

CAN satellite workshop # 6

Title: Neural Signal and Image Processing: Quantitative Analysis of Neural Activity

Dates: May 20 & 21, 2019.

Organizers:

Majid Mohajerani¹ (mohajerani@uleth.ca), Artur Luczak¹ (luczak@uleth.ca), and Steve Prescott² (steve.prescott@sickkids.ca)

1. Neuroscience Dept., University of Lethbridge, AB, Canada
2. University of Toronto, ON, Canada

Dates: May 20 & 21, 2019.

Location: SickKids building (686 Bay St), Toronto; Event room 1, on the 2nd floor of the Peter Gilgan Centre for Research and Learning. Symposium participants do NOT need a visitor pass.

Description: Given the exponentially growing size and complexity of experimental data, advanced data analyses methods are proving to be indispensable for neuroscience research. In this workshop we will overview different analysis methods used in variety of neuroscience fields to help to understand complex brain signals.

The target audience of the workshop will be graduate students, postdoctoral researchers and principal investigators in neuroscience and psychology with interest in data analysis. The course will combine lectures and hands-on tutorials using MATLAB. Participants will perform the computer exercises using data sets and analysis software on their own laptop computers

Scope: This two-day course will provide a survey of diverse topics, including methods for analyzing single and multiple spike trains, local field potential, optical imaging data (single-cell level vs whole brain imaging), EEG/MEG recordings, and fMRI data.

Based on feedback from students attending our CAN satellite workshops in the last 2 years, we have expanded it to 2 days to cover more data analysis topics and to have more time for in-class Matlab exercises.

Estimated attendance: 30-50 participants.

Ticket price: 95 CAD (this includes coffee, snacks and lunch on both days)

Final Schedule

Day 1 (Mon. May 20)

Opening remarks

8am-9am. Analyses of Neurons Population Data (Artur Luczak, University of Lethbridge)

9am-10am. Analyses of EEG Signals (Kyle E. Mathewson, University of Alberta)

10am-1.15am Coffee break

10.15-11.15am. Analysis of Functional Magnetic Resonance Imaging Data: Principles and Techniques, Part 1 (John Griffiths, University of Toronto)

11.15-12.15. Analysis of Functional Magnetic Resonance Imaging Data: Principles and Techniques, Part 2 (John Griffiths, University of Toronto)

12.15-1pm. Lunch break

1pm-2pm. Graph theory and measures of brain connectivity (Bratislav Misic, McGill University)

2pm-3pm. Use Of 'Virtual Brain' for Modeling and Simulation (Kelly Shen & Amanda Easson, Rotman Research Institute, University of Toronto; Note: this tutorial will use TVB python-based package using a cloud-based Jupyter notebook shared to Google Colab. Participants are advised to have a Google account set up ahead of time).

3-3.15pm Coffee break

3.15-4.15 Deep Learning for Neuronal and Behavioral Data Analyses Part 1 (Artur Luczak, University of Lethbridge)

4.15-5.15. Deep Learning for Neuronal and Behavioral Data Analyses Part 2 (Blake Richards, University of Toronto)

5.15-5.45. DeepEEG demo (Kyle E. Mathewson, University of Alberta)

Day 2 (Tue. May 21)

9-10am. Analyzing intracellular signals (Steve Prescott, University of Toronto)

10-10.15am Coffee break

10.15-11.15am Estimating model parameters from experimental data (Milad Lankarany, Krembil Research Institute/UHN, Toronto)

11.15-12.15. Memory reactivation analyses (Masami Tatsuno, University of Lethbridge)

12.15-1pm. Lunch break

1-1.30pm Application of mutual information to neuronal data (Masami Tatsuno, University of Lethbridge)

1.30-2pm. Quantitative Analysis Toolbox for Characterization of Spatiotemporal Dynamics in Mesoscale Optical Imaging of Brain Activity (Majid Mohajerani, University of Lethbridge)

2.30-2.45 Coffee break

2.45-3-45pm Quantitative Tools to Analyze Cellular Based Calcium Imaging Data (Andrea Giovannucci, University of North Carolina)

3.45-4.15 Open Discussion About Data Analysis Methods (Instructors and Students)