



JOHNS HOPKINS
BLOOMBERG
SCHOOL of PUBLIC HEALTH

Department of Biostatistics

BIOSTATISTICS SEMINAR

Estimation and Inference for Changepoint Models

Sean Jewell, Statistics PhD Candidate, University of Washington

Abstract:

This talk is motivated by statistical challenges that arise in the analysis of calcium imaging data, a new technology in neuroscience that makes it possible to record from huge numbers of neurons at single-neuron resolution. In the first part of this talk, I will consider the problem of estimating a neuron's spike times from calcium imaging data. A simple and natural model suggests a non-convex optimization problem for this task. I will show that by recasting the non-convex problem as a changepoint detection problem, we can efficiently solve it for the global optimum using a clever dynamic programming strategy.

In the second part of this talk, I will consider quantifying the uncertainty in the estimated spike times. This is a surprisingly difficult task, since the spike times were estimated on the same data that we wish to use for inference. To simplify the discussion, I will focus specifically on the change-in-mean problem and will consider the null hypothesis that there is no change in mean associated with an estimated changepoint. My proposed approach for this task can be efficiently instantiated for changepoints estimated using binary segmentation and its variants, L0 segmentation, or the fused lasso. Moreover, this framework allows us to condition on much less information than existing approaches, thereby yielding higher-powered tests. These ideas can be easily generalized to the spike estimation problem.

This talk will feature joint work with Toby Hocking, Paul Fearnhead, and Daniela Witten.

Johns Hopkins Bloomberg School of Public Health, Department of Biostatistics
Thursday, January 9, 2020, 12:15-1:15pm, Room W3008 (Refreshments 12:00pm)

For disability access information or listening devices, please contact the Office of Support Services at 410-955-1197 or on the web www.jhsph.edu/SupportServices. **EO/AA**

Department of Biostatistics, 615 N. Wolfe Street, Suite E3527, Baltimore, MD 21205



Brief Bio:

Sean Jewell is a PhD Candidate in the Department of Statistics at the University of Washington, mentored by Daniela Witten. He completed his MSc in Statistics in the Department of Statistics at the University of British Columbia under the supervision of Alexandre Bouchard-Côté. His undergraduate degree was in Applied Mathematics from McMaster University. He is the recipient of an NSERC Alexander Graham Bell Doctoral Scholarship and the Z.W. Birnbaum Award from UW's Department of Statistics.

His research focuses on developing new methods for applied problems using tools from high-dimensional statistics, machine learning, and optimization.

Personal website: <https://www.stat.washington.edu/~swjewell>