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Abstract:	The prototype, available for use by members of the HBP Consortium, comprises alpha releases of the following components of the platform: the dataset search, documentation about data standards and HBP-core models, links to tools for the analysis of structural and functional brain data, and access to the HBP Mouse/Rat Brain Atlas and Human Brain Atlas via a 2D Atlas viewer.		
Keywords:	HBP-core, data integration, search, tools, ontologies		



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## 1. The Aim of this Document

This document provides the information needed to access the Neuroinformatics Platform alpha release - preliminary release for internal Consortium use (Deliverable D5.8.3, Milestone 105).

## 2. How to Access the HBP Neuroinformatics Platform

The Neuroinformatics Platform alpha release is accessible at the following address: <https://nip.humanbrainproject.eu> (username: visitor, password: hUm4nbr41n).

The current alpha release of the Platform is a preliminary release for internal Consortium use. If you do not have the necessary login and password, please contact: [data.nip@humanbrainproject.eu](mailto:data.nip@humanbrainproject.eu).

All HBP Platforms will also be accessible via the HBP Collaboratory.

Collaboratory:

<https://collab.humanbrainproject.eu/#/collab/19/nav/403>

Neuroinformatics Platform on the Collaboratory:

<https://collab.humanbrainproject.eu/-/collab/47/nav/236>

## 3. Overview

The Neuroinformatics Platform homepage gives an overview of datasets that are currently integrated in the HBP KnowledgeGraph, and are accessible through the Search application. The HBP KnowledgeGraph serves as the common data store and provenance tracker for all types of data, models, and literature produced and consumed by other services, tools and Platforms in the HBP. On the Neuroinformatics Platform homepage, users are invited to contribute data, and are provided with a link to request support (see Figure 1 in Annex 2 below). The Navigation bar gives direct links to search, tools released by SP5 and documentation.

## 4. Help and User Feedback

To contribute data or to provide feedback, please contact: [data.nip@humanbrainproject.eu](mailto:data.nip@humanbrainproject.eu).

User feedback on the expected search criteria will be very valuable. It will help the Platform team to optimise the search application, and ensure that the proper metadata is captured.

The HBP core model is being developed based on [W3C PROV](#). This captures metadata that describe how a dataset was obtained, who contributed to it, and details about the specimen used. Most of the metadata are described by ontologies, allowing comparisons between datasets. Textual and spatial search services are being built based on the metadata to enable data exploration and discovery. Feedback on the methodology and possible ontology extensions would be welcome.



## 5. Annexes

- 1) Tools & Features Available in this Platform Release
- 2) Screenshots of Tools & Features Available in this Platform Release



## Annex 1: Tools & Features Available in this Platform Release

Tool / Feature	Responsible	Milestone / Remarks	Keywords	Available at	Description/Screenshot
Tools for Brain Atlases	WP5.1 Sean HILL	MS87 Alpha version of atlas registration and navigation tools including search of KnowledgeGraph. Tracking of dataset registration.	Search	<a href="#">Search</a>	<a href="#">Brain Atlas Search</a> . Search based on curated metadata
			Atlas viewer	<a href="#">Atlas</a>	<a href="#">Brain Atlas Viewer</a> . Web-based application to visualise image stacks at multiple resolution.
			Registration tracker (Internal use)	<a href="#">Data tracker</a>	<a href="#">Data tracker</a>
Tools for Structural Data Analysis	WP5.2 José M. PEÑA	Alpha release of structural analysis tools.	Structural analysis tools	<a href="#">Tools</a> , <a href="#">EspINA</a>	<a href="#">Structural Data Analysis Tools</a>
Tools for Functional Data Analysis	WP5.3 Sonja GRÜN	MS95 Alpha release of functional analysis tools	Functional analysis tools	<a href="#">Tools</a> , <a href="#">Elephant</a>	<a href="#">Functional Data Analysis Tools</a> . Elephant is a package for the analysis of neurophysiology data based on Neo.
Brain Atlases	WP5.5 Jan BJAALIE	MS101 Alpha versions of mouse and human atlases released - Waxholm Space rat brain atlas - High resolution architectonic atlas of rat hippocampal region - BigBrain/JuBrain	Atlas, Waxholm template	<a href="#">Atlas</a>	<a href="#">Waxholm Brain Atlas</a>
			Rat hippocampal region	<a href="#">Tools</a> , <a href="#">Rodent Workbench</a>	<a href="#">Rodent Workbench</a> . The workbench is a mesh-based viewer for Rodent atlases.
			BigBrain	<a href="#">Atlas</a>	<a href="#">BigBrain</a>
			JuBrain	<a href="#">JuBrain</a>	
		Atlasing registration tools. Tool for anchoring 2D experimental image to 3D atlas templates. Scalable Brain Atlas	Atlas registration	<a href="#">Tools</a> , <a href="#">AlignII</a> , <a href="#">QuickNII</a> , <a href="#">Scalable Brain Atlas</a>	<a href="#">Atlas registration tool</a> . Online and standalone tools for anchoring of 2D experimental image data to 3D atlas template.
User documentation	WP5.7 Sten GRILLNER	MS109 Alpha release of user documentation	Documentation	<a href="#">Documentation</a>	<a href="#">Documentation</a>

## Annex 2: Screenshots of Tools & Features Available in this Platform Release

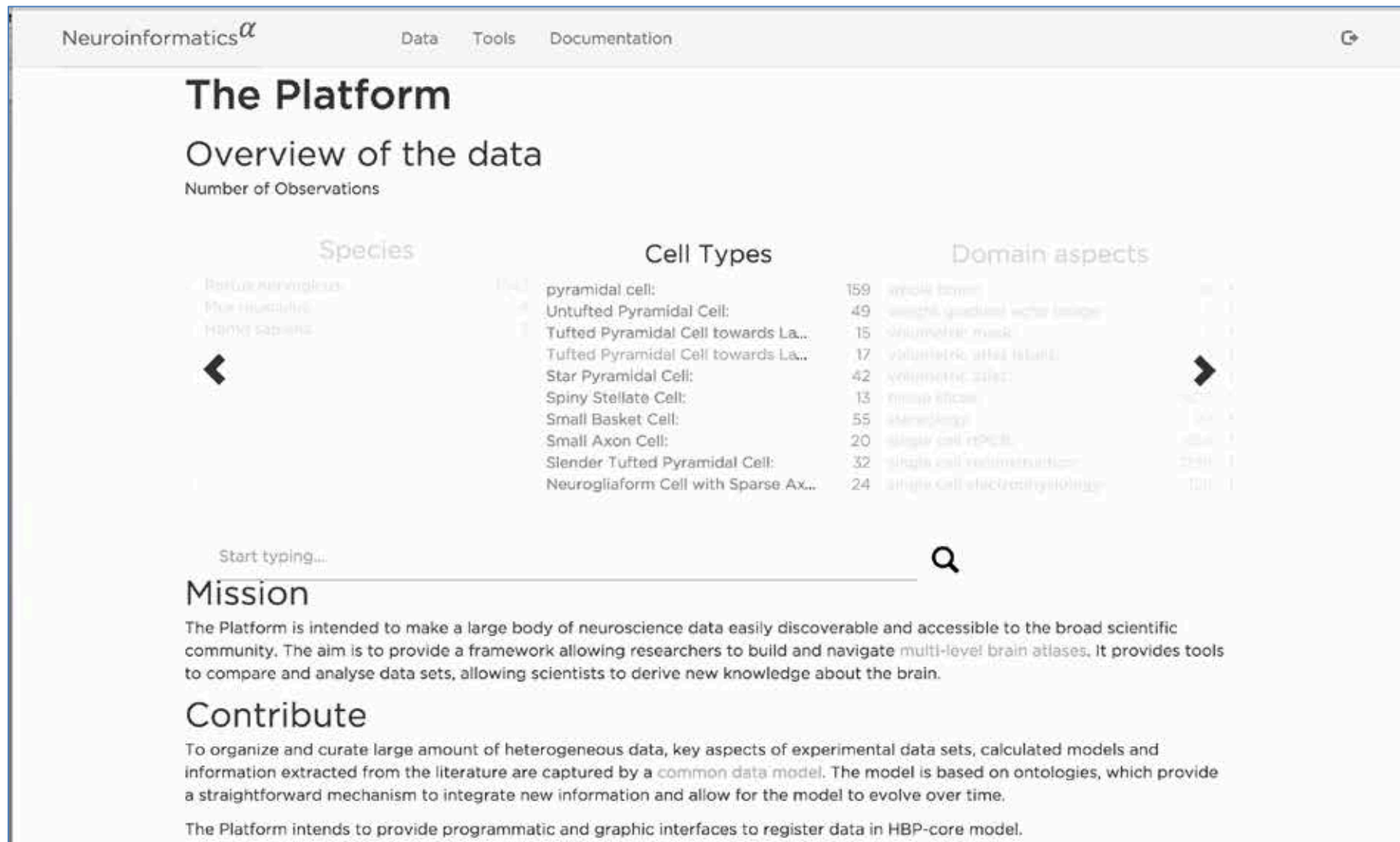


Figure 1: Screenshot of the Neuroinformatics Platform Homepage



Neuroinformatics<sup>α</sup>

DataToolsDocumentation

# Explore the data

Start typing...

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Untufted Pyramidal Cell

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Affiliations

wang lab, tufts17

lnmc, epfl49

kisvarday lab, deb7

bbp, epfl25

Single cell reconstruction - biocytin - tissue slices - reconstruction - manual reconstruction [VD110524\_IDB.asc]

Yun Wang, Jean-Vincent LeBe, Meystre Julie

Species: rattus norvegicus

Methods: morphological reconstruction of a single cell

slice staining for morphological cell

reconstruction

labeling of cells for morphological

reconstruction

slice extraction for electrophysiology

experiments

Single cell reconstruction - biocytin - tissue slices - reconstruction - manual reconstruction [TKB071114A3\_CH10\_CC2\_N\_DB\_100X\_1.asc]

Ying Shi, Meystre Julie, Thomas Berger

Species: rattus norvegicus

Methods: morphological reconstruction of a single cell

slice staining for morphological cell

reconstruction

labeling of cells for morphological

reconstruction

slice extraction for electrophysiology

experiments

Single cell reconstruction - biocytin - tissue slices - reconstruction - manual reconstruction [VD110511\_IDG.asc]

Ying Shi, Jean-Vincent LeBe, Meystre Julie


Figure 2: Screenshot of Brain Atlas Search





Rat Golgi-Cox Stained, BCCBP

Display additional information...



Sample Information

Navigation

<b>Specimen</b>	<b>Data Provider</b>	<b>Methods</b>
Species: Rattus norvegicus	Visible Brainwide Networks Project, Britton Chance Center for Biomedical Photonics, Wuhan, China	HUST - Image Capture
Age: post natal day 70		Reconstruction of Multiple Cell Morphologies from an Image Stack
Strain: Sprague Dawley	<b>Contributors</b>	Extraction of Single Cell Reconstruction from Multi Cell Reconstruction File
Lab Name: animal	Hui Gong, (head of laboratory, acquisition of microscopy data), Huazhong University of Science and Technology	Slice Joining
Sex: male	Yun Wang, (acquisition of cell morphological data), TUFTS	Pyramid Construction (BBIC)
	Martin Telefont, (data integration), EPFL	Projection Extraction
		Image Reslicing

Data provided by the Visible Brainwide Networks Project, Britton Chance Center for Biomedical Photonics, Wuhan, China

Figure 3: Screenshot of Brain Atlas Tools





term

Search

## active cases

id	task	short description	final n	TODOs	why	who	when	what	where	how	contact	domain types	species
6	1.2.2	distribution of purkinje cells in the mouse cerebellum	1	13	✓	✓	✓	✓	✓	✓	Ludovico Silvestri	images stack, cell distribution	
22	x.x.x	single cell human morphology reconstructions	3 specimens, 94 observations	10	✓	✓	✓	✓	✓	✓	ruth benavides-piccione	cellular reconstructions	
24	1.2.4	3D reconstruction with Neurolucida Hippocampus & BONUS (ephys & image stacks	20-50	8	✓	✓	✓	✓	✓	✓	Attila Gulyas	electrophysiology, reconstruction, imagestack	
26	1.2.3	Numbers and distributions of excitatory and inhibitory neurons and glia - Automated 3D segmentation with Confocal microscope	1+	1	✓	✓	✓	✓	✓	✓	ruth	synaptome, reconstruction	
38	none	open connectome	2+	0	✓	✓	✓	✓	✗	✗	kunal lillaney	EM-stack, connections	mus musculus, c. elegans
42	2.1.6	Infant Template MR volume	1+	0	✓	✓	✓	✓	✓	✓	Timo Dickscheid		
52	1.1.3	The cellular and synaptic proteome - Mass Spectrometry Analysis of PSD protein samples	1+	0	✗	✗	✗	✗	✗	✗	nathan	proteome, synapse, mass spec	
53	1.1.3	The cellular and synaptic proteome - distribution of synapses in space.	1+	0	✗	✗	✗	✗	✗	✗	nathan	imaging	

Figure 4: Screenshot of Data Tracker



## Structural data analysis

Much of the structural data produced by modern neuroscience takes the form of image stacks from light and electron microscopy, MRI, PET, etc. As many of these techniques produce terabytes of data in a single session, the best way to unlock the information they contain is through automatic image processing. The HBP will integrate and develop tools for this.

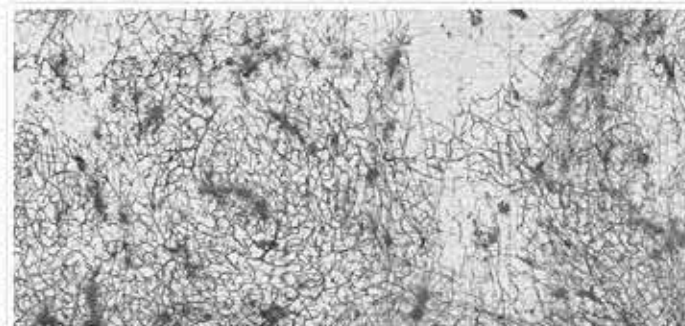
The tools will include software to automate the extraction of cell densities and distributions; the reconstruction of neuron morphologies; the determination of subcellular properties such as synapse and organelle geometry, size and location; and the identification of the long-range fibre tracts underlying connectivity.

The tools contributed by HBP are:



### EspINA

Segmentation and annotation of brain tissue microscopy stacks.



### EMDigest

Analysis of experimental data obtained by EM and light microscopy.

Figure 5: Screenshot of Structural Analysis Tools

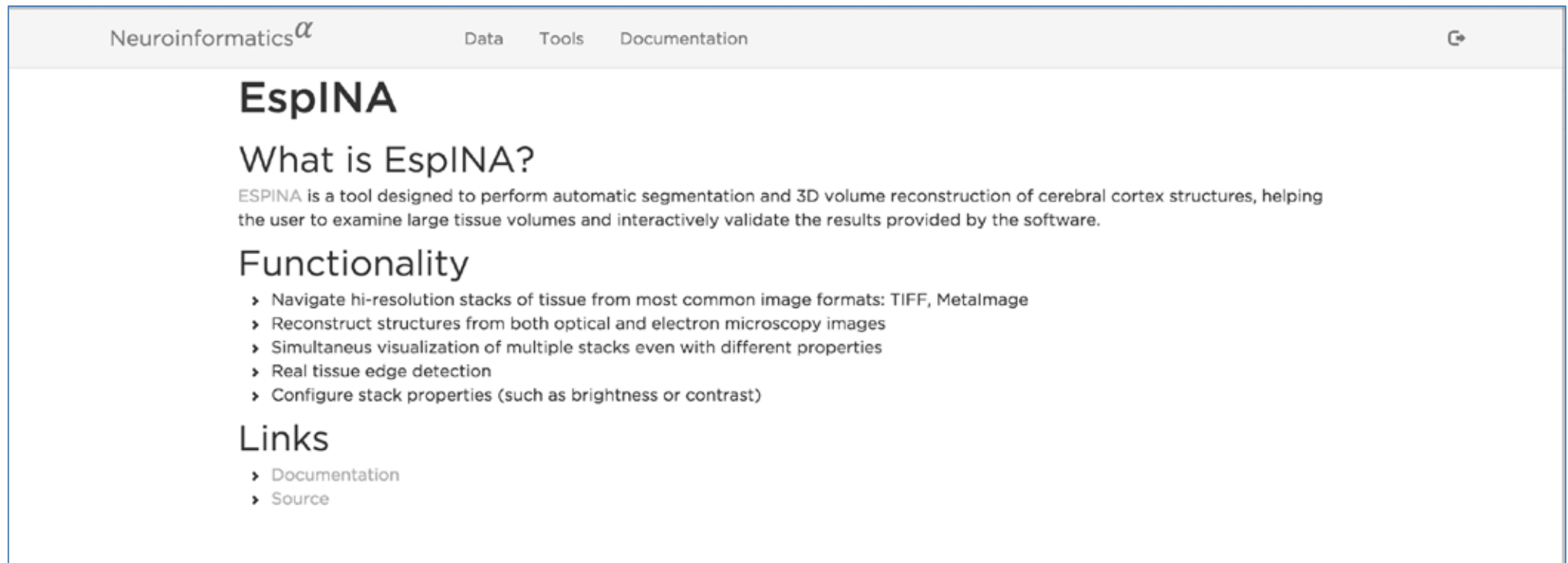


Figure 6: Screenshot of Structural Analysis Tools



## Functional data analysis

Understanding of brain function depends on data from a wide range of techniques. It is important that simulation results be comparable against this data. To meet this need, the HBP will develop new tools and techniques to compare data from simulations against data from experiments. These will include tools for population analysis (measurement of local field potentials, EEG, fMRI, MEG etc., and tools for the analysis of single cell activity. Some of these tools will build on previous work in the BrainScaleS project.

The tools contributed by HBP are:



Figure 7: Screenshot of Functional Analysis Tools



# Elephant - Electrophysiology Analysis Toolkit

## What is Elephant?

Elephant (Electrophysiology Analysis Toolkit) is an open-source, community centered library for the analysis of electrophysiological data in the Python programming language. The focus of Elephant is on generic analysis functions for spike train data and time series recordings from electrodes, such as the local field potentials (LFP) or intracellular voltages. In addition to providing a common platform for analysis codes from different laboratories, the Elephant project aims to provide a consistent and homogeneous analysis framework that is built on a modular foundation.

## Functionality

- › Analysis functions use consistent data formats and conventions as input arguments and outputs. Electrophysiological data will generally be represented by data models defined by the Neoproject.
- › Library functions are based on a set of core functions for commonly used operations, such as sliding windows, converting data to alternate representations, or the generation of surrogates for hypothesis testing.
- › Accepted analysis functions must be equipped with a range of unit tests to ensure a high standard of code quality.

## Links

[Documentation](#)

[Source](#)

Figure 8: Screenshot of Functional Analysis Tools

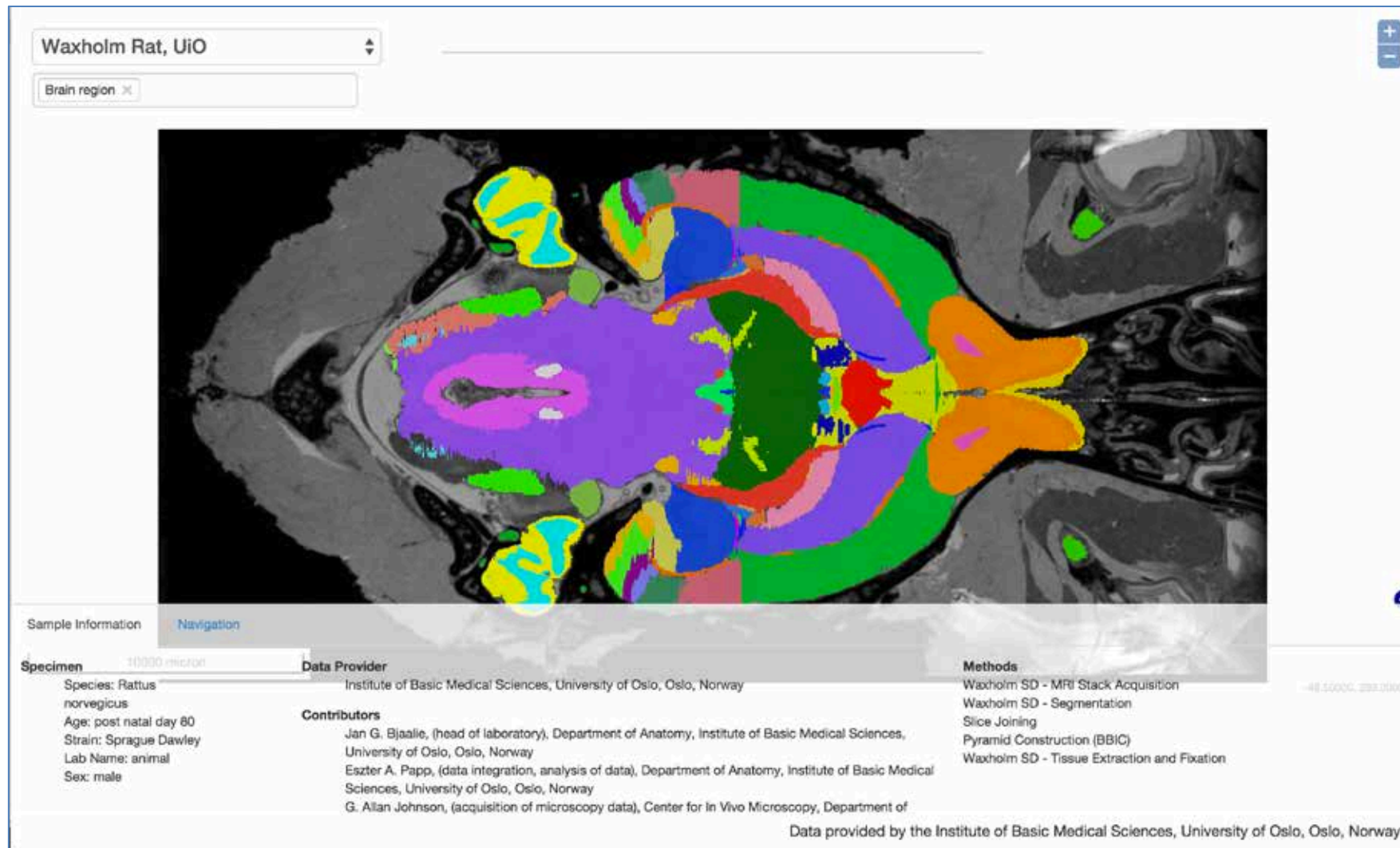


Figure 9: Screenshot of Waxholm Brain Atlas



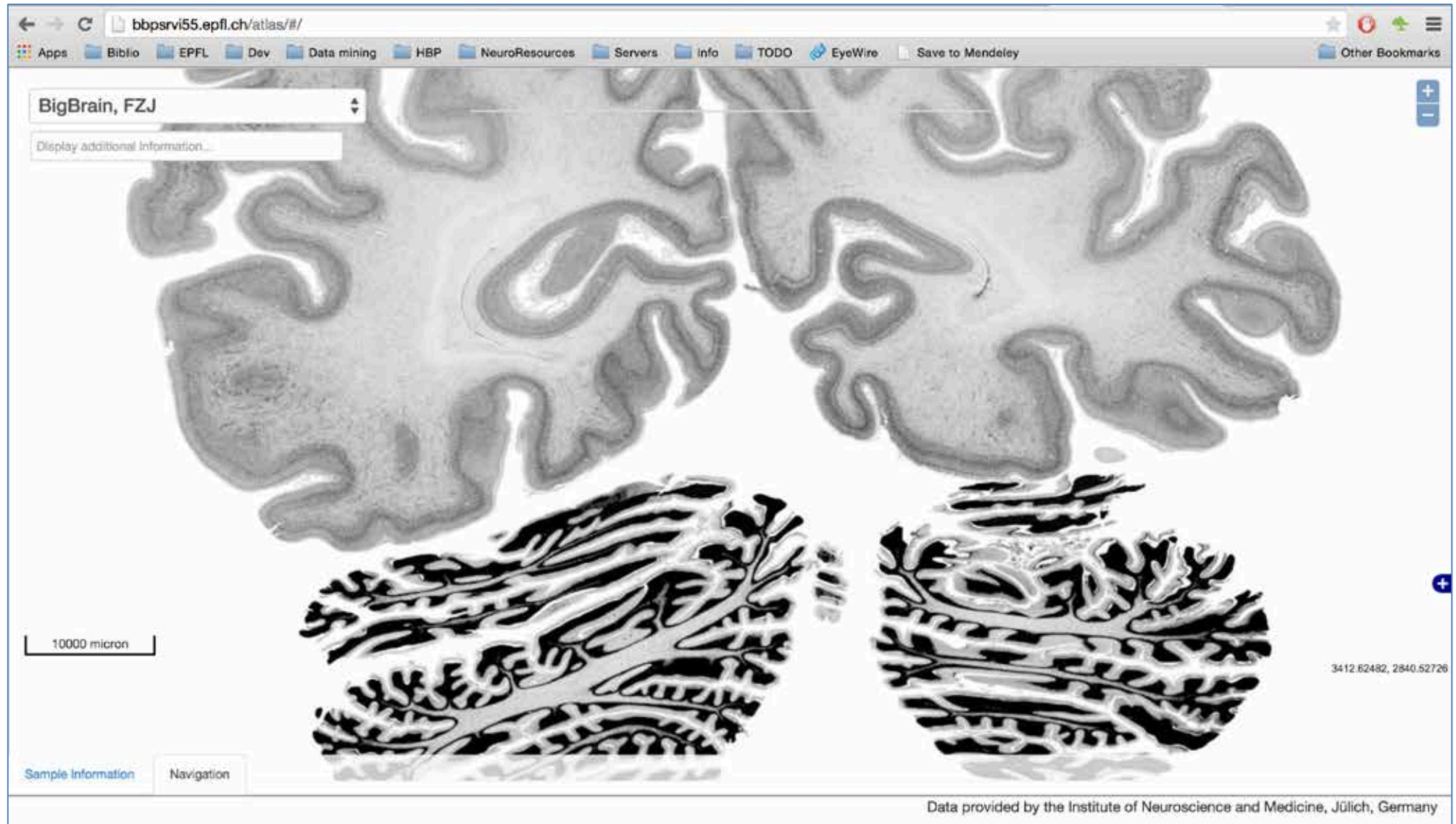


Figure 10: Screenshot of Human Brain Atlas



## Rodent workbench

### What is the Rodent workbench?

The Workbench is a mesh-based viewer for Allen Brain mouse atlas and Waxholm Space atlases for mouse and rat.

### Functionality

Web application providing access to vector based versions of mouse and rat brain atlases in standardized 3D space for real-time viewing of shape, size and neighboring relationships of brain structures, and viewing of boundaries of brain structures in any user defined cut plane.

The available mouse and rat brain volumetric atlases are presented through a browser-based viewer for real-time visualisation of mesh data. Since meshes representing adjacent structures typically intersect with each other, visual artifacts occur when rendering them. In order to ensure strict non-intersecting property of meshes, a custom mesh generator tool has been used to create the meshes based on the volumetric parcellations of structures. The tool generates a quad for each face of a voxel-cube which is facing a voxel and is not part of the structure, before applying a CESN-like (Constrained Elastic SurfaceNets) algorithm for smoothing the mesh. In the final release, it is the ai to support viewing of anchored 2D image data, and viewing of the locations of any data set.

### Links

- › Workbench

### Release

- › Internal HBP release March 2015,
- › Partial public release June 2015 and
- › Full public access December through The Rodent Brain WorkBench.

Figure 11: Screenshot of Rodent Workbench



# AligNII

## What is the AligNII?

AligNII is an online tool for user guided registration of 2D image data to volumetric atlas templates for the mouse or rat brain.

With use of the tool, data are anchored to Waxholm Space (mouse and rat) or Allen Brain atlas space (mouse), facilitating data integration through standardized coordinate systems.

## Functionality

A key feature in the tool is the capability to generate user defined cut planes through the atlas templates, matching the orientation of the cut plane of the 2D experimental image data, as a first step towards anchoring of images to the relevant atlas template.

AligNII supports multi-modality 3D atlas packages and one-click switching between image modalities (e.g., MRI and DTI) while preserving the view location and UI settings in general, and in-depth numerical control over cut plane settings. The tool has been tested extensively and is improved based on user feedback. A series of research projects are currently using the tool for registration of project data to standardized atlas space.

## Links

- › AligNII
- › Tutorial

## Release

Tool integrated in the Navigator data system

- › Internal HBP release October 2014
- › Update February 2015.

Figure 12: Screenshot of AligNII: Atlas Registration Tool



The screenshot displays the Navigator 3 Data Management interface. A modal window titled "Representation ID: 16968" is open, showing details for a specific representation. The modal has tabs for "Preview", "OpenZarr", "Download Original", "Annotate", and "Anchor". The "Preview" tab is active, displaying the following information:

- Name: 4340\_PuP2\_ITA\_Isa2\_067
- Origin: [empty]
- Coordinates: [empty]
- Metadata table:

Key	Value
U vector	-439.9148828482937 -50.46793455054313 7.71677961034274
V vector	-2.962464122213718 -20.33559783472581 -302.5821784410434
Anchored To	Allen Mouse Brain Atlas
Q vector	446.3499380677441 233.0293687730884 315.482388992498

Below the metadata table, there are fields for "Add Metadata" (Metadata keys and values), a "Status" dropdown (set to "Private"), and an "Update Status" button. A message at the bottom of the modal states: "You are PRINCIPAL for this record. Record created by Lillehaug on 20 January 2014. Processing message: 20.01.14 13:29 Done!". The modal has "Save" and "Delete" buttons at the bottom.

The background interface shows a sidebar with "Projects" and "Animals" categories. The "Animals" category is expanded, showing a list of representations. The main area displays a table of representations, with the selected representation highlighted in blue.

Figure 13: Screenshot of AlignNII Showing the Results of Data Anchoring



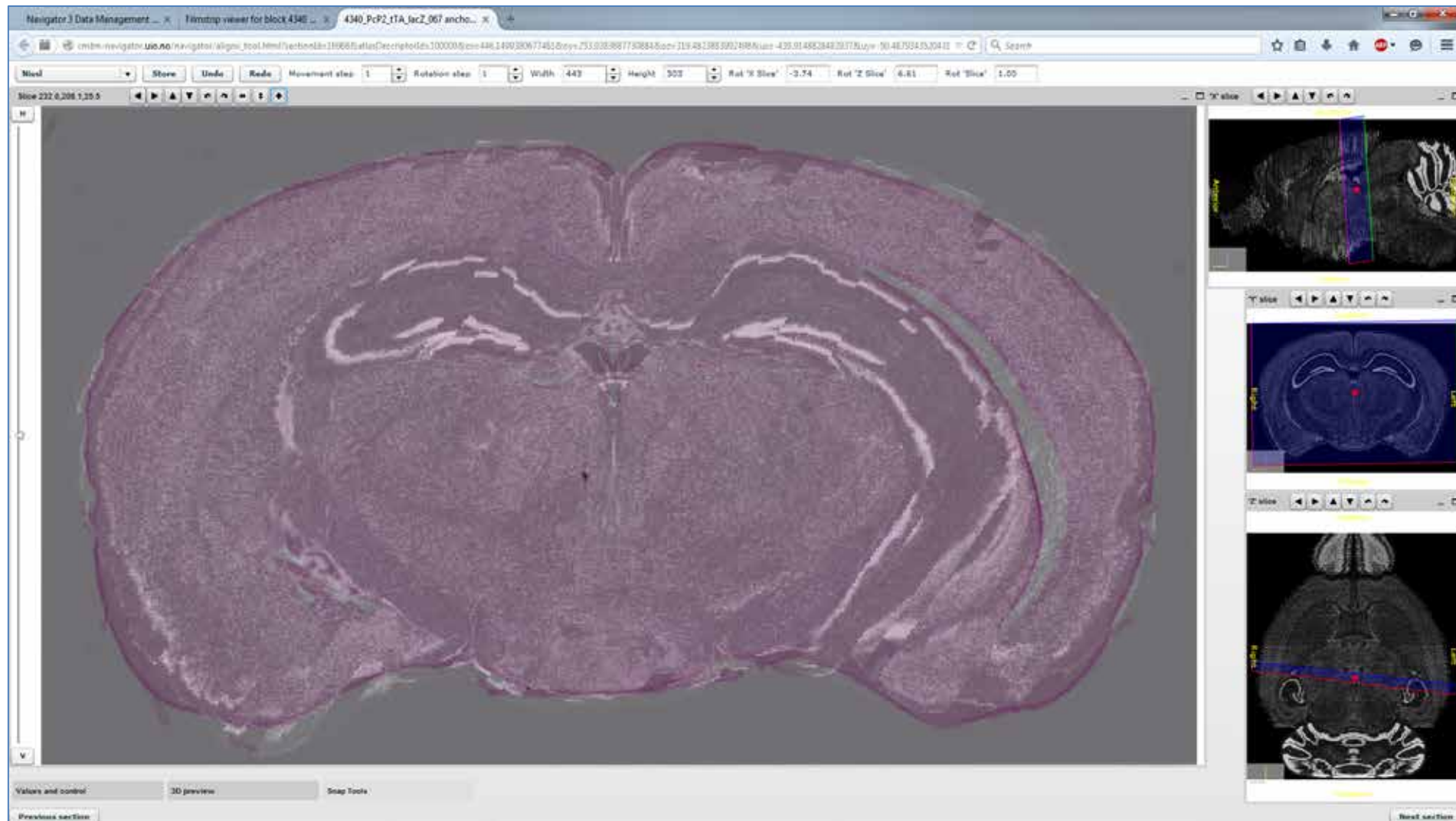


Figure 14: Screenshot of Atlas Viewer in AligNII



## Documentation

The generation of data, while challenging in the set up phase, is often nothing compared to trying to ensure the data is accessible to others. While data standards are not new concepts it is often challenging to get support in the the process of adopting data standards. On the documentation pages we are introducing tested approached to ensure data and analysis results are accessible for other researchers who can then build on top of it, and cite your original findings in the process. If we can help you in any way to make you data more accessible don't hesitate to [contact us](#)

This serves as the common data store and provenance tracker for all types of data, models, and literature produced and consumed by other services, tools and platforms in HBP.

Data shared on the Neuroinformatic platform (NIP) are enriched with minimal medatadata, [HBP-CORE](#), to provide essential information in order to ensure traceability of any data artefact. Moreover, it is of utmost importance that datasets are collected and processed in compliance with [EU ethical standards](#).

## Data standards

- › [Electrophysiology standards](#)
- › [Neuroimaging standards](#)
- › [Proteomic standards](#)
- › [Neuron reconstruction standards](#)
- › [Transcriptomic standards](#)

## Tidying data

[Guidelines for data providers to create accessible datasets for further usage and analysis.](#)



Figure 15: Screenshot of Documentation