EBRAINS

EBRAINS

New enabling infrastructure for brain and brain-inspired research

Introduction to EBRAINS

The Belgian Society for Neuroscience
Virtual meeting, March 8, 2021

Jan Bjaalie, University of Oslo

Director, HBP Infrastructure Development
Leader, EBRAINS Data services
Co-chair, International Brain Initiative (IBI)
Head, Norwegian Neuroinformatics Node (INCF Norway)

Human Brain Project

FET FLAGSHIPS

Co-funded by the European Union

EBRAINS

Overview

What is the EBRAINS‘ ambition?

- To accelerate the effort to understand human brain function and disease by fostering collaborative brain science
- Securing Europe’s leading position in the dynamically growing field of multidisciplinary brain research and its exploitation

What is EBRAINS?

- A new European distributed digital Research Infrastructure for brain and brain-inspired research
- The EBRAINS RI provides tools and services assisting scientists in their research: collecting, analysing, sharing and integrating brain data, and performing modeling and simulation of brain function

EBRAINS

Overview

What is the role of HBP in EBRAINS?

- EBRAINS was launched by HBP in 2019. HBP will continue to develop tools and services in EBRAINS until 2023
- The EBRAINS AISBL, a new legal entity based in Brussels, Belgium, is taking over as HBP coordinator 2021-2023 and will be the Central hub in future EBRAINS operations in Europe

Where do I find EBRAINS?

- The entry point to the EBRAINS RI is the EBRAINS web portal: https://ebrains.eu

EBRAINS

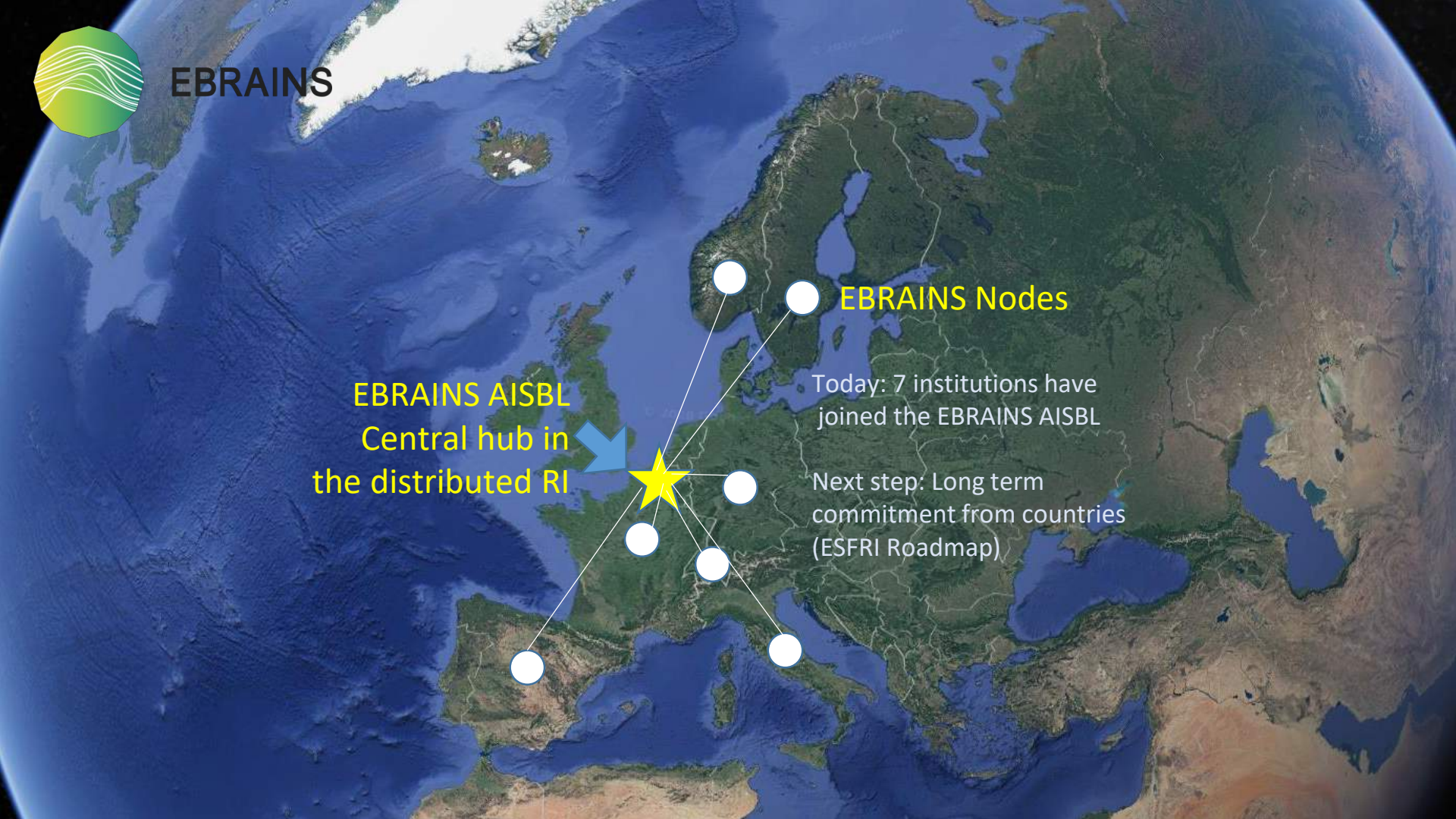
Overview

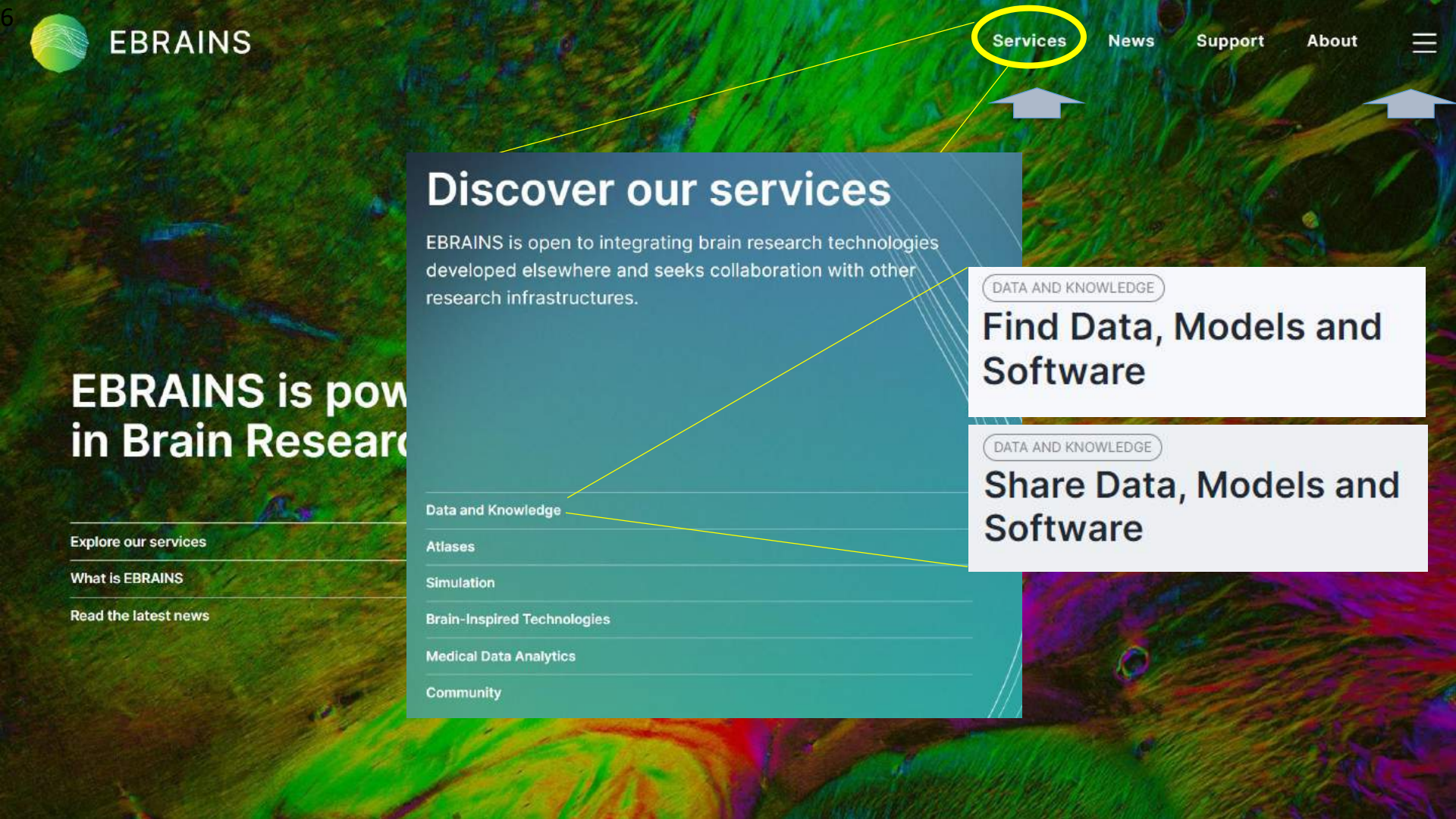
Who can use the EBRAINS RI?

- Only tools and services that can be used also by *reseachers external to HBP* are included in the EBRAINS RI
- Services fall in 3 categories:
  - Open services (e.g.: *Find* data, models, and software, General support for services)
  - Access-controlled services: require an EBRAINS account – researchers at European Universities and research institutions are prioritized for accounts
  - Limited services: Deeper support for use of services and access to computing services – priority to EBRAINS members

Why join EBRAINS as a member?

- Life sciences has at least 13 infrastructures in Europe. Neuroscience has none
- Neuroscience needs a large scale Research Infrastructure, demonstrating that the field can stand out in the competition for funding
- Define the directions of EBRAINS and influence the future of neuroscience in Europe


EBRAINS
EBRAINS Nodes
EBRAINS AISBL
Central hub in
the distributed RI
Today: 7 institutions have
joined the EBRAINS AISBL
Next step: Long term
commitment from countries
(ESFRI Roadmap)


EBRAINS
Services
News
Support
About
EBRAINS is pow
in Brain Researc
Explore our services
What is EBRAINS
Read the latest news
Discover our services
EBRAINS is open to integrating brain research technologies developed elsewhere and seeks collaboration with other research infrastructures.
Data and Knowledge
Atlases
Simulation
Brain-Inspired Technologies
Medical Data Analytics
Community
DATA AND KNOWLEDGE
Find Data, Models and Software
DATA AND KNOWLEDGE
Share Data, Models and Software

Services available on the EBRAINS web portal

Data and Knowledge	Atlases	Simulation	Brain-inspired Technologies	Medical Data Analytics	Community
Share Data, Models, and Software	Multilevel Human Brain Atlas	Cellular Level Simulation *	Neurorobotics Platform	The Medical Informatics Platform	Collaboratory
Find Data, Models, and Software	Rat Brain Atlas	Network Level Simulation *	Neuromorphic Computing		
	Mouse Brain Atlas	Whole Brain Level Simulation *			
	Integrate Data in Atlas Space *	Data Analysis and Visualization *			
	Analyse Data in Atlas Space *				

Future actions:

- More services (e.g. Intracranial EEG database and Community space)
- Improved services
- Improved presentation of services (regular portal usability testing)

Cellular Level Simulation

- Feature Extraction
- Hodgkin-Huxley Neuron Builder
- Small Circuit in silico Experiments
- Brain Area Simulation
- Arbor
- NeuroScheme
- NeuroTessMesh
- ViSimpl

Network level Simulation

- NEST Simulator
- NEST Desktop
- NESTML
- Neuromorphic Computing
- Neurorobotics Platform
- Elephant

Whole Brain Simulation

- The Virtual Brain

Data Analysis and VIsualization

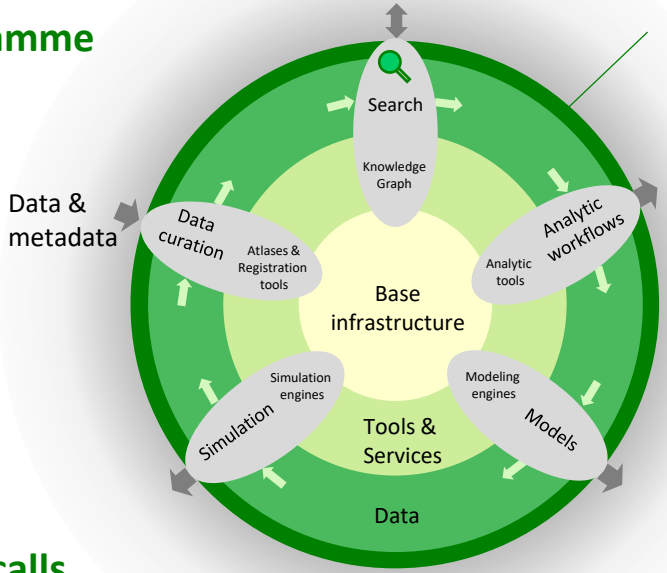
- Elephant
- NEST Desktop
- NeuroScheme
- NeuroTessMesh
- ViSimpl

The multiple layers of the EBRAINS RI

Voucher programme

- Supporting the infrastructure needs of external projects
- > 40 projects from Europe supported 2018 - 2022

New partners through Open calls

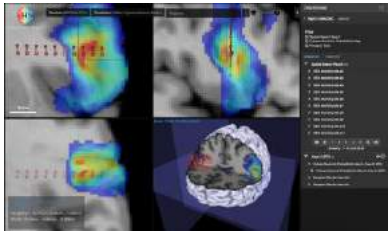


High-Level Support Team

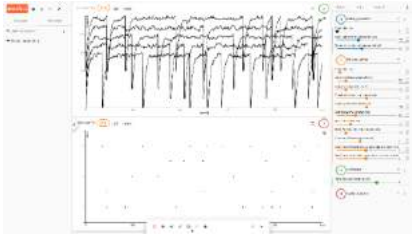
- Supporting all users of the EBRAINS RI
  - Sharing and publishing data and models through the EBRAINS Data and Knowledge services
  - Use of tools and workflows, including Brain atlases, Structural and Functional analysis, Brain simulation, Medical informatics, HPC workflows, Neuromorphic computing, Neurorobotics

EBRAINS Service Categories

➢ Data and Knowledge
FAIR data and models

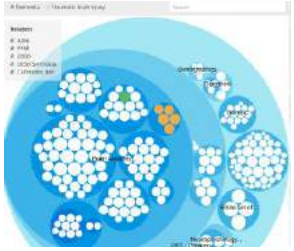


➢ Brain Atlases



➢ Brain Modeling and Simulation

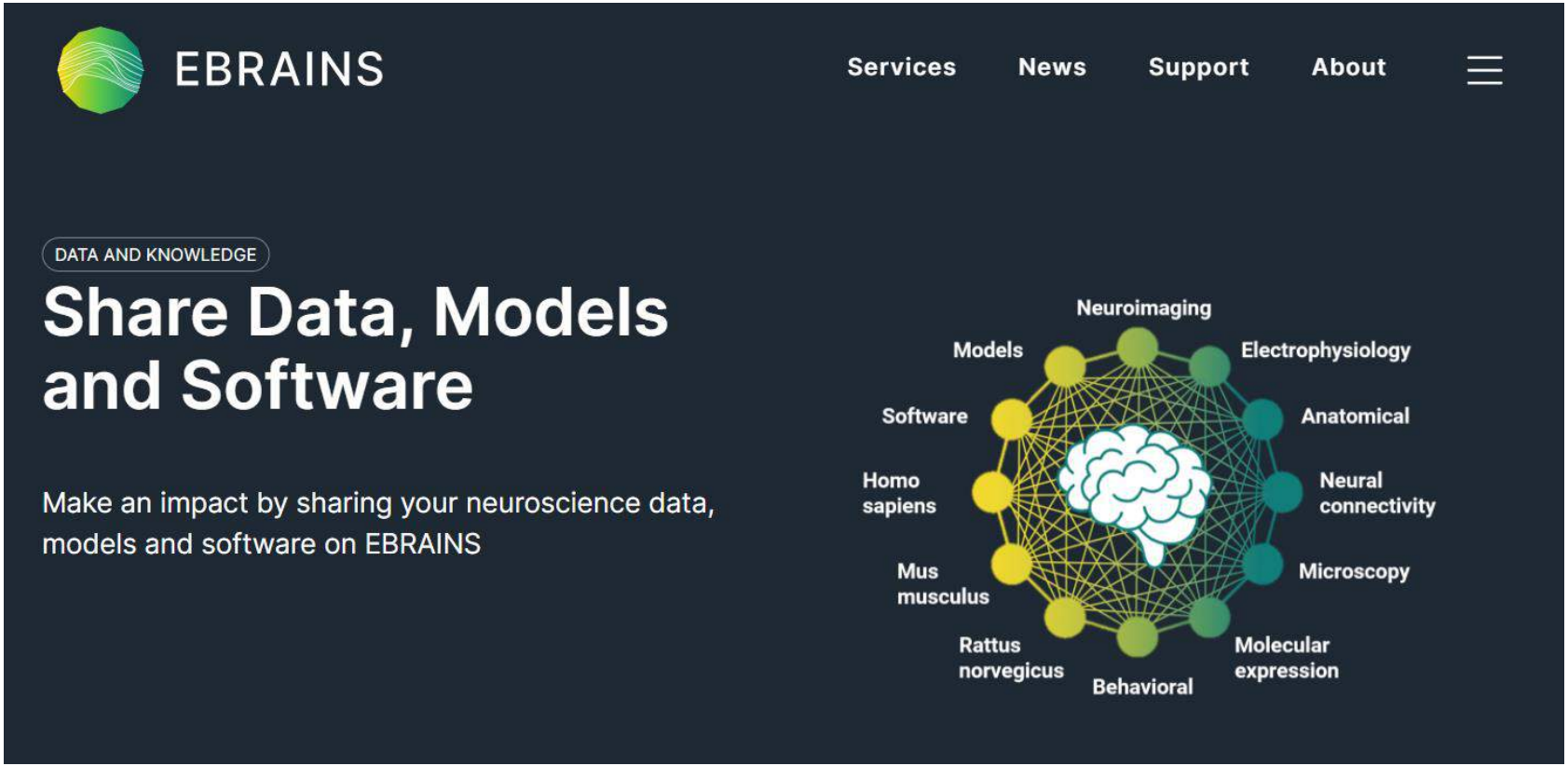
➢ Closed loop AI and Neurorobotics



➢ Medical Informatics

➢ Interactive Workflows on HPC and NMC systems

EBRAINS *Share data* service

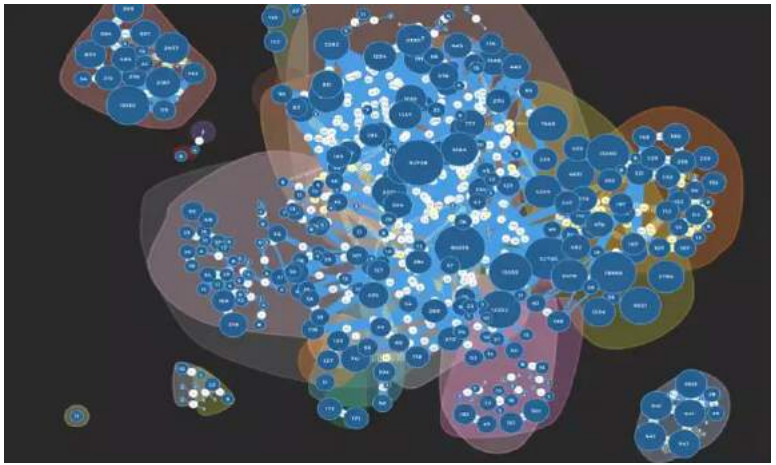


EBRAINS *Share data* service

Key characteristics

- Comprehensive tools and services for shared data and computational models
  - Open to the research community
  - Curation request procedure
  - Accepted requests provided with resources for curation and publishing of datasets and models
  - Options for journal authors / publishing citable and licensed data on EBRAINS linked to journal article
  - Long term storage

Built around the EBRAINS Knowledge Graph



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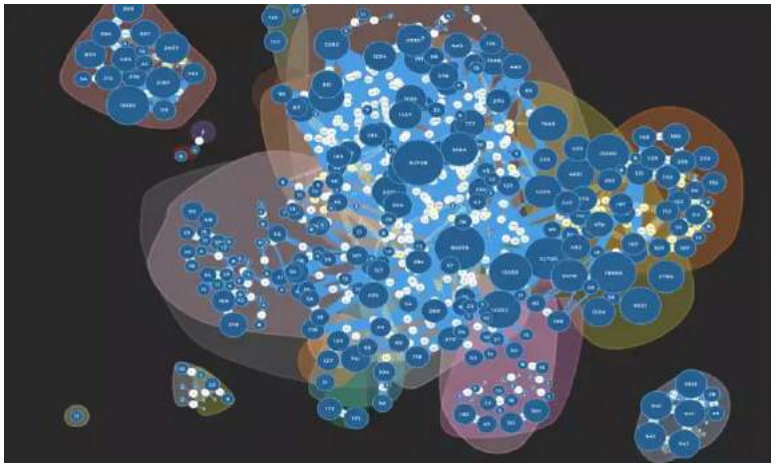
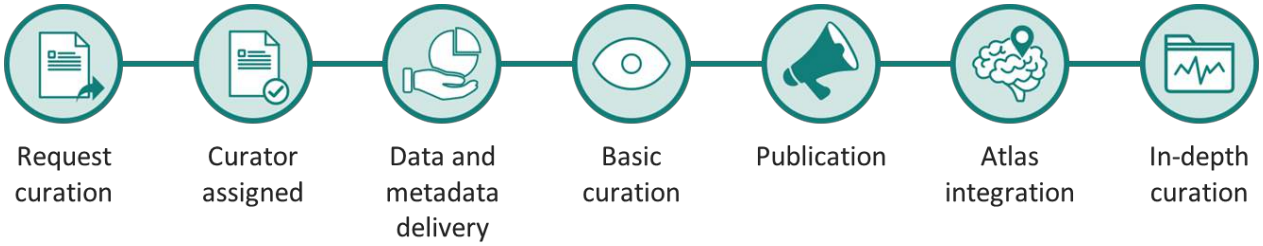
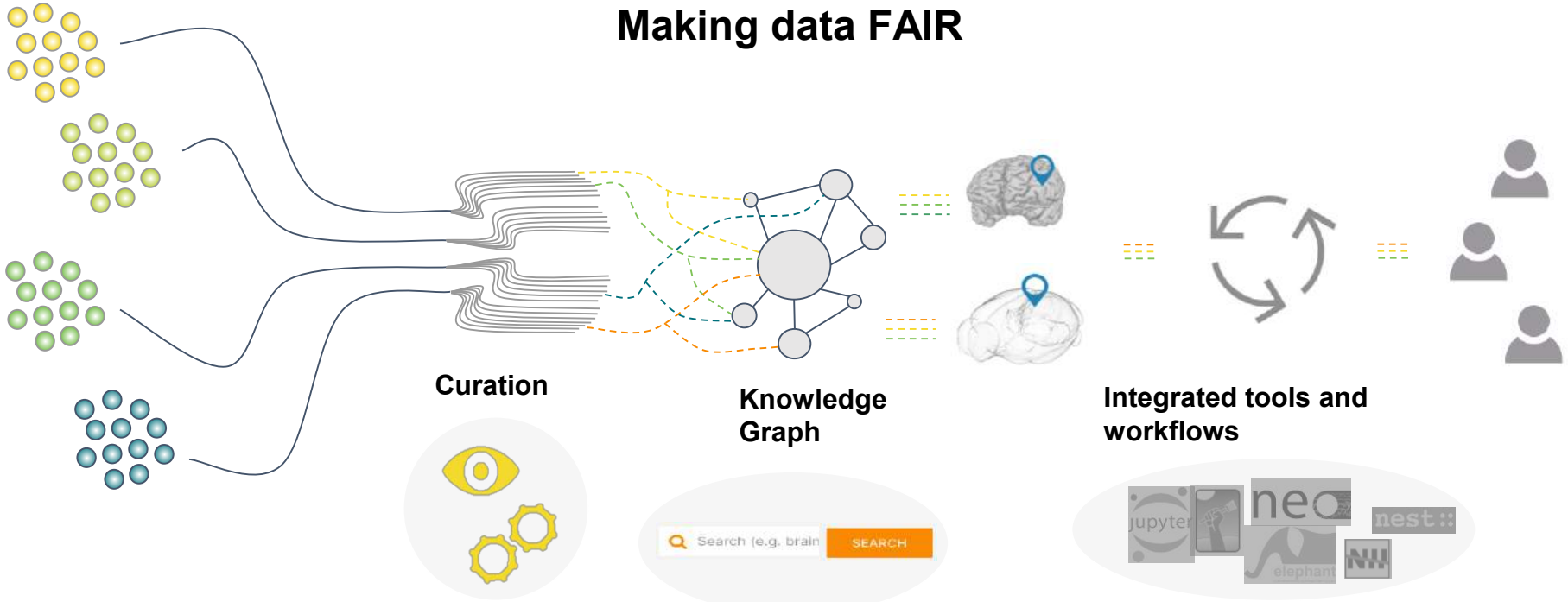




EBRAINS *Share data* service

Making data FAIR



EBRAINS *Find data* service

Collections of data: How they can be found, accessed and used by the research community

Search (e.g. brain or neuroscience)

SEARCH

CATEGORIES

Project	120
Dataset	1012
Subject	3007
Sample	2389
Model	93
Software	148
Contributor	1138

FILTERS Reset

SPECIES

Homo sapiens	680
Mus musculus	163
Rattus norvegicus	122
Macaca fascicularis	22
Macaca mulatta	13
Mustela putorius furo	3
Chlorocebus aethiops sabaeus	2
macaca fuscata	1

EMBARGO

Free	796
Embargoed	177
Under review	28
Externally hosted	7
Controlled access	4

MODALITY

anatomical approach	633

Viewing **1-20** of **1012** results

Sort by Relevance

Dose-dependent effects of ketamine on spontaneous and evoked EEG activity in rats

This dataset contains recordings of spontaneous epidural EEG from a large number of cortical areas and evoked related potentials (ERPs) following local electrical cortical stimulation in 6 rats during deep ketamine an...

Keywords: electrophysiological recording; ketamine anaesthesia

Methods: electrophysiology recording

Regional and laminar distribution of receptors for norepinephrine in the rat brain

The present dataset provides the quantitative regional and laminar distribution of key molecules in signal transfer, namely the noradrenergic receptors α_1 and α_{2h}, in five selected rost...

Keywords: brain mapping; noradrenergic receptor alpha1; noradrenergic receptor alpha2h

Methods: autoradiography - imaging

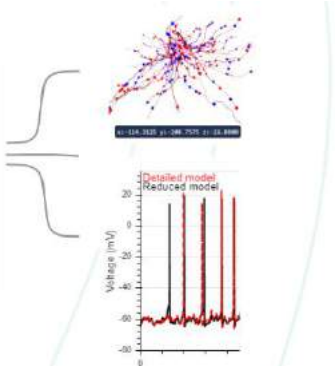
Regional and laminar distribution of receptors for GABA in the rat brain

The present dataset provides the quantitative regional and laminar distribution of key molecules of inhibitory neurotransmission, namely the γ-aminobutyric acid (GABA) receptors $GABA_A$ and $GABA_B$ a...

Keywords: brain mapping; GABAA associated benzodiazepine binding sites (GABAA/BZ); GABAA receptor

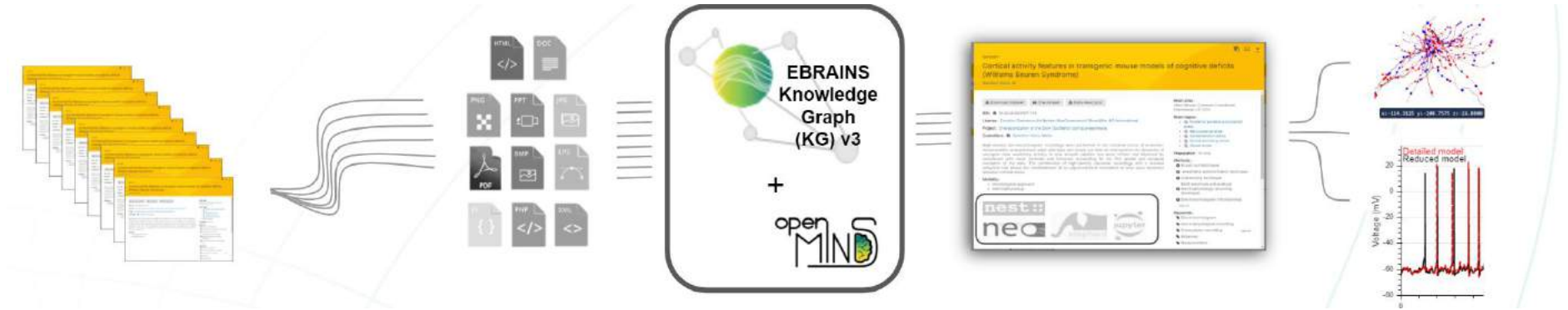
Methods: autoradiography - imaging

Regional and laminar distribution of dopamine receptors and uptake sites in the rat brain



EBRAINS *Find data* service

Collections of data: How they can be found, accessed and used by the research community



Highly diverse content and formats, few limitations for the data contributor

Content sorted according to MIME type and associated attributes

Content connected to KG v.3 and openMINDS

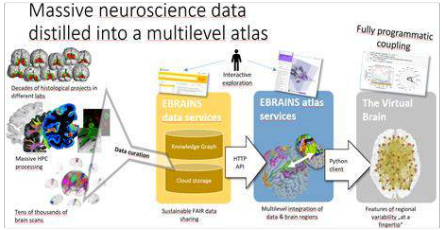
Examples of using data with EBRAINS services

ebrains.eu/services

Atlases

Multilevel Human Brain Atlas

Access viewer & workflows



ebrains.eu/services

Atlases

QUINT

https://ebrains.eu/service/quint

Download the tools with tutorials required to run workflow aimed at selecting features in the images and sort the output according to atlas regions as chosen granularity

ebrains.eu/services

Simulation

Elephant

Tutorial and documentation for installation of the tool in python terminal. Jupyter notebooks can be created on the EBRAINS Jupyterhub with access to HPC resources.

General use case:
https://wiki.ebrains.eu/bin/view/Collabs/sga2-sp3-uc003/

Human Brain Project

THANK YOU!

www.humanbrainproject.eu

@humanbrainproj

@humanbrainproj

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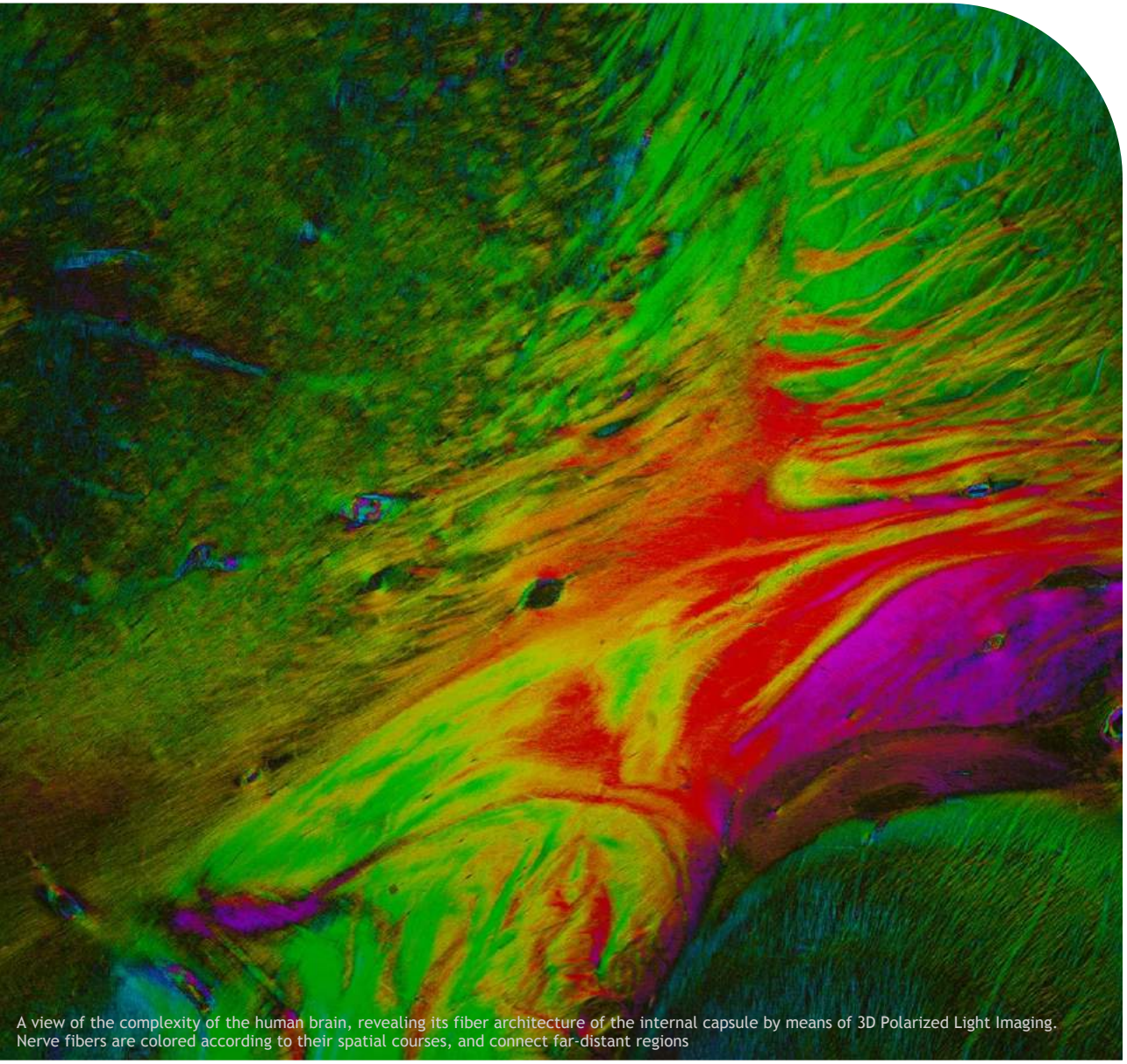


A view of the complexity of the human brain, revealing its fiber architecture of the internal capsule by means of 3D Polarized Light Imaging. Nerve fibers are colored according to their spatial courses, and connect far-distant regions

EBRAINS

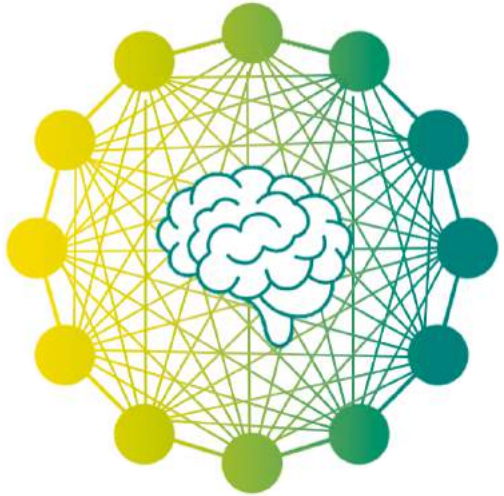
A key enabler to advance brain science

The need for European Digital Brain Research Infrastructure

EBRAINS is consolidating as the most advanced European ICT to be used for facing the challenge of decoding the human brain and tackling societal challenges in a multidisciplinary manner.

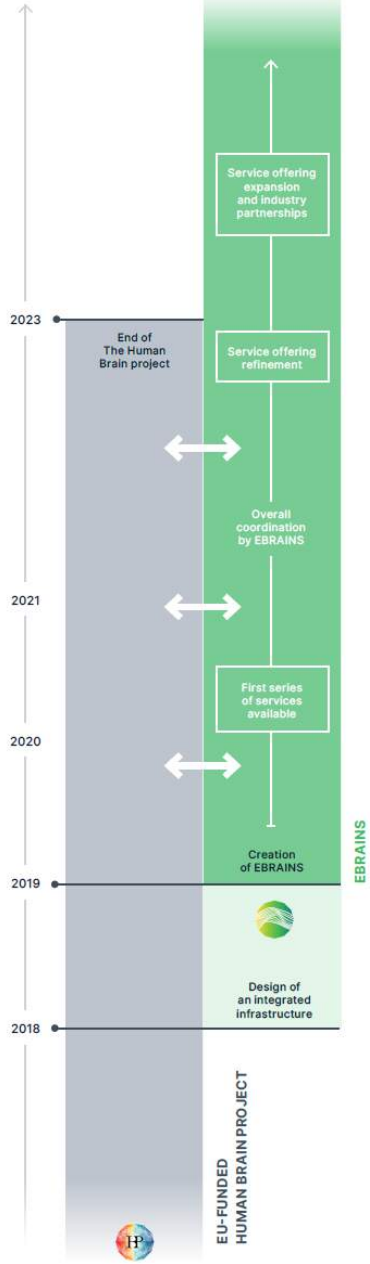
Addressing a public health priority

Accelerating research through cutting-edge technology and community-wide sharing of expertise



Ensuring digital and technological progress

Towards EBRAINS

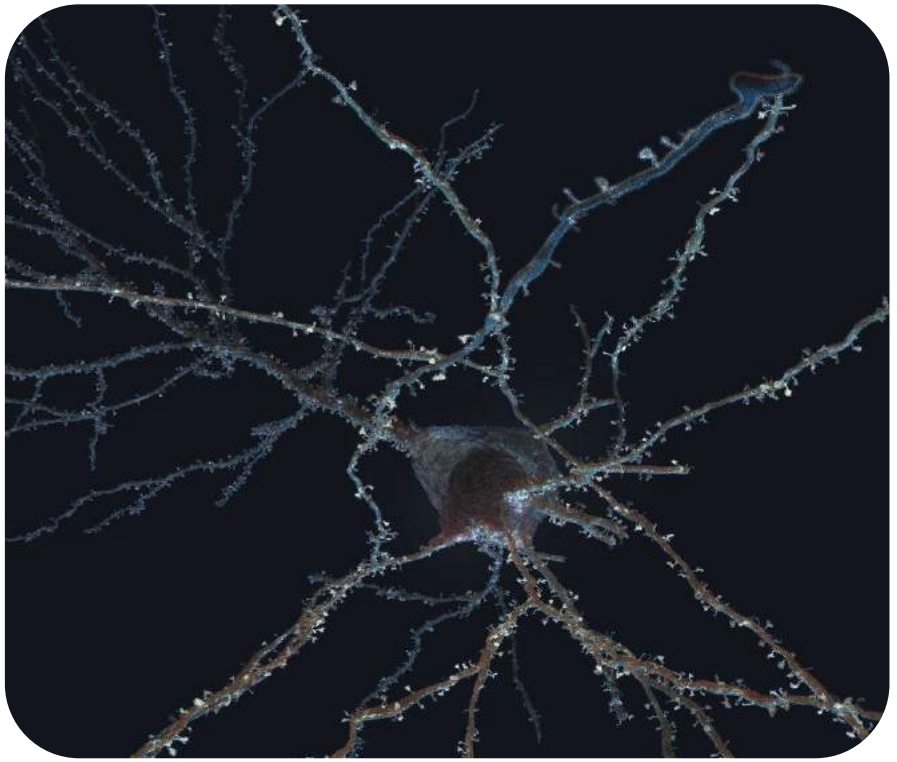


Enhancing the offering

Moving from **tools to services**, enabling re-use and intuitive workflows.

Co-design. Where prepackaged services end and the solution begins

Support for **sensitive data**. In support of Brain Health and medical use-cases



Translating the latest scientific discoveries into innovation

EBRAINS is currently preparing its innovation strategy that will serve the scientific and academic community to help them further boost research in brain science, combining neuroscience with modern ICT, and translate that knowledge into medical and technological progress and concrete implementation output, benefiting patients and society.

*Establishing a dialogue with key-industry players **is crucial.***

Thank you!

https://ebrains.eu/