EBRAINS

QUINT workflow and related viewers

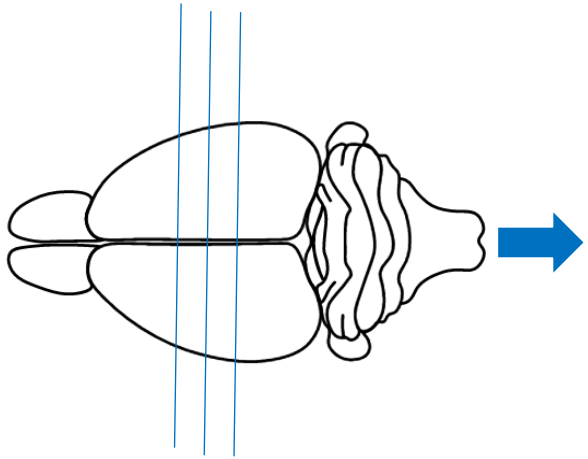
Maja Puchades

University of Oslo

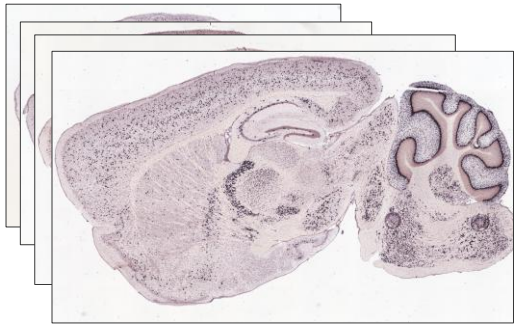
EBRAINS Tools for Teaching: Leveraging EBRAINS Open Science Tools for Neuroscience Education
EBRAINS Tutorials and Users Day, 12 March 2025 | Heidelberg, Germany

Co-funded by the European Union

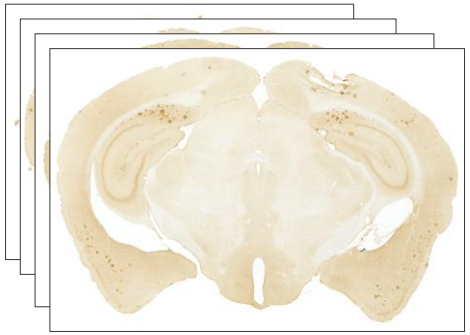
Scientific question: how to quantify features in rodent brains?



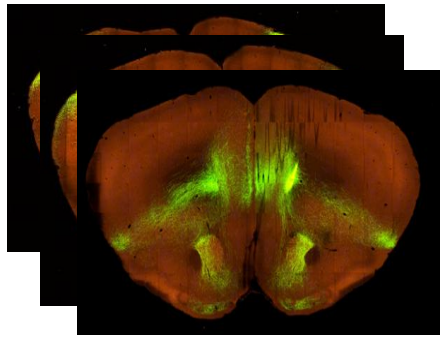
Immunohistochemistry, in-situ hybridisation, other staining methods



Labelled cells



Beta-amyloid aggregates



Projecting white matter fibres

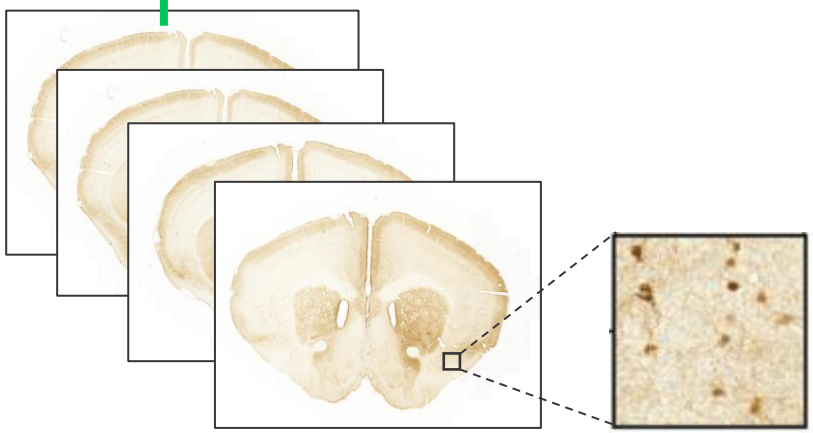
- Explore normal anatomy and connectivity
- Assess disease progression in animal models
- Quantify effects of interventions

Images from Allen gene expression library and Maja Puchades, CrossSeeds, unpublished

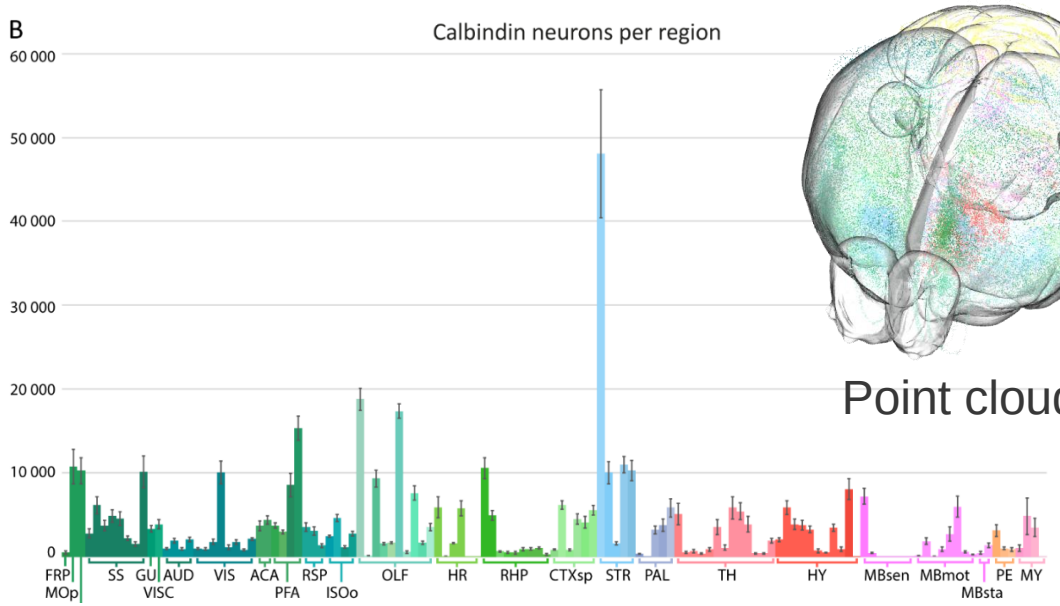
QUINT workflow for atlas-based analysis

https://www.ebrains.eu/brain-atlases/analysis/labelled-features-analysis

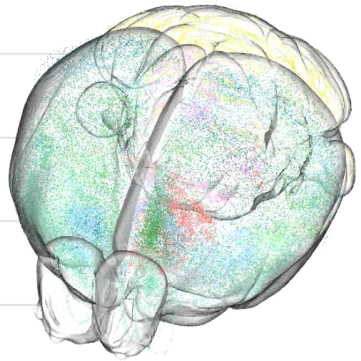
Prepare images ***Nutil*** → Register to Atlas ***QuickNII*** → Refine registration ***VisuAlign*** → Extract Features ***ilastik*** → Quantify & Analyse ***Nutil*** → Visualise ***MeshView***



Calbindin cells in mouse brain



Brain-wide regional counts

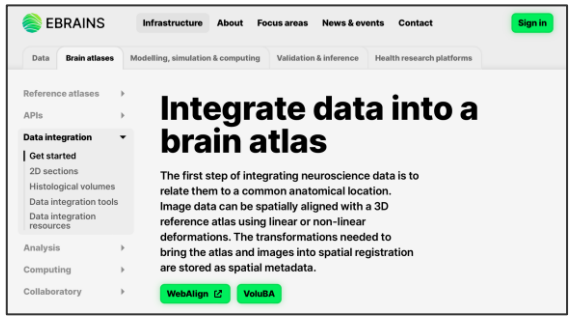


Point clouds

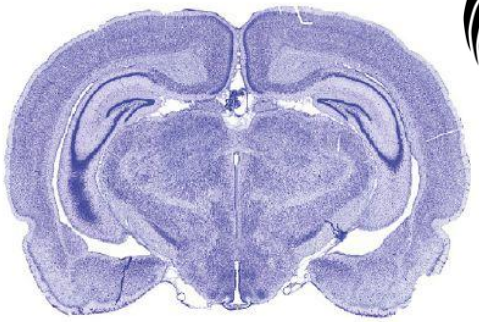
Cited in more than 80 original publications

Yates et al, 2019. Frontiers of Neuroinformatics; Bjerke et al. 2020 iScience

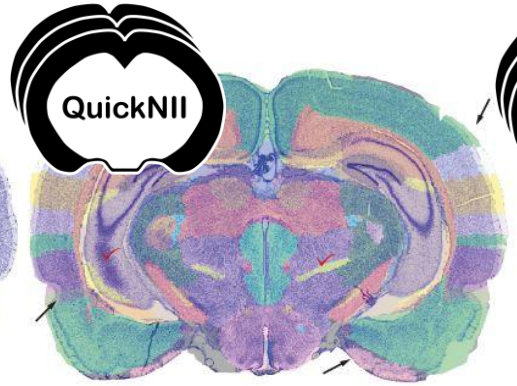
Brain section image registration to an atlas



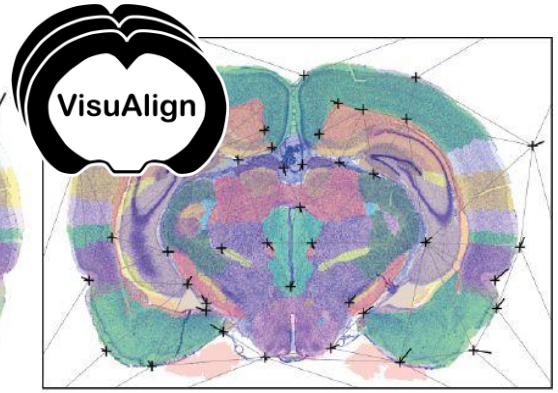
ebrains.eu/brain-atlases/data-integration



Section image



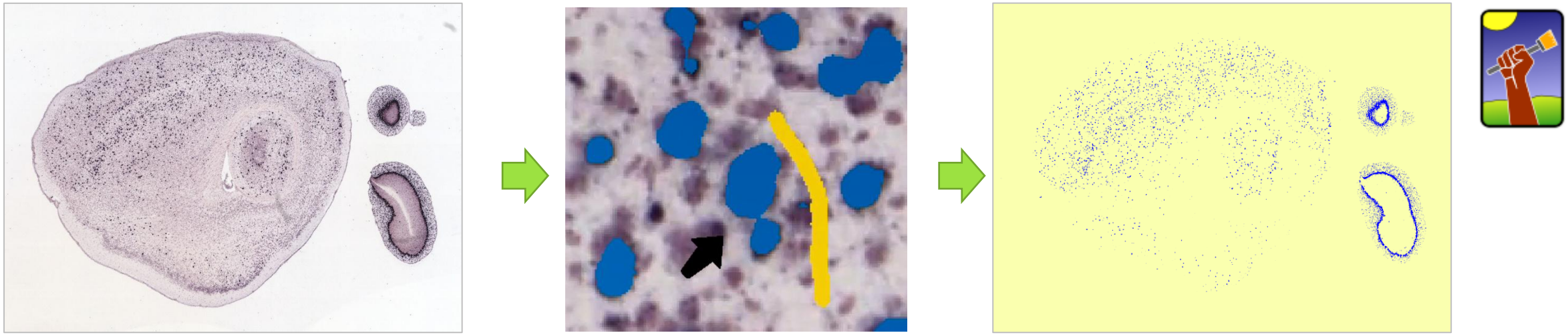
QuickNII registration:
find deviation angles



VisuAlign registration:
non-linear adjustment

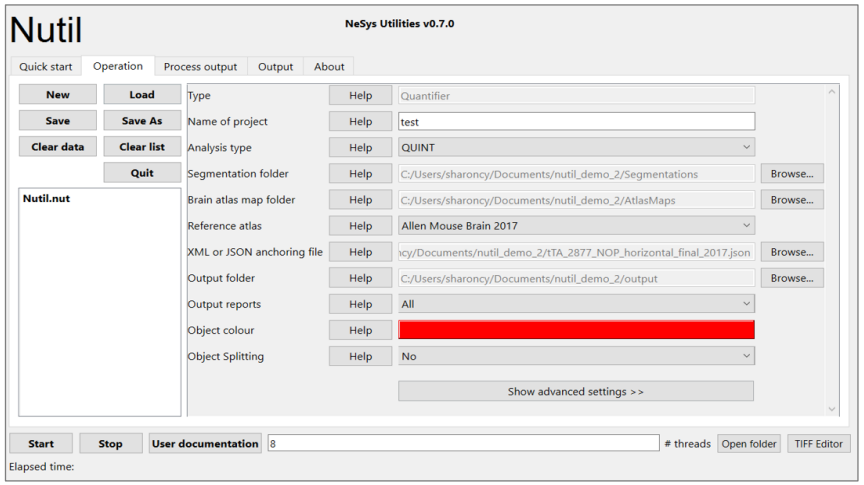
- QuickNII and VisuAlign sofware allow users to perform brain section registration to a reference atlas (mouse or rat).
- Course at PhD level: *Neuroscience data integration through use of digital brain atlases (University of Oslo)* and available through INCF training space.
- Requirements: easy to download and install. Works on Windows and Mac OS, does not require coding skills. Challenges: requires preprep of data files.
- Freely available, has good user documentation and support. Will be part of a modular teaching package.

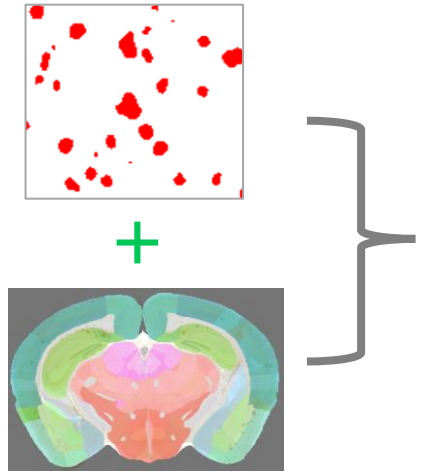
Segmentation your features of interest with ilastik

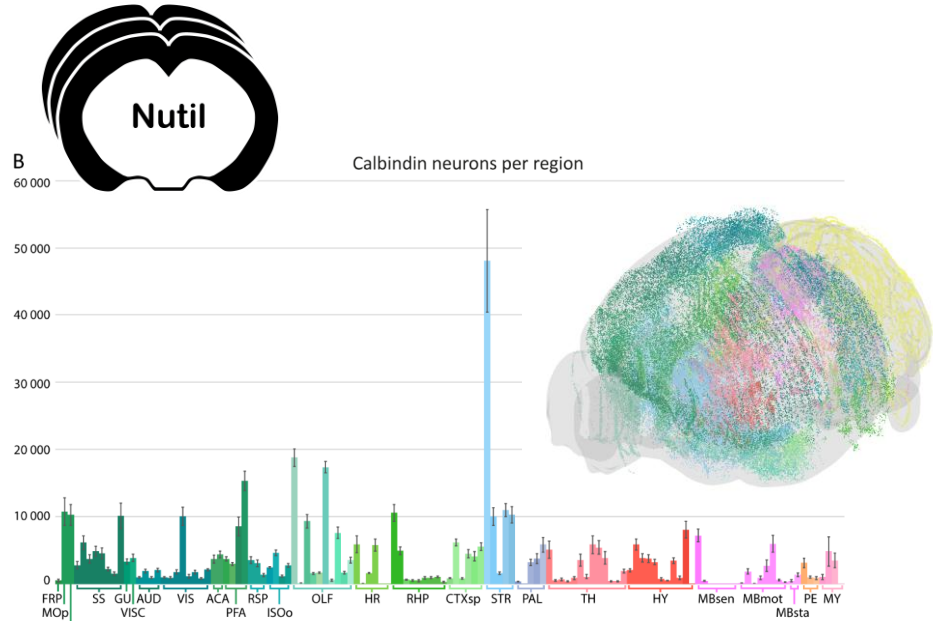


- Machine learning based object segmentation
- Course at PhD level: *Neuroscience data integration through use of digital brain atlases (University of Oslo)* and available through INCF training space.
- Requirements: Easy to download and install. Works on Windows and Mac OS, does not require coding skills. Challenges: Requires preprep of data files and has an upper limit of image size.
- Freely available, has good user documentation.

Nutil: atlas based quantification







The Nutil software is a pre- and post-processing toolbox for histological images

- *Transform* for image preparation (downscale, rotate, rename)
- *Quantifier* for spatial analysis

- Course at PhD level: *Neuroscience data integration through use of digital brain atlases (University of Oslo)* and available through INCF training space.
- Requirements: easy to download and install. Works on Windows. does not require coding skills. Challenges: Requires preprep of data files and has an upper limit of image size.
- Freely available, has good user documentation and support. Will be part of a modular teaching package.

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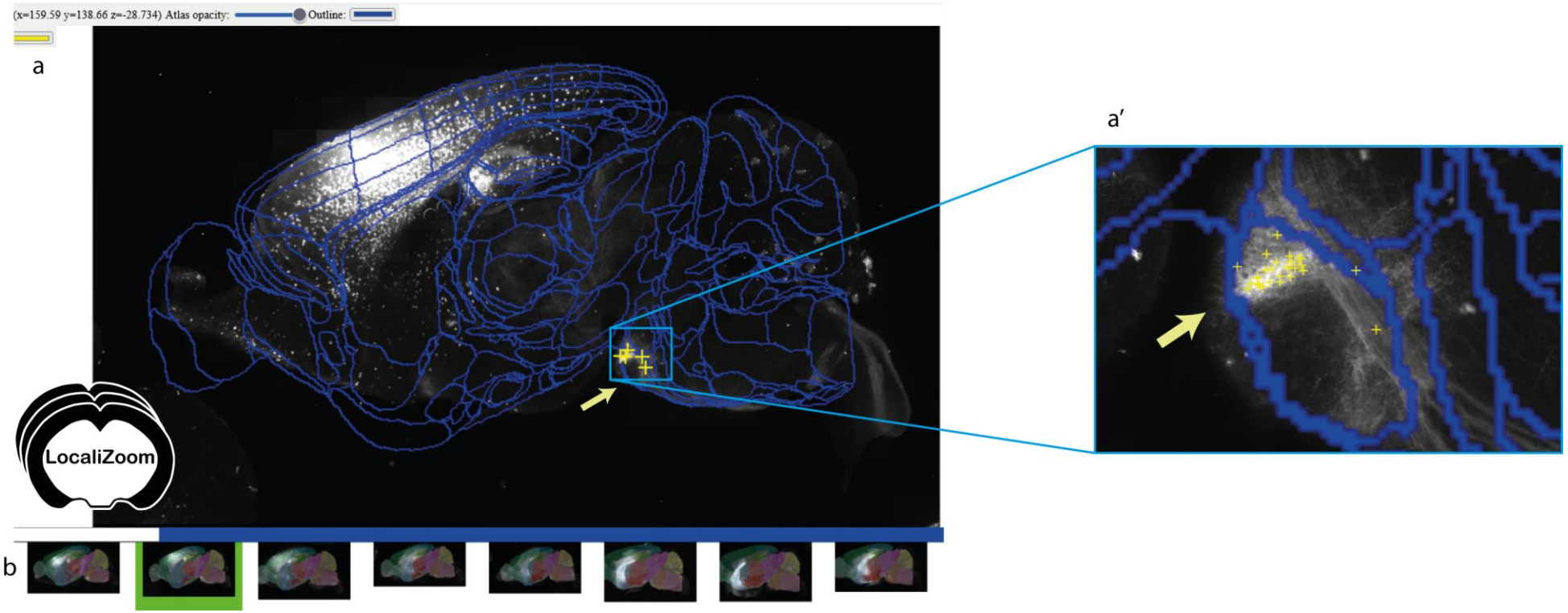
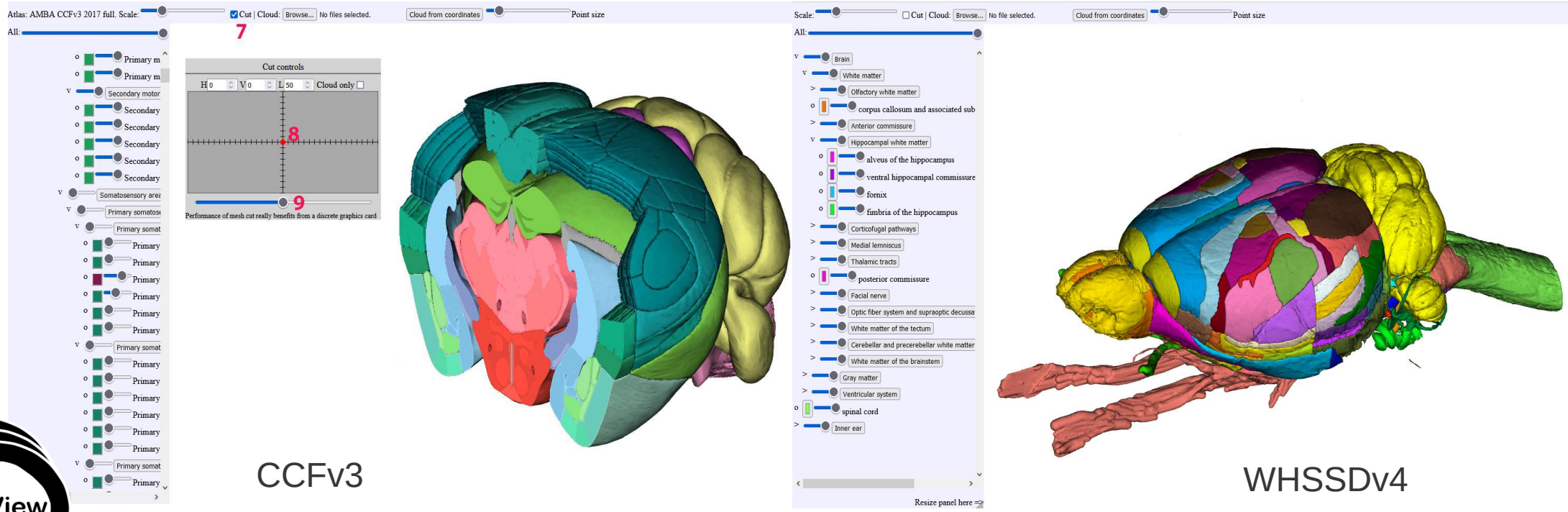
LocaliZoom



- Viewer for registered brain section images, annotation feature allow extraction of points coordinates.
- Recently available to EBRAINs users as a collaboratory app.
- Requirements: EBRAINS account
- Freely available, has good user documentation and support. Will be part of a modular teaching package.

MeshView



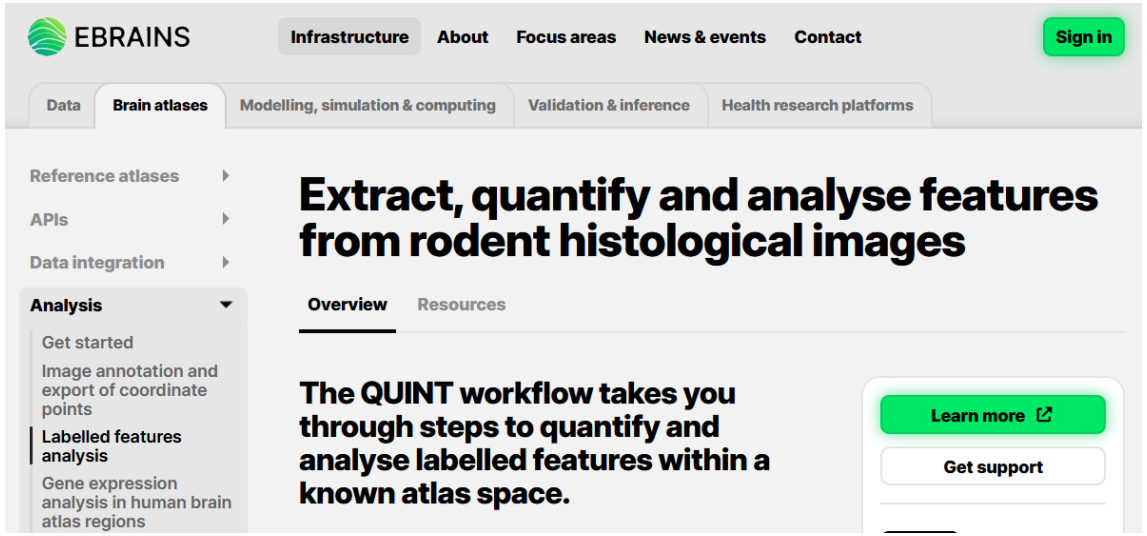
MeshView

CCFv3

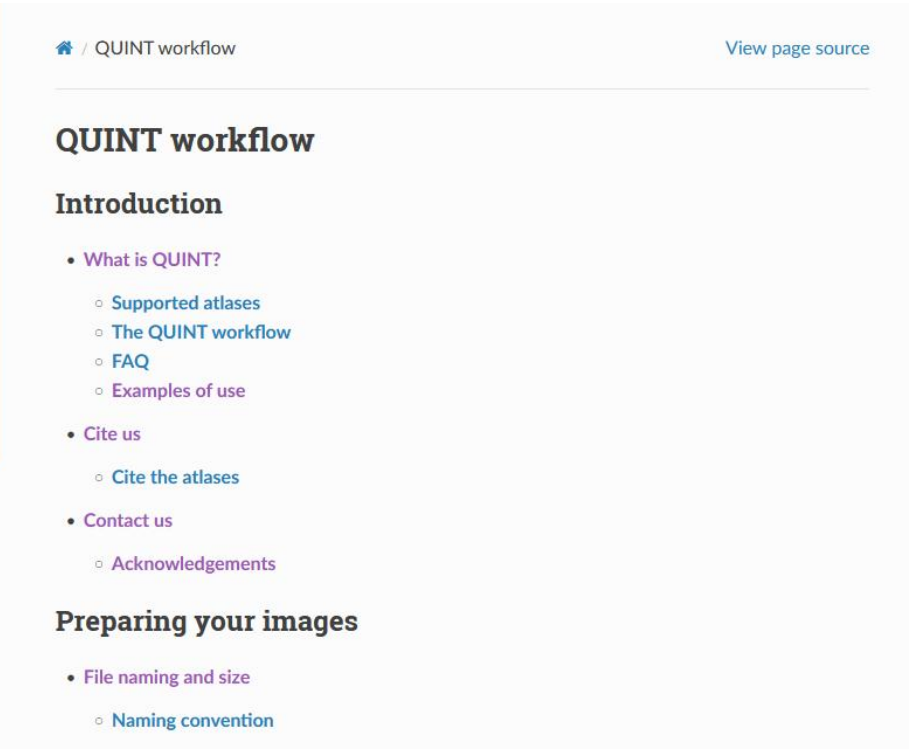
WHSSDv4

- Meshview can be used to learn the anatomy. Allow for visualisation pf point clouds.
- Course at PhD level: *Neuroscience data integration through use of digital brain atlases (University of Oslo)* and available through INCF training space.
- Freely available (MeshView read the docs), has good user documentation and support. Will be part of a modular teaching package.

Documentation and Access



www.ebrains.eu



https://quint-workflow.readthedocs.io/en/latest/

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Heidi Kleven

Ilastik developers, EMBL

Anna Kreshuk
Dominik Kutra
Tomaz Vieira
Emil Melnikov

Collaborators

Brianna Gurdon, JAX
Catherine Kaczorowski, JAX
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Thank you

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Head office
Chaussée de la Hulpe 166
B-1170 Brussels - Belgium

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