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# Matthew Whiteway

## Education

**University of Maryland**, College Park, MD
Ph.D. Student in Applied Mathematics and Scientific Computing
Advisor: Dr. Daniel Butts
Anticipated Graduation: May 2018

**University of Oklahoma**, Norman, OK
B.Sc. in Physics, B.A. in Mathematics
May 2011

## Research Experience

**The effects of shared variability on neural population codes**
(March 2017-present) Developed an analytical framework for understanding how shared variability arising from additive or multiplicative interactions can influence noise correlations in a population of neurons. This model was compared to the activity from simultaneously recorded neurons in both primary visual cortex and prefrontal cortex to understand how these correlations affect the decoding of information in downstream brain regions. Advisors: Dr. Daniel Butts, University of Maryland & Dr. Bruno Averbeck, National Institutes of Health

**A nonlinear latent variable model for the analysis of large-scale population recordings**
(November 2014-present) Developed a statistical modeling framework that combines stimulus processing models and latent variable models. I am interested in using this model to address questions about the nature of the interactions between stimulus processing and ongoing cortical network activity in populations of sensory neurons. Advisor: Dr. Daniel Butts, University of Maryland

**The effect of network structure on large systems of coupled oscillators**
(June 2010-August 2010) Conducted theoretical and computational research on the effect of both topology and natural frequency distribution on networks of coupled oscillators described by the Kuramoto Model. Advisors: Drs. Edward Ott, Michelle Girvan & Tom Antonsen, University of Maryland

## Scholarships and Awards

- Center for Comparative and Evolutionary Biology of Hearing Trainee Grant (Summer 2015 - Summer 2016)
- Excellence in Teaching Award, University of Maryland Department of Mathematics (2013)
- J. Clarence Karcher Scholarship, University of Oklahoma Department of Physics and Astronomy (Fall 2009 - Spring 2011)
- National Merit Scholarship (Fall 2006 - Spring 2011)

## Publications

Liu J, **Whiteway MR**, Butts DA and Kanold, PO (*submitted*). Differential organization of the mouse auditory cortex to tone onset and offset revealed using automated image segmentation.

**Whiteway MR** and Butts DA (2016). Revealing unobserved factors underlying cortical activity using a rectified latent variable model applied to neural population recordings. Journal of Neurophysiology, 117(3), 919-936.

Stout J, **Whiteway M**, Ott E, Girvan M and Antonsen TM (2011). Local synchronization in complex networks of coupled oscillators. Chaos: An Interdisciplinary Journal of Nonlinear Science, 21(2), 025109.

## Conference Abstracts

**Whiteway MR**, Bartolo R, Averbeck BB and Butts DA. Unsupervised nonlinear dimensionality reduction of large-scale neural recordings in prefrontal cortex. *Society for Neuroscience, Washington, D.C.*, November 2017.

Liu J, **Whiteway MR**, Butts DA and Kanold PO. Differential organization of the mouse auditory cortex to tone onset and offset revealed using automated image segmentation. *Society for Neuroscience, Washington, D.C.*, November 2017.

**Whiteway MR**, Socha K, Bonin V and Butts DA. Nonlinear latent variable approaches for understanding population activity in sensory cortex. *Computational and Systems Neuroscience, Salt Lake City, UT*, February 2017.

Butts DA, Perrin GE, Cui Y, **Whiteway MR**, Demb J and Singer J. Characterizing nonlinear neuronal computation within a single stage of processing. *Computational and Systems Neuroscience, Salt Lake City, UT*, February 2017.

**Whiteway MR** and Butts DA. Hidden sources of variability modulate populations of sensory neurons. *Society for Neuroscience, San Diego, CA*, November 2016.

Stout J, **Whiteway M**, Ott E, Girvan M and Antonsen TM. The effect of network structure on the path to synchronization in large systems of coupled oscillators. *SIAM Conference on Applications of Dynamical Systems, Snowbird, UT*, May 2011.

## Teaching Experience

**Lecturer**
Integral Calculus - Summer 2014
Introductory Statistics - Spring 2013

**Teaching Assistant**
Introductory Statistics - Spring 2015
Multivariable Calculus - Spring 2014 & Fall 2014
Linear Algebra - Fall 2013
Integral Calculus - Fall 2012

## Mentoring

**Deep Generative Models for Understanding Natural Images**
Semester project with an undergraduate student that focused on understanding and implementing variational autoencoders and generative adversarial networks, including their conditional and convolutional variants. (Spring 2017)

**An Introduction to Neural Networks for Image Classification**
Semester project with an undergraduate student that focused on the foundations of neural networks and their application to the problem of image classification. (Fall 2016)

**Theory and Applications of the Generalized Linear Model for Regression**
Summer project with an undergraduate student that focused on the theoretical foundations of the generalized linear model, including linear regression, exponential families, maximum likelihood estimation, and iteratively reweighted least squares. (Summer 2015)

**Linear Programming and its Applications to Economics**
Semester project with an undergraduate student that focused on how to represent a linear optimization problem in the language of linear algebra, and the fundamentals of the Simplex Algorithm. (Spring 2015)

## Activities

Treasurer for the AMSC Student Council (Fall 2015-Spring 2017)

## Language Skills

Proficient: MATLAB, Python (Tensorflow, OpenCV), LaTeX

Inefficient: C++ (OpenGL), Java