Deep learning-based Object Segmentation and Image Restoration with StarDist and CSBDeep

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Session 1: 2020-11-30 15:00 UTC – 2020-11-30 19:00 UTC
Session 2: 2020-12-02 08:00 UTC – 2020-12-02 12:00 UTC

Information about the tutor[s]

This tutorial will be given by Martin Weigert and Uwe Schmidt, who are the main developers of the CSBDeep and StarDist software packages for deep learning based image restoration and cell nuclei segmentation.

Title and abstract of the tutorial

Title:

Deep learning-based Object Segmentation and Image Restoration with StarDist and CSBDeep

Abstract:

This tutorial covers deep learning based object/nuclei segmentation and image restoration for 2D/3D microscopy images with the Python packages StarDist and CSBDeep.
We will first give a short method overview, general tips and tricks for using DL in image analysis projects, and an introduction to StarDist and CSBDeep from a developer's perspective.

The practical part will include:
 * Hands-on exercises for common segmentation/restoration problems
 * Helping participants with their specific projects
 * Suggestions on how to extend and contribute to StarDist and CSBDeep

Participants are strongly encouraged to use and prepare their own data (see StarDist and CSBDeep example notebooks for potential applications):
 * object/nuclei segmentation: 2D/3D images and fully annotated label masks (objects should have blob-like shapes)
 * image restoration: registered pairs of high and low quality (noisy, blurry, binned) 2D/3D images

Preliminary outline

1. Introduction to StarDist and CSBDeep (30 min)
 * Conceptual overview of segmentation and image restoration with deep learning
 * General considerations on using DL for image analysis projects
 * Tech introduction to the StarDist and CSBDeep python packages

2. Participant introductions (1h)
All participants should prepare 2 slides describing

* the image data (and annotations) they have
* the problem they want to solve

3. Practical work and training (2.5h)
* Track 1: Work on demo data with tutorial notebooks (for participants with unsuitable data)
* Track 2: Work on your own data with custom notebooks (for participants with suitable data)
* Track 3: Understanding the python codebase (for developers)

4. Summary and questions (1h)

Technical requirements:

Code will be run in Google colab notebooks, so participants should
* have/create a Google account
* upload their data to Google drive