

From Images to Knowledge with ImageJ & Friends

virtual conference

Nov 30 - Dec 2, 2020

Stephan Preibisch, Stephan Saalfeld, Anna Kreshuk,
Pavel Tomancak and Virginie Uhlmann

hhmi | janelia
Conferences



Deep Learning and Prediction in Large nD Volumes

Tutors: Jan Funke (funkej@janelia.hhmi.org)
William Patton (pattonw@janelia.hhmi.org)

Session 1: 2020-11-30 23:00 UTC – 2020-12-01 03:00 UTC

Session 2: 2020-12-01 12:00 UTC – 2020-12-01 16:00 UTC

Title and abstract:

Deep Learning and Prediction in Large nD Volumes

=====

Developing machine learning solutions for microscopy datasets is often challenged by the large size of the datasets, arbitrary numbers of channels, anisotropic resolutions, and multi-dimensionality. In this tutorial, you will learn how to train and apply current deep neural networks on datasets that are too large to be held in memory. For that, we will introduce "gunpowder" [1], a python library to facilitate deep learning on large, multi-dimensional images and show you how to use it for:

1. Semantic Segmentation,
2. Instance Segmentation,
3. and Object Detection.

On real-world large microscopy dataset, we will setup a training pipeline for each of those tasks to fetch training batches in parallel, apply augmentations on the fly, and train a state-of-the-art convolutional neural network. We will then apply the trained networks to arbitrarily large datasets in a block-wise fashion and discuss how to perform prediction on multiple GPUs in a distributed computing environment.

Besides introducing training and prediction solutions for large nD volumes, you will learn in this tutorial about the zarr [2] and N5 [3] data containers as well as about volume visualization using neuroglancer [4]. Basic knowledge of python is required, experience with deep learning frameworks like PyTorch or TensorFlow is a plus. You are welcome to bring your own dataset to work on, in this case, please contact the organizers beforehand to make sure your data is in the right format to follow along.

Timeline

- 0:00 - 1:00 Basics of gunpowder and data containers
- 1:00 - 2:00 Semantic Segmentation
- 2:00 - 3:00 Instance Segmentation using Affinity Predictions
- 3:00 - 4:00 Object Detection

- [1] <http://funkey.science/gunpowder/>
- [2] <https://zarr.readthedocs.io/en/stable/>
- [3] <https://github.com/saalfeldlab/n5>
- [4] <https://github.com/google/neuroglancer>