

From Images to Knowledge with ImageJ & Friends

virtual conference

Nov 30 - Dec 2, 2020

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Conferences



Analyze calcium imaging data & create FAIR-functionally linked datasets using the Mesmerize platform

Tutors: Kushal Kolar (kushalkolar@gmail.com)
Daniel Dondorp (danieldondorp@gmail.com)

Session 1: 2020-12-01 08:00 UTC – 2020-12-01 12:00 UTC

Session 2: 2020-12-02 12:00 UTC – 2020-12-02 16:00 UTC

Information about the tutors:

Kushal Kolar:

Staff Engineer at the Sars Centre, wrote Mesmerize and works extensively on calcium imaging in *Ciona intestinalis*

Daniel Dondorp:

Staff Engineer at the Sars Centre, works on various *Ciona* microscopy projects using contemporary techniques for image analysis & cell biology. Also works extensively on *Ciona* behavioral neuroscience.

Title: Analyze calcium imaging data & create FAIR-functionally linked datasets using the Mesmerize platform

Abstract:

Mesmerize is a platform for the annotation and analysis of neuronal calcium imaging data. It encompasses the entire process of calcium imaging analysis from raw data to interactive visualizations. Mesmerize allows you to create FAIR-functionally linked datasets that are easy to share. The analysis tools are applicable for a broad range of biological experiments and come with GUI interfaces that can be used without requiring a programming background. We will show you how Mesmerize was used to analyze spontaneous activity in a protochordate, as well as how it can be used to analyze calcium imaging data from mice and other model organisms in neuroscience by using openly available datasets. We will go through how you can perform signal extraction using the Mesmerize Batch Manager which can interface with the CalmAn library, as well as how you can import extracted signals from other sources such as Suite2p. Finally, we show you how Mesmerize can be used for common forms of analysis in neuroscience research, such as stimulus tuning, sorting cells based on stimulus responses, creating spatial maps, and some more contemporary analysis techniques such as k-Shape clustering. Finally, we'll show you how data from a Mesmerize project can be navigated in notebooks or scripts for more customized downstream analysis. We're also eager to hear about any feature requests that you may have.

Outline of how the tutorial will be organized:

1. About a week before the tutorial we will send out instructions on how to install Mesmerize and will be available if they need help getting it installed. Mesmerize is cross-platform and can run in python virtual environments or anaconda environments.
2. 2-3 weeks before the tutorial we will ask if some students are open to sharing parts of their dataset(s) to use as additional examples for the tutorial. (see below).

Tutorial Day:

1. Overview of Mesmerize, how we've used it in the Chatzigeorgiou lab, and how it was used

to analyze other openly available datasets. - Kushal Kolar (20 mins)

2. Introduction of each student, their background, and the dataset they want to try out in the tutorial, presented by the students (2-5min each, 50min). If a student doesn't have their own dataset we they can work with an open dataset.

3. We show examples of how Mesmerize can be used to analyze 2-3 datasets provided by a few of the students prior to the tutorial (45 minutes)

4. Practical work and training, students try out Mesmerize on their datasets. Kushal & Daniel guide the students. (2h)

5. Summary and questions (45 minutes)

Technical Requirements:

A desktop or laptop with a fairly generation Core i7/Ryzen 7 and 16GB of RAM is recommended. Less capable systems would be fine if their datasets are small. Much more powerful systems would be required if they want to try out larger datasets. The students must have permissions to create either python virtual environments or anaconda environments on their machine. We will be available before the tutorials to help students create virtual environments & install Mesmerize.

More information on Mesmerize:

GitHub repo: <https://github.com/kushalkolar/MESmerize>

Documentation: <http://docs.mesmerizelab.org/en/master/>

Video tutorials:

https://www.youtube.com/playlist?list=PLgofWiw2s4REPxH8bx8wZo_6ca435OKqg

Associated bioRxiv paper: <https://www.biorxiv.org/content/10.1101/840488v1>

(we are submitting the latest version of Mesmerize soon)

We have used Mesmerize to analyze calcium imaging data of spontaneous neuronal activity in the protochordate *Ciona intestinalis*, an emerging model organism in neuroscience. The dataset is available in the form of a Mesmerize project. All the figures from the bioRxiv paper can be interactively explored, with the analysis procedure & raw data of every data point being traceable: https://figshare.com/articles/Ciona_Calcium_Imaging_Dataset_Nov_2019/10289162