

# JIPipe: Designing automated image analysis pipelines without programming

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## JIPipe

Java Image Processing Pipeline (*JIPipe*) is a plugin for *ImageJ* [1] that allows to create image processing pipelines without a script language. Instead users only have to design a flow-chart by connecting processing steps (nodes) to each other in a **visual programming language**.

- ✓ 500+ commonly used functions from ImageJ and popular plugins
- ✓ Intuitive and modern user interface
- ✓ Powerful annotation system for tracking metadata
- ✓ Standardized & automated output to hard drive

### Image analysis powered by ImageJ

*JIPipe* integrates many image analysis functions, like image import, thresholding, contrast enhancement, edge detection, or extracting measurements from *ImageJ* and allows them to be run in a batch environment. Additionally, we included popular plugins like ...

- ✓ **Bio-Formats**
- ✓ **OMERO**
- ✓ **MorphoLibJ**
- ✓ **FeatureJ**
- ✓ **Multi-Template-Matching**

To allow even greater flexibility, you can utilize **ImageJ Macro**, **Python**, and **R** script nodes to write or re-use custom code inside the *JIPipe* environment.

### GPU processing and Deep Learning

*JIPipe* allows easy utilization of modern graphics hardware by including all functions provided by the powerful **CLIJ2** [2] library for GPU processing. *JIPipe's* advanced data management automatically takes care of all technical details like converting images.

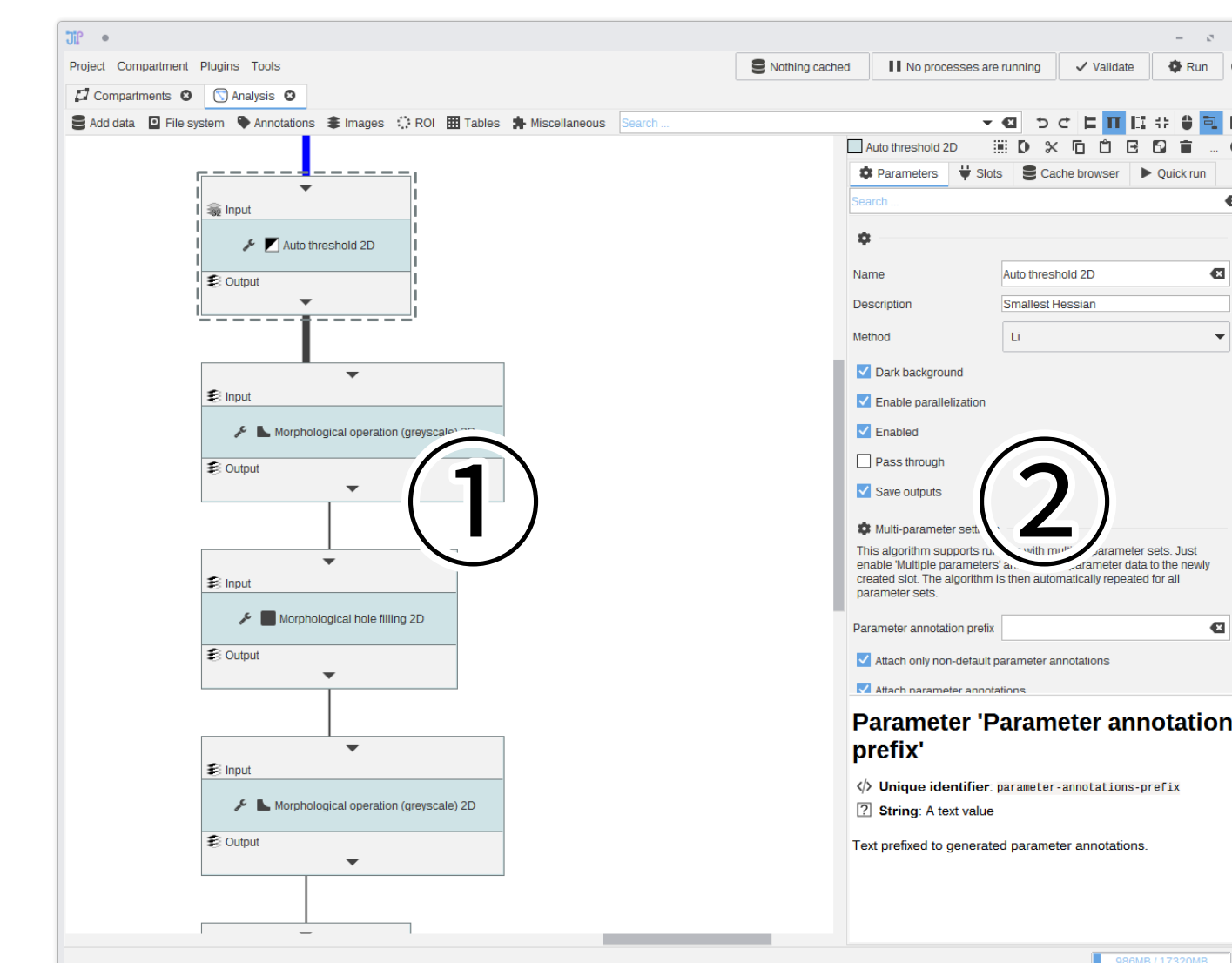
Deep Learning has become a commonly used tool in image analysis. To allow anyone to make use of this technology, *JIPipe* includes Deep Learning libraries like **Cellpose** [3] - with full support for all functions and parameters, including training.

A more generalized library for Deep Learning using **Keras** and **Tensorflow** is currently being developed, as well.

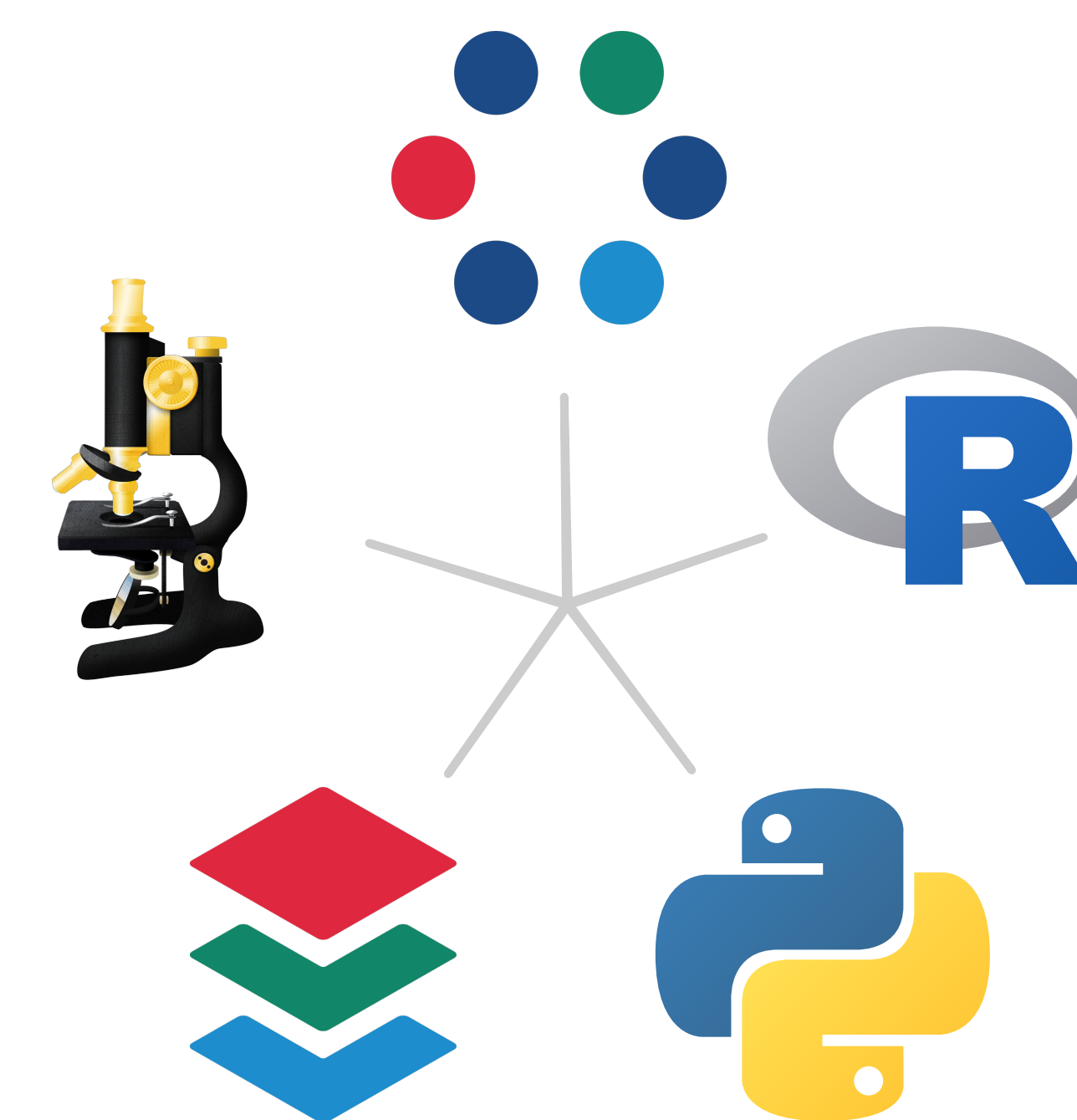
### More features via plugins

*JIPipe* already provides many features, like the table processing algorithms, plotting, sorting and distributing data, user interaction during the pipeline, and more.

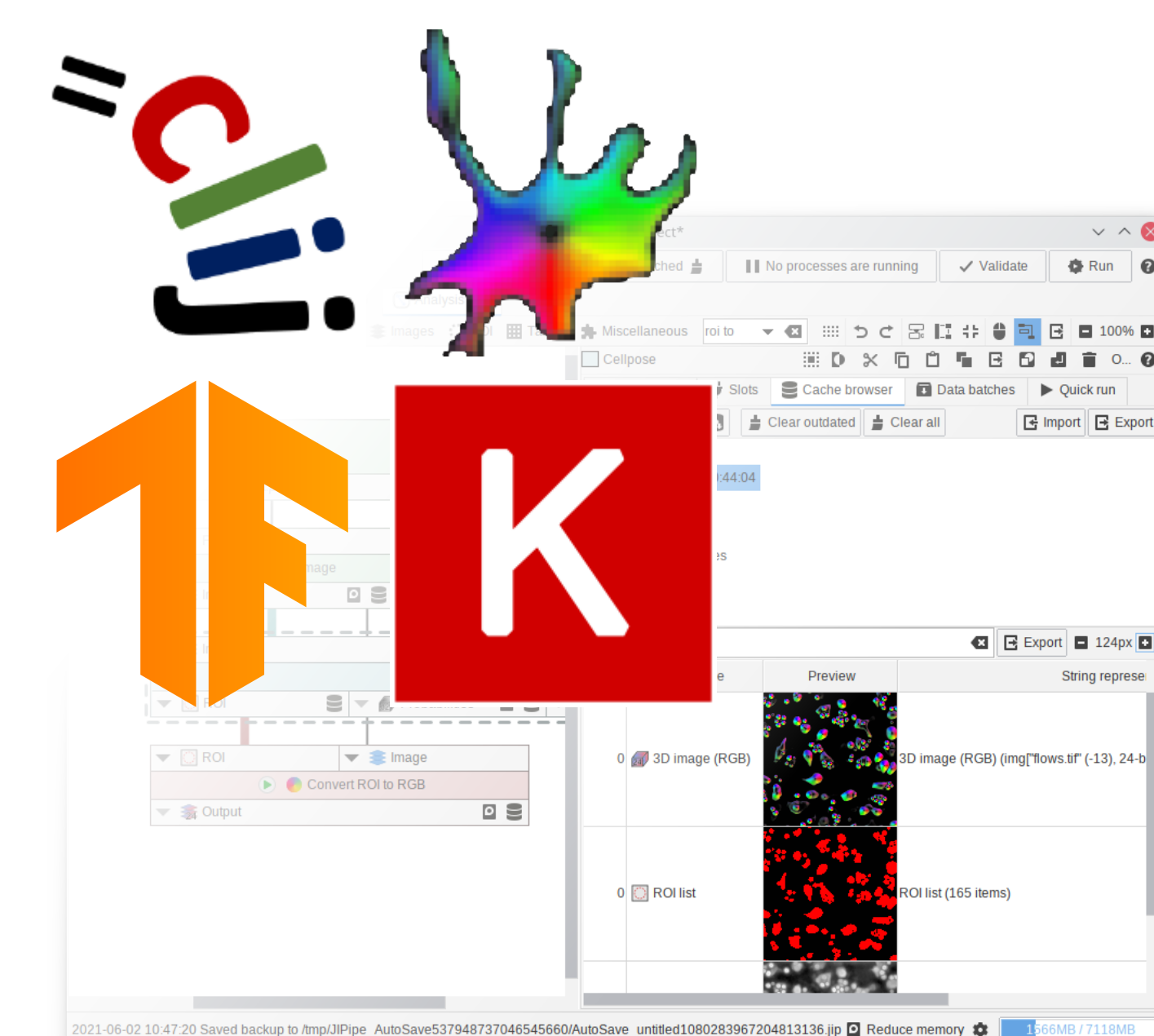
Additional features can be easily developed in Java as *ImageJ* plugin, or created within a **GUI tool** that allows anyone to create new nodes. These are also automatically available from inside *ImageJ*, as *JIPipe* exports all its functions to *ImageJ*.



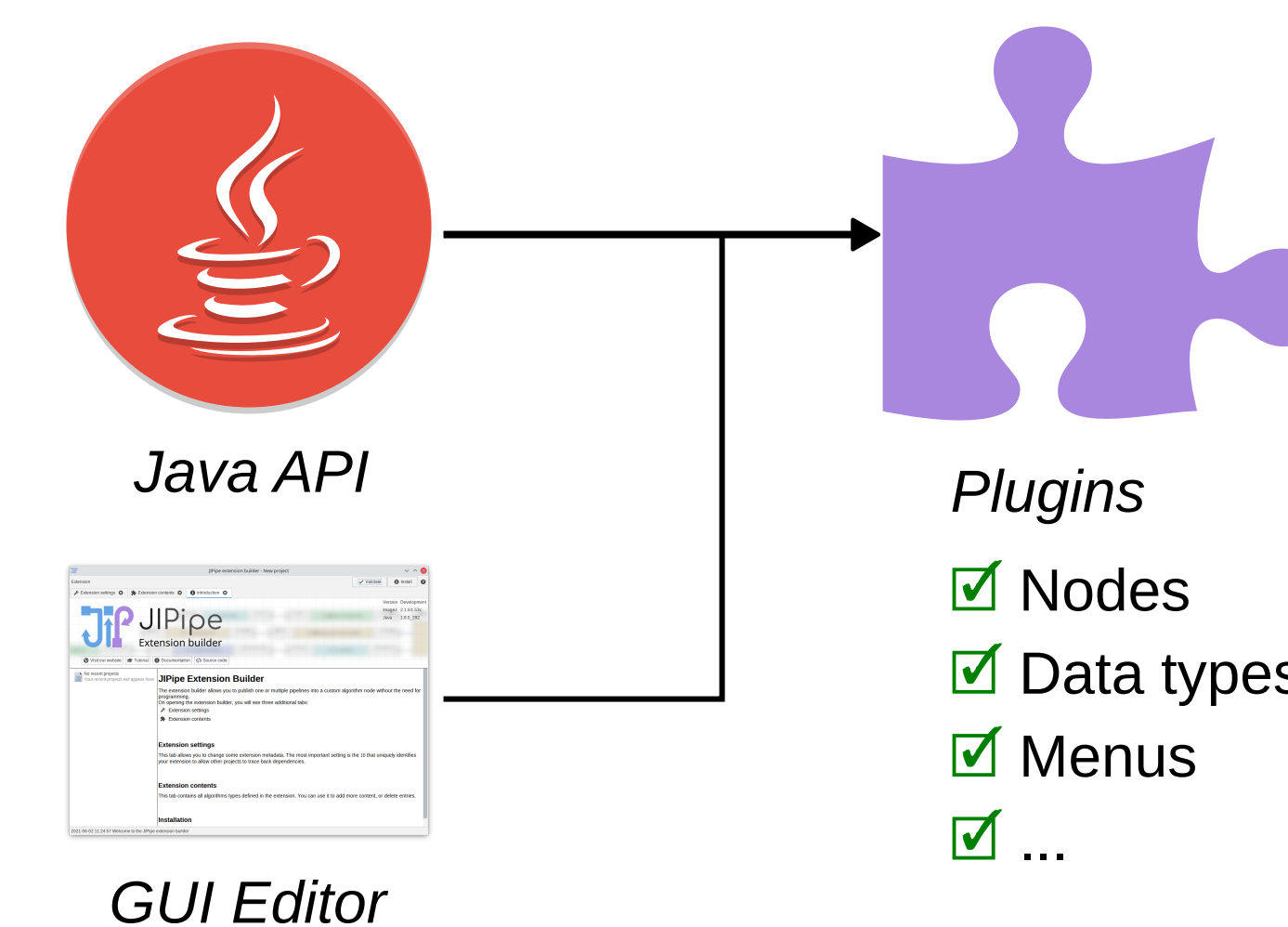
*JIPipe* comes with its own graphical user interface that allows easy access to all functions.  
 ① The graph editor to build the flow chart  
 ② All settings are shown on the right-hand side



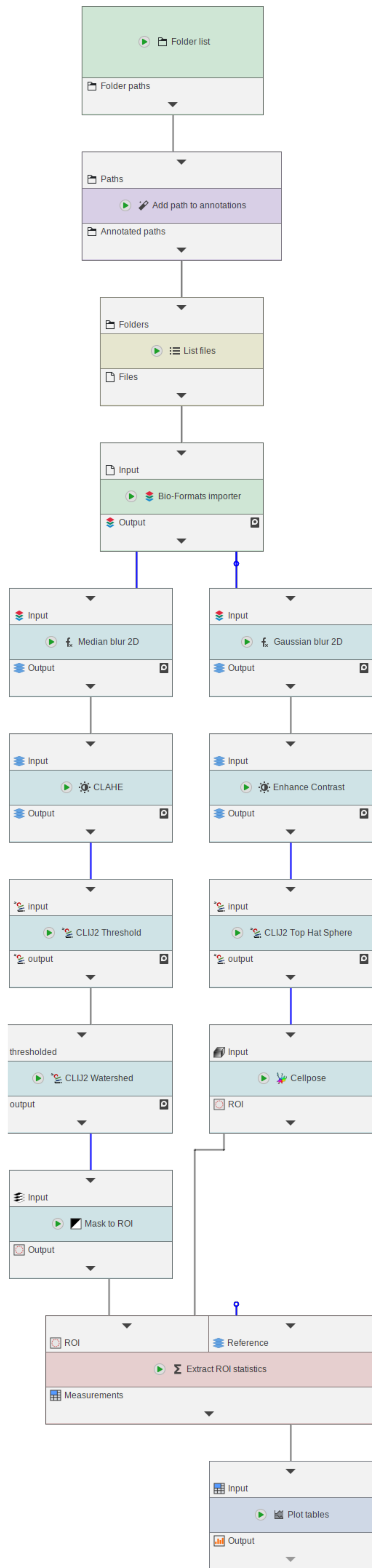
*JIPipe* already integrates many popular software tools like *ImageJ* and *Python* into one easy-to-use environment.



*JIPipe* comes pre-packaged with support for GPU and Deep Learning tools like **CLIJ** and **Cellpose**.



*JIPipe* can be easily extended with plugins.



**References:**  
 [1] Rueden, C. T., Schindelin, J., Hiner, M. C., DeZonia, B. E., Walter, A. E., Arena, E. T., & Eliceiri, K. W. (2017). ImageJ2: ImageJ for the next generation of scientific image data. *BMC bioinformatics*, 18(1), 1-26.  
 [2] Haase, R., Royer, L. A., Steinbach, P., Schmidt, D., Dibrov, A., Schmidt, U., ... & Myers, E. W. (2020). CLIJ: GPU-accelerated image processing for everyone. *Nature methods*, 17(1), 5-6.  
 [3] Stringer, C., Wang, T., Michaelos, M., & Pachitariu, M. (2021). Cellpose: a generalist algorithm for cellular segmentation. *Nature Methods*, 18(1), 100-106.



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