Exploring large volumetric data with Fiji Python scripting

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Session 2: UTC – UTC

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Number of students: 20

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Image data sets, particularly for whole-brain connectomics, are increasingly large and therefore less approachable with standard off-the-shelf tools. But the image processing libraries bundled with the Fiji open source software are extremely capable. Here, from Fiji's Script Editor, we will demonstrate how to navigate and perform exploratory processing of large data sets from computers with limited computing capacity such as a laptop.

First, we will demonstrate how to swiftly browse a file share with tens of thousands of image stacks by combining a one-off, one-liner bash script to collect all file paths, and then filtering and opening image stacks from the comfort of a custom graphical user interface (GUI). The goal is to illustrate how to build responsive graphical user interfaces that respond to keyboard and mouse.

Second, we will show how to load series of large image files (such as serial sections for volume electron microscopy), view and dynamically process small subsets of them, and export them into data formats that facilitate very fast random access such as N5. The dynamic processing will use examples from conventional computer vision for contrast enhancement, as well as from machine learning with the WEKA library for segmenting cytoplasmic membranes.

Most of the tutorial examples will be based on examples already available in this Fiji Python Tutorial:
https://syn.mrc-lmb.cam.ac.uk/acardona/fiji-tutorial/

The documentation we'll use is:

* Java 8 API:
https://docs.oracle.com/javase/8/docs/api/index.html

* Source code for ImgLib2:
https://github.com/imglib/imglib2/tree/master/src/main/java/net/imglib2
https://github.com/imglib/imglib2-algorithm/tree/master/src/main/java/net/imglib2/algorithm
https://github.com/imglib/imglib2-cache/tree/master/src/main/java/net/imglib2/cache
https://github.com/imglib/imglib2-realtransform/tree/master/src/main/java/net/imglib2/realtransform
https://github.com/imglib/imglib2-roi/tree/master/src/main/java/net/imglib2

* Source code for n5-imglib2
https://github.com/saalfeldlab/n5-imglib2/tree/master/src/main/java/org/janelia/saalfeldlab/n5/imglib2

* WEKA API
https://weka.sourceforge.io/doc.dev/