

brainlife.io

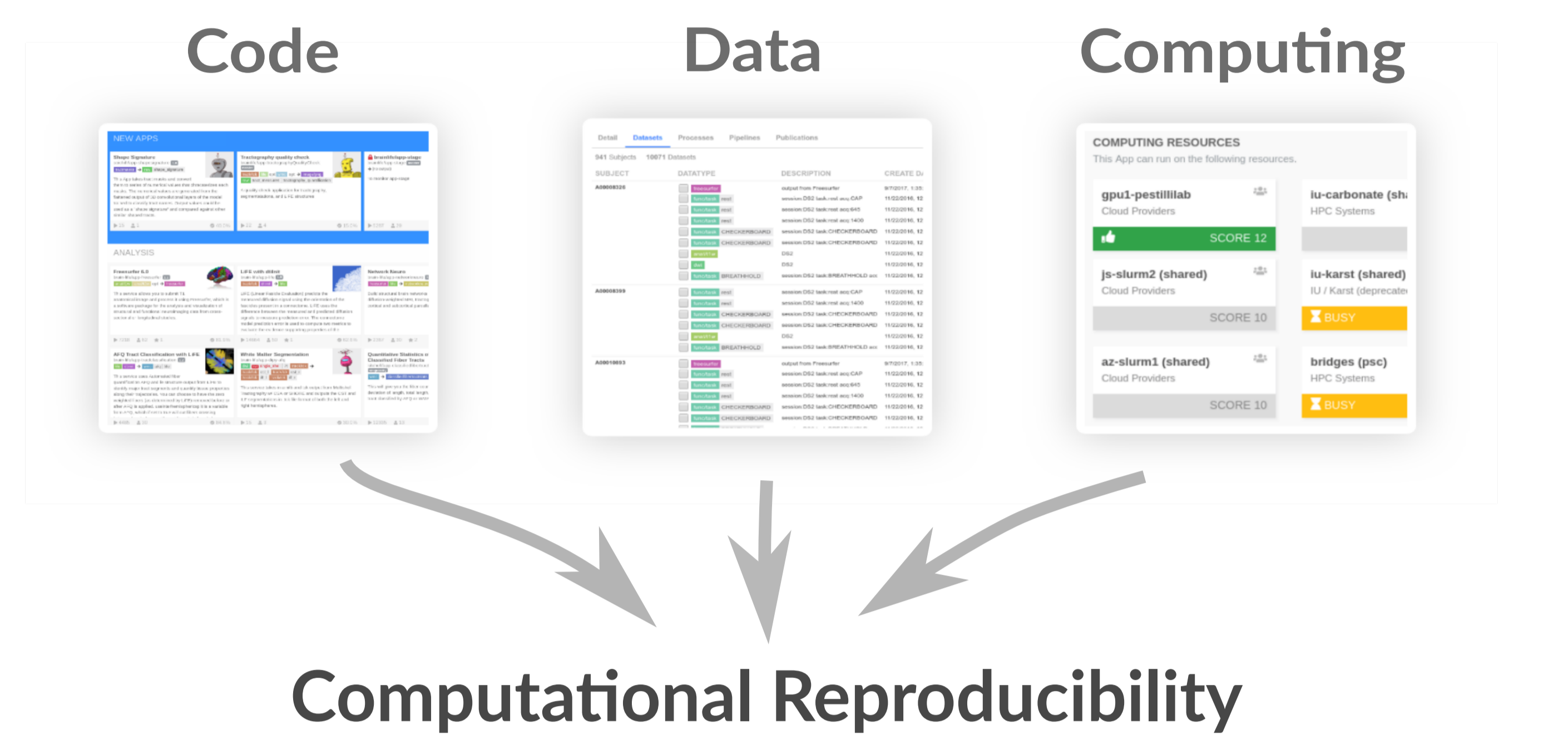
an online platform to accelerate scientific discovery by automated data management, large-scale analyses, and visualization.

Project Goal

Neuroscience is engaging at the forefront of science by dissolving disciplinary boundaries and promoting transdisciplinary research. This process can facilitate discovery by convergent efforts from theoretical, experimental and cognitive neuroscience, as well as computer science and engineering.

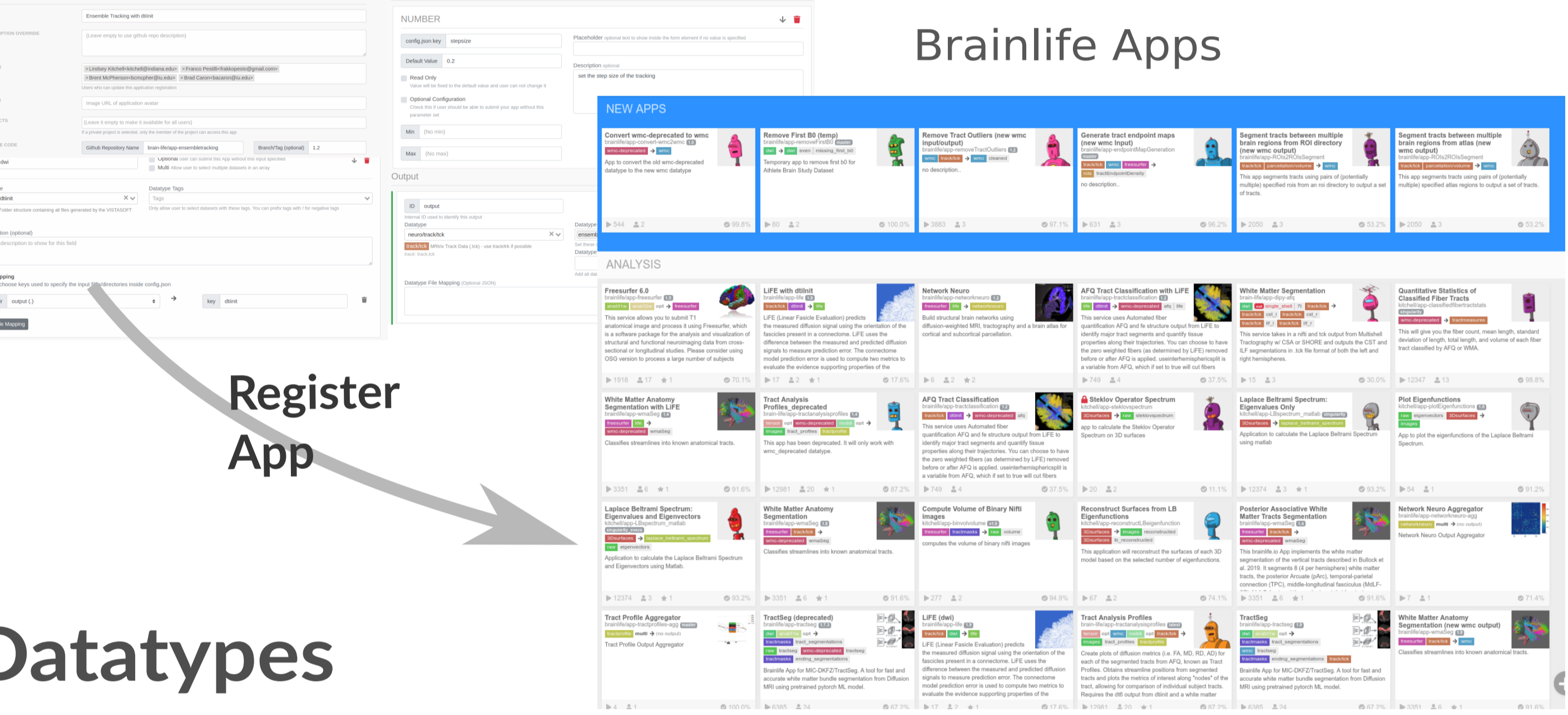
To assure the success of this process, the current lack of established mechanisms to promote open sharing data, software and scientific results must be overcome. Promoting open software and data sharing has become paramount to addressing the problem of scientific reproducibility.

We address challenges to neuroscience open sharing and reproducibility by providing integrative mechanisms for publishing data, and algorithms while embedding them with computing resources to impact multiple scientific communities.



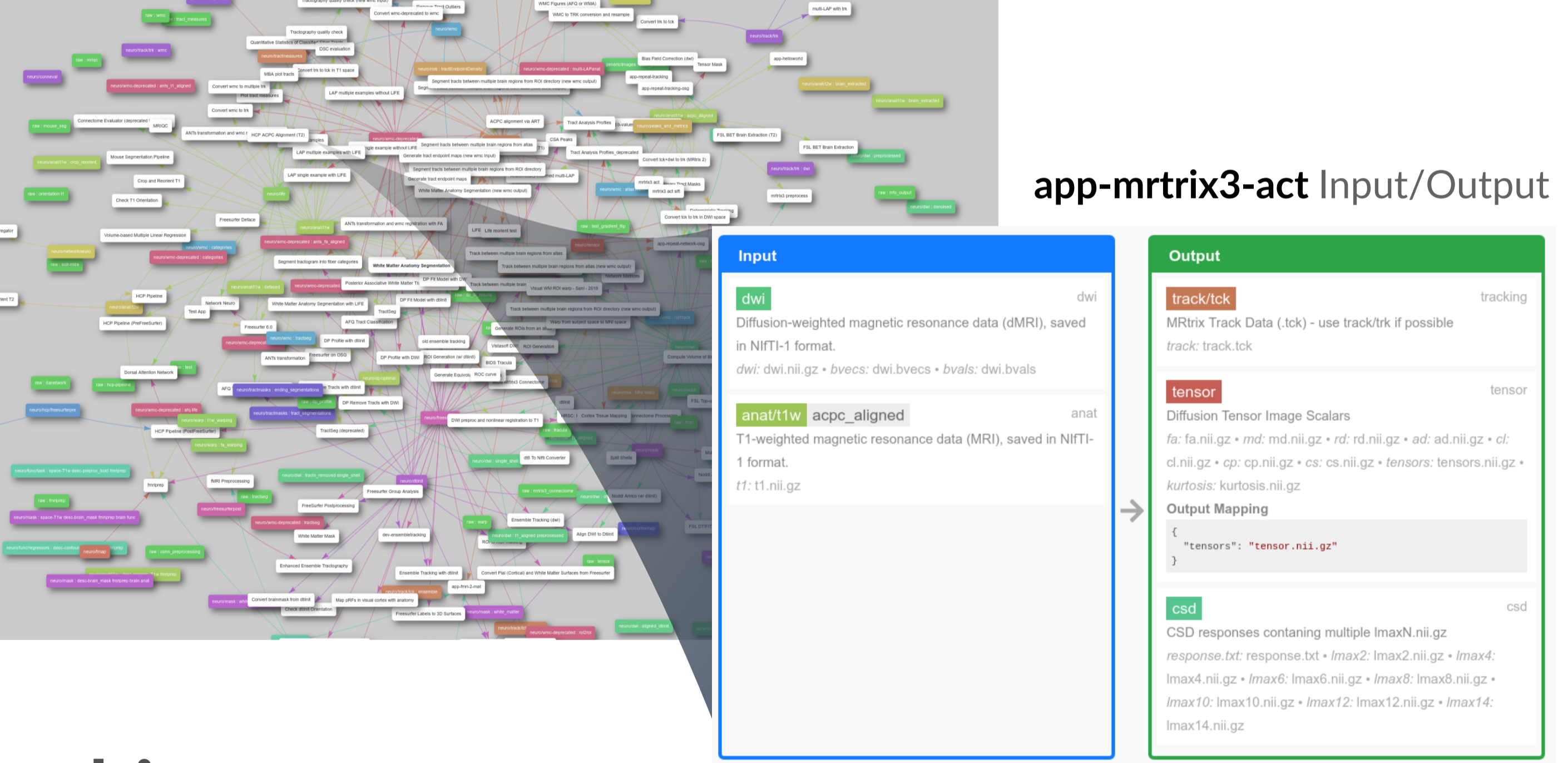
Apps

brainlife.io users can register their analyses as reusable Apps. Apps are simply github.com repositories written following the brainlife.io App specification. Apps can be either an end-to-end scientific workflow or a modular step within a larger analysis pipeline. Most brainlife.io Apps are small analyses modules, they are composable. brainlife.io users can mix and match Apps to build flexible processing pipelines that best fits their data and needs.



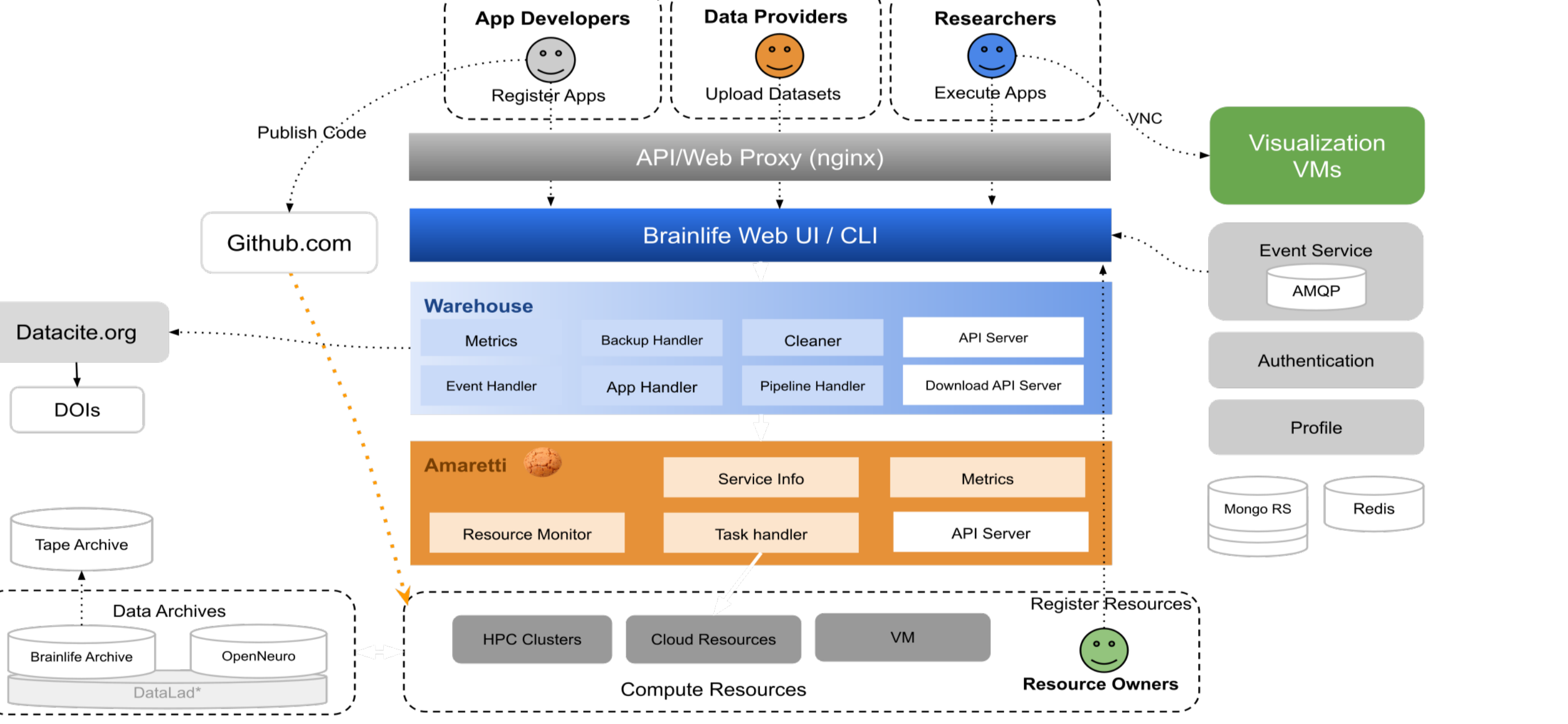
Datatypes

brainlife.io datatypes allow Apps to interoperate. Datatypes can be passed between Apps. The brainlife.io platform uses datatypes to recognize the type of data being processed, and to match data with analyses. brainlife.io datatypes are all related to each other by the Apps that uses them, below the network of brainlife.io datatypes.



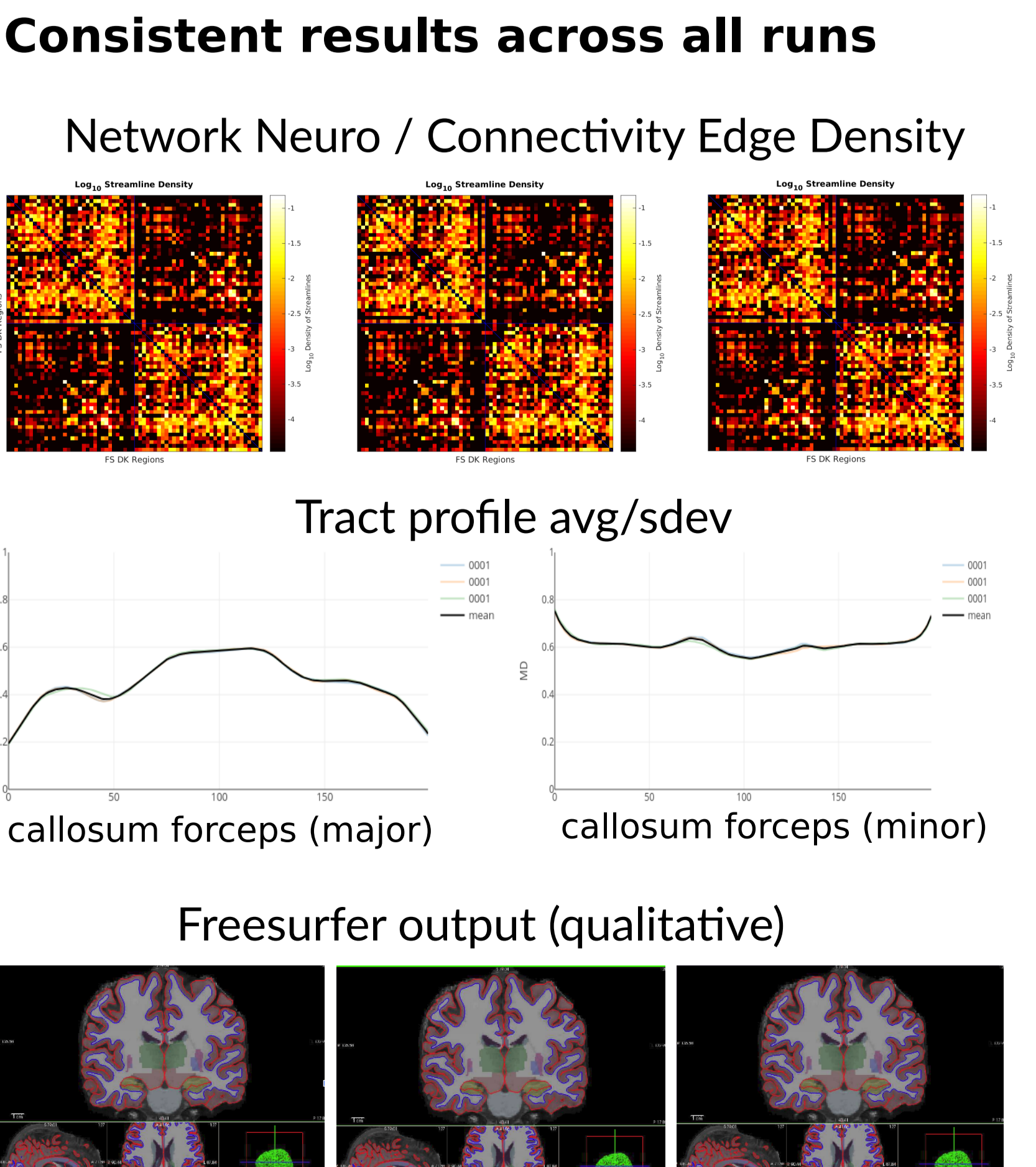
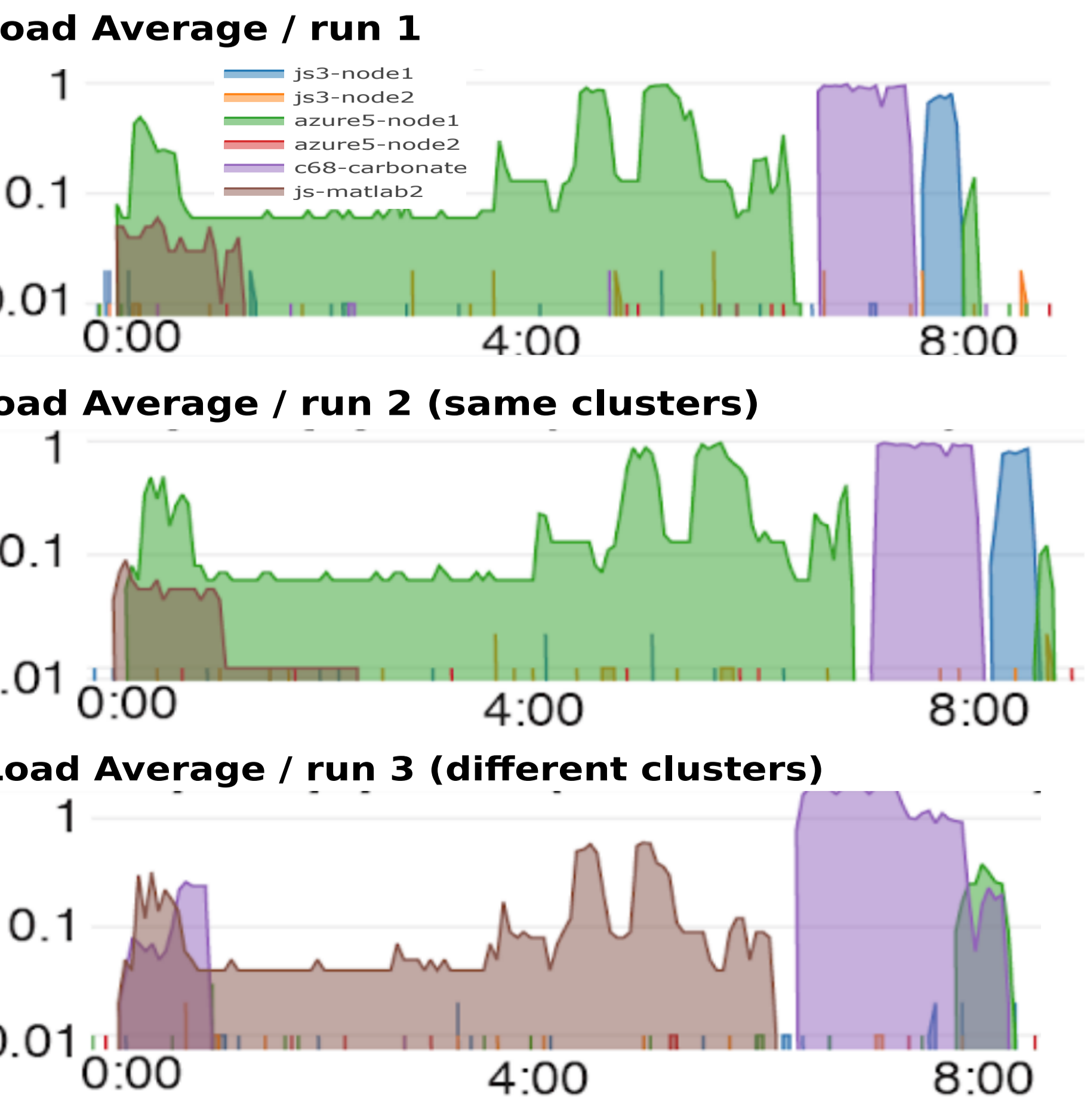
Architecture

Brainlife platform is constructed as a collection of open-sourced* microservices that are distributed across multiple docker hosts and VMs running on jetstream-cloud. brainlife.io has a primary web user interface that communicates users inputs and requests to the data management system, the Warehouse. The Warehouse manages data, visualization and Apps and communicates with Amaretti. Amaretti is brainlife.io meta orchestration service that allows monitoring and processing across multiple high performance compute resources and clouds. * <https://github.com/brainlife>



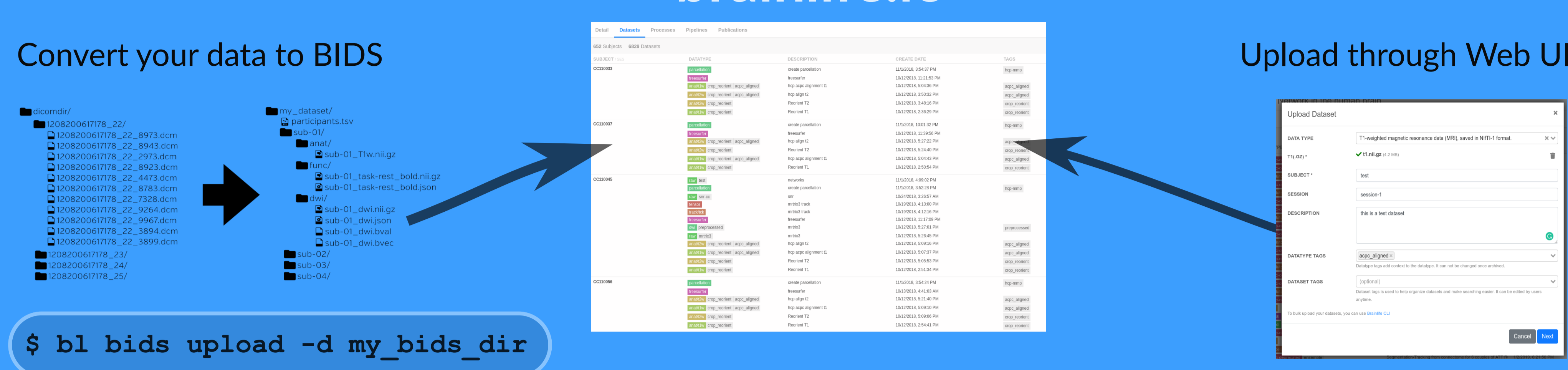
Reproducibility

brainlife.io keeps track of all the information you need to reproduce your analyses. The data being analyzed, the Apps being used to perform the analyses (all the way down to their github.com commit ID), the parameter set for the App. Most brainlife.io Apps use singularity to containerize their execution environment to allow reproducibility. We have performed a series of experiments to demonstrate that brainlife.io can deploy Apps across diverse computing resources and obtain near-identical results (i.e., within the expected stochasticity).



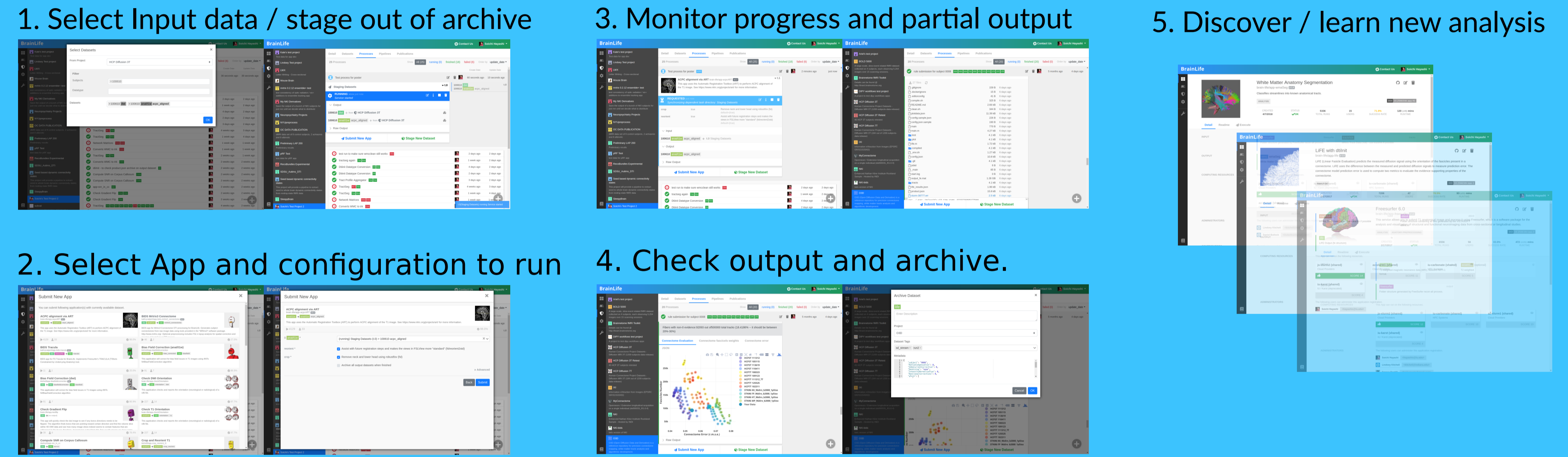
UPLOAD DATA

Upload and organize large data files securely on our cloud storage and share them with your collaborators.



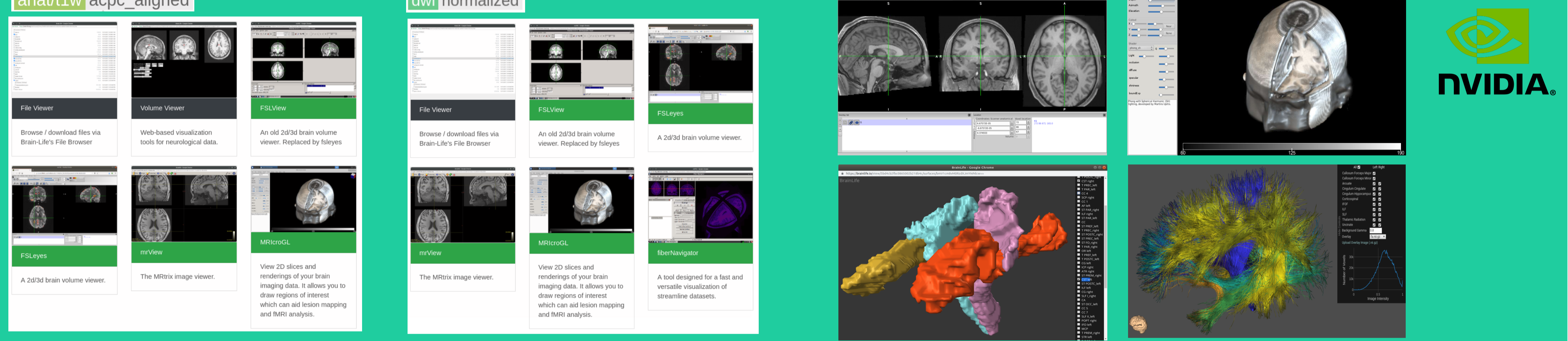
ANALYZE DATA

You can analyze your data and experiment with close to 200 Apps currently registered on Brainlife. Our simple web based user interface allows you to discover / learn new analysis methods developed by various developers.



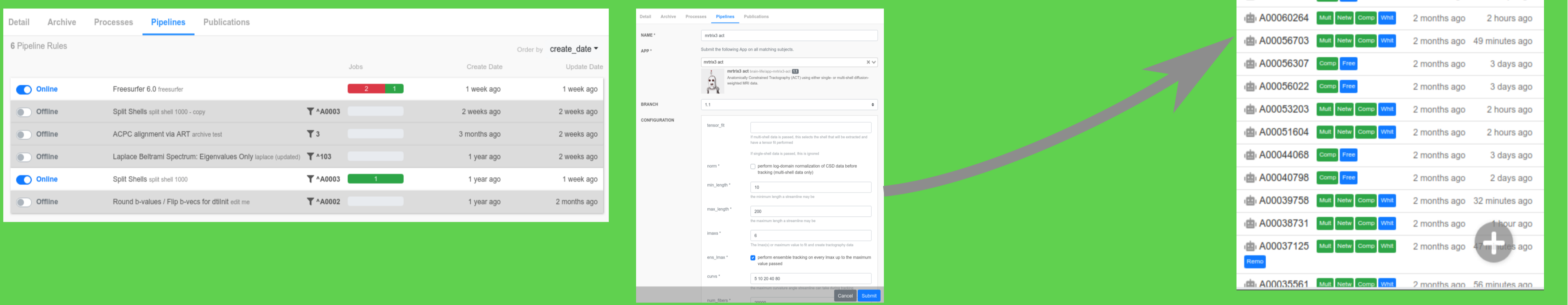
VISUALIZE RESULTS

You can visualize your data using different set of visualizers registered to each datatype directly on the cloud. We provide popular UIs such as fsleyes, freeview, mricrogl, mrview, etc. via our GPU enabled virtual desktop (no need to install anything) as well as various advanced web visualization tools.



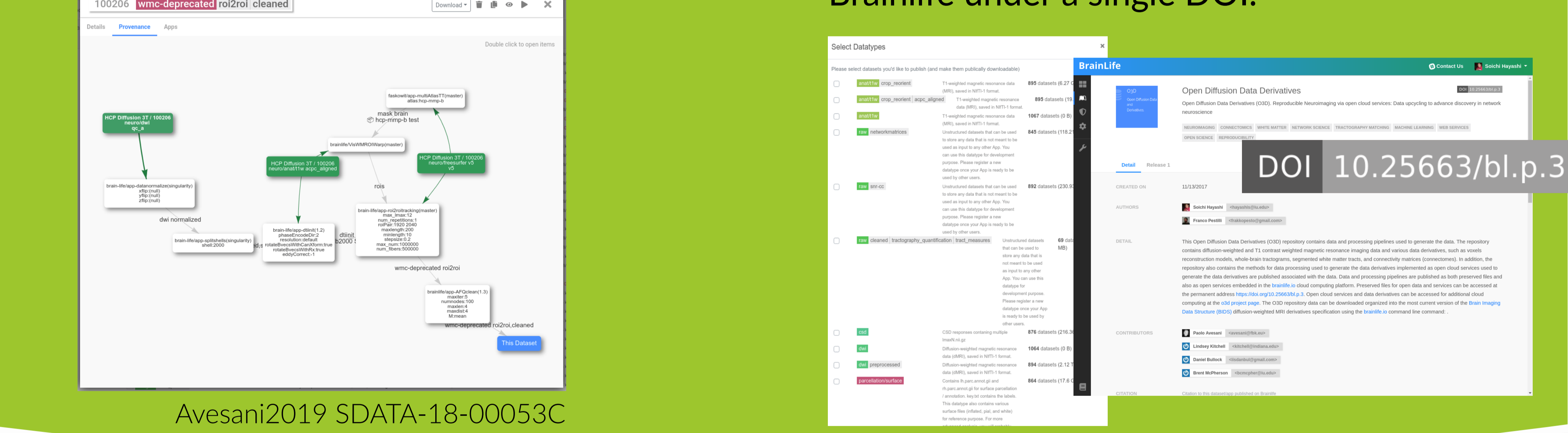
BULK PROCESSING

Brainlife allows you to bulk process 1000s of subjects through our novel rule based pipeline submission mechanism just as easily as you would process an individual subject. Your jobs can be executed on our shared cloud computing resources, or on your own computing resources.



PUBLISH RESULTS

Brainlife automatically captures full provenance of each output as you run analysis.



Interoperability

brainlife.io interoperates with a number of common data, and computing standards as well as other platforms. For example, brainlife.io can import and export most BIDS datatypes (anat, dwi, fmri, fmap). brainlife.io also interoperates with a series of open science projects and data providers such as NKI, OpenNeuro, and the Human Connectome Project. A series of DIPY workflows are available as brainlife.io Apps.

