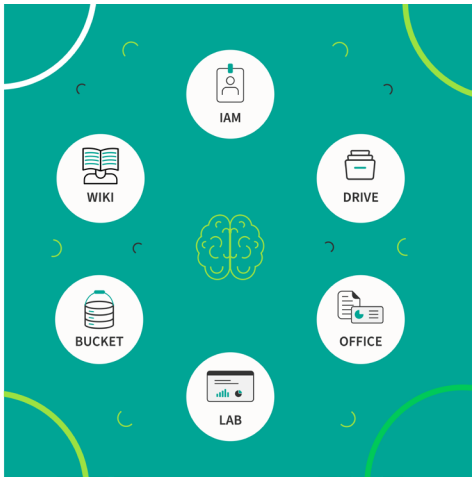
The Collaboratory consists of six services to make all of this possible. IAM - EBRAINS Authentication and Authorisation. The Lab - Online processing and code execution with a built in toolset. The Drive - Hot file storage. The Bucket - Cold storage. The Wiki - An online publishing platform that brings everything together in “collabs”.

EBRAINS Collaboratory

Discover.
Create.
Collaborate.

From anywhere.

Human Brain Project EBRAINS



Explore The Collaboratory

Computing infrastructure

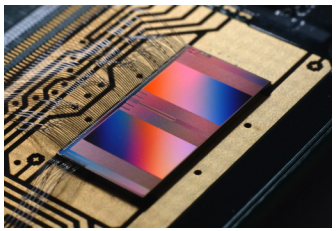
SpiNNaker

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

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 - from showing features of a single artificial neuron (including multicompartment neurons and plastic neurons) up to the training of a neuronal network with gradient descent methods. There are also notebooks available (in German language) with easier descriptions, suitable for school children from around grade 7.



https://ebrains.eu/nmc

EBRAINS

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.

Explore high-performance computers

About EBRAINS

EBRAINS is a digital research infrastructure, created by the EU-funded Human Brain Project, to foster brain-related research and to help translate the latest scientific discoveries into innovation in medicine and industry, for the benefit of patients and society. It draws on cutting-edge neuroscience and offers an extensive range of brain data sets, a multilevel brain atlas, modelling and simulation tools, easy access to high-performance computing resources and to neuromorphic platforms.

All academic researchers have open access to EBRAINS' state-of-the art tools. Industry researchers are also very welcome to use the platform under specific agreements.

For more information about EBRAINS, please contact us at info@ebrains.eu or visit www.ebrains.eu.

EBRAINS

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