

Curriculum Vitae

Brendan Chambers

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Education

University of Chicago, Chicago IL USA, PhD, Computational Neuroscience, 2016
Oberlin College, Oberlin OH USA, BA, Computer Science with Honors, 2011
Davenport Central High School, Davenport IA USA, 2007

Core Data Skills

Python (2015 - 2018). Matlab (2011 - 2017). Java/C# (2008 - 2012, 2016).
Analysis of dynamic networks. NetworkX, igraph, Gephi.
Data visualization and information design. Matplotlib, Processing, Adobe Illustrator.
Web scraping. Selenium Web Driver, BeautifulSoup.

Research Experience

2017. Postdoctoral Scholar. Supervised by Stephanie Palmer & Jason MacLean, Palmer Theory Group and MacLean Neurobiology Lab, University of Chicago.
2011-2016. PhD Candidate. Supervised by Jason N MacLean, Committee on Computational Neuroscience.
2010-2011. Honors Research. Supervised by John Donaldson, Department of Computer Science, Oberlin College.
2010. Summer Research Intern. Rockwell Collins, Cedar Rapids, IA.
2009-2011. Undergraduate Research Assistant. Supervised by Daniel Steinbring, Department of Physics, Oberlin College.

Data Science Experience

Dynamics of Complex Networks

- Network motif labeling
- Comparison of topological structure in networks
- Inference of embedded causal relationships
- Visualization of complex dynamics
- Data acquisition & preprocessing

Web Scraping

- Collecting dynamic page content using Python and Selenium Webdriver
- Gathering text and images from news media pages using BeautifulSoup
- Crawling Twitter follower networks

Machine Learning and Stochastic Optimization

- Firefly search for high-dimensional model design
- Recurrent neural networks, training with BPTT and Hessian-free optimization
- Iterative Bayesian inference, inferring synaptic connections from spike times
- Restricted Boltzmann Machines, computer vision for solving reCaptcha
- Hopfield Networks as autoencoders, unsupervised learning
- Feedforward Neural Networks, training with backpropagation
- Genetic algorithm for decrypting cipher text
- Support vector machines, distinguishing words using vowel spectral content
- Genetic algorithm for solving traveling salesman tours

Computational Modeling of Spreading Processes

Dynamics in small-world versus random topologies
Adaptive exponential leaky integrate-and-fire units
Leaky integrate-and-fire units
Beyond-pairwise dependencies: impact of synchrony
Modeling pairwise dependencies in spreading activity
Poisson rate-matched populations

Publications

Manuscripts

2015. Multineuronal activity patterns identify selective synaptic connections under realistic experimental constraints. **Chambers B**, MacLean JN. *Journal of neurophysiology*.

Mapping dynamics unfolding on networks. Reliable lagged pairwise activity can serve as indicators of causal interactions, particularly when true timescale of interactions is known.

2016. Higher-order synaptic interactions coordinate dynamics in recurrent networks. **Chambers B**, MacLean JN. *PLoS Computational Biology*.

Motif analysis in the context of network dynamics. A clustering motif coordinates temporal inputs and re-routes traffic. Recognized by PLoS Computational Biology among their top 50 most downloaded articles of 2016/2017.

2017. Ensemble stacking mitigates biases in inference of synaptic connectivity. **Chambers B**, Levy M, Dechery J, MacLean JN. *Network Neuroscience*.

Methods for mapping lag-relationships. We also suggest a treatment for noise arising from heterogeneous activity levels.

Abstracts

2017. Higher-order synaptic interactions shape neocortical activity beyond pairwise structure. **Chambers B**, MacLean JN. NetSci Abstracts.

2015. A small world of synaptic integration. **Chambers B**, MacLean JN (2015). Society for Neuroscience Abstracts.

2014. Detecting causal connectivity from spiking correlations. **Chambers B**, Dechery J, MacLean JN. Society for Neuroscience Abstracts.

2014. Microcircuit activity is patterned topologically and reveals features of underlying connectivity. **Chambers B**, Sadovsky AJ, MacLean JN. COSYNE abstracts.

Awards

2017. NetSci 2017 symposium speaker, Society for Network Science

2017. PLoS Computational Biology Top 50 Most Downloaded articles 2016/2017

2016-2017. University of Chicago Laura Thorne Donnelley Fellow

2012-2015. NSF IGERT Fellowship. Integrative training in motor control and movement

2009-2011. NSF S-STEM Scholar in Computation and Modeling at Oberlin College

2007-2011. John Fredrick Oberlin Scholar

2007-2009. National Merit Scholar

2007. Des Moines Register Iowa Academic All-State Top 10