



Workshop 5: Optimizing the use of connectomic data to drive data science and scientific discovery
March 31, 2021

Overall goal: To identify the current state of the art, challenges and opportunities in the analysis, interpretation, and dissemination of brain connectomic data. This workshop will focus on new analysis methods for partial, full and multiple connectomes emerging from a number of model systems, in addition to the problem of making connectomic data accessible to the community.

Agenda:

11:00 am ET **Welcome and Series Overview**

John Ngai, Ph.D.
Harriet Kung, Ph.D.

11:10 am ET **Welcome and Introduction**

Mala Murthy, Ph.D. (Workshop Co-Lead)
Joshua T. Vogelstein, Ph.D. (Workshop Co-Lead)

11:25 am ET **Workshop Logistics**

11:30 am ET **Speaker Sessions**

Each speaker will address some or all of these questions:

- a) What scientific breakthroughs have analyses of connectomes already enabled?
- b) What current methods for analyses of connectomes are most promising?
- c) What new types of analyses (not developed yet) are needed to make progress and enable scientific breakthroughs?
- d) How do we integrate analyses across scales (from nano to micro to meso)?
- e) How do we integrate connectomic data with functional data?
- f) What types of data and analyses are needed to make interesting comparisons between connectomes?
- g) What kinds of infrastructure are needed to make connectomic data and analyses widely available to the neuroscience community?

11:30 am ET **Session 1 – Analysis of Partial and Full Connectomes**

11:30 am ET From the fly connectome to the mouse connectome
Greg Jefferis, Ph.D.

11:40 am ET How to simulate a connectome to gain a mechanistic understanding of neural computation
Srini Turaga, Ph.D.

11:50 am ET Learning representations of neural architecture across many spatial scales
Eva Dyer, Ph.D.

12:00 pm ET Lessons from analyzing navigational circuits in the *Drosophila* hemibrain connectome
Hannah Haberkern, Ph.D.

12:05 pm ET Neural network organization for courtship song feature detection in *Drosophila*
Christa Baker, Ph.D.

12:10 pm ET *Ciona* connectome analyses and considerations for the future
Kerriane Ryan, Ph.D.

12:15 pm ET Whole-brain functional studies in *C. elegans*: A direct comparison of structure and function
Albert Lin, Ph.D.

12:20 pm ET Modularity and neural coding from a synaptic wiring diagram
Ashwin Vishwanathan, M.D.

12:25 pm ET **Q & A Session**

12:45 pm ET **Break**

12:55 pm ET **Session 2 – Analysis of Multiple Connectomes**

12:55 pm ET From a developmental connectomics study: Analyses, Interpretations and Limitations
Mei Zhen, Ph.D.

1:05 pm ET Combining Connectomics with Functional Studies to Investigate Circuit Mechanisms of Learning and Action-Selection
Marta Zlatic, Ph.D.

1:15 pm ET Multiscale statistical learning for connectome data
Jesús Arroyo, Ph.D.

1:25 pm ET Optimization of the reliability of functional brain connectome
Ting Xu, Ph.D.

1:35 pm ET Network data science for bilateral brains: Applications in the larval *Drosophila* connectome
Benjamin Pedigo

1:45 pm ET **Q & A Session**

2:05 pm ET **Break**

2:15 pm ET **Session 3 – Making Connectomic Data Accessible to the Community**

2:15 pm ET Engineering the Future of Connectomics
Will Gray-Roncal, Ph.D.

2:20 pm ET Neuroscience research on the basis of whole-brain connectomics
Albert Cardona, Ph.D.

2:25 pm ET Continuous proofreading and analysis of large EM reconstructions
Sven Dorkenwald, Ph.D.

2:30 pm ET Exploring connectomes at varying levels of detail
Stephen Plaza, Ph.D.

2:35 pm ET The Brain Image Library: Designated Repository for NIH BRAIN Initiative
Microscopy Data
Alexander Ropelewski

2:40 pm ET Rubin Observatory – Astronomy Big Data
William O’Mullane, Ph.D.

2:50 pm ET **Q & A Session**

3:10 pm ET **Break**

3:20 pm ET **Discussion Panel**

Discussion Topic: Analysis of connectomes

Session Chairs: *Mala Murthy, Ph.D.; Joshua T. Vogelstein, Ph.D.*

Discussants: *Sebastian Seung, Ph.D.; Carey E. Priebe, Ph.D.; Kim Stachenfeld, Ph.D.; Alex Szalay, Ph.D.; Rachel Wilson, Ph.D.; Terry Sejnowski, Ph.D.*

4:20 pm ET **Workshop ends**