

## Joshua Agterberg

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<https://jagterberg.github.io>

### Education

- 2017 - Present    Johns Hopkins University  
PhD in Applied Mathematics and Statistics  
Master of Science in Engineering in Applied Mathematics and Statistics  
Advised by Professor Carey Priebe
- 2013 - 2017      University of Wisconsin-Madison  
Bachelor of Business Administration, Major in Actuarial Science and Mathematics  
Advised by Professor Marjorie Rosenberg  
GPA: 3.73/4.0, Actuarial Science Major GPA: 4.0/4.0  
Graduated with Distinction

### Research Interests

- Random Graph Inference
- Kernel Methods
- Spectral Perturbation Theory and Matrix Analysis
- High-dimensional Statistics
- Nonparametric Statistics

### Preprints and Publications

1. *On Two Distinct Sources of Nonidentifiability in Latent Position Random Graph Models*  
**Joshua Agterberg**, Minh Tang, and Carey Priebe, Submitted, 2020.
2. *Spectral Graph Clustering via the Expectation-Solution Algorithm*  
Zachary Pisano, **Joshua Agterberg**, Carey Priebe, Daniel Naiman, Submitted, 2020.
3. *Vertex Nomination, Consistent Estimation, and Adversarial Modification*  
**Joshua Agterberg**, Youngser Park, Jonathan Larson, Chris White, Carey Priebe, and Vince Lyzinski, Under Revision, 2019.
4. *Social Determinant-Based Profiles of US Adults Used to Identify Groups with the Highest and Lowest Health Expenditures*  
Fanghao Zhong, Margie Rosenberg, **Joshua Agterberg**, and Richard Crabb, Submitted, 2019.
5. *A Data-Driven Clustering Application Using All Categorical Variables to Identify Clusters of Individual Profiles with High Health Expenditures*  
**Joshua Agterberg**, Fanghao Zhong, Richard Crabb, and Margie Rosenberg, Submitted, 2019.

### Working Papers

1. *Numerical Algorithms for an Indefinite Procrustes Problem Motivated by Random Graph Inference*  
**Joshua Agterberg**, Jonathan Robbins, Patrick Rubin-Delanchy, and Carey Priebe, In Progress, 2019.
2. *Consistent Nonparametric Hypothesis Testing for Random Graphs with Negative or Repeated Eigenvalues*  
**Joshua Agterberg**, Minh Tang, and Carey Priebe, In Progress, 2019.

## Talks

- 4/7/2020 "Nonidentifiability and nonparametric random graph hypothesis testing," *MINDS Seminar*, JHU
- 1/28/2020 "On Two Distinct Sources of Nonidentifiability in Latent Position Random Graph Models," *Applied Math and Statistics Student Seminar*, JHU
- 4/23/2019 "Vertex Nomination, Consistent Estimation, Adversarial Modification," *Applied Math and Statistics Student Seminar*, JHU

## Honors and Awards

- 2020-Present Applied Mathematics and Statistics Apprentice Teaching Fellow
- 2019-2020 MINDS (Mathematical Institute of Data Science) Fellowship
- 2019-2020 Charles and Catherine Counselman Fellowship
- Spring 2017 Graduated with distinction (top 20% of graduating business students)
- Spring 2017 DW Simpson Scholarship
- Fall 2016 Bicknell Scholarship
- 2013-2014 Arthur C. Nielsen Scholarship
- 2013 Directly Admitted to Wisconsin School of Business
- 2014-2017 Dean's list (>3.8 Semester GPA – achieved five separate times)

## Teaching

### *Johns Hopkins University (Applied Mathematics and Statistics)*

- Fall 2019 Co-created a topics course in probability with another graduate student
- Summer 2019 Instructor for Financial Mathematics Master's Program Statistics Review
- Summer 2019 Teaching Assistant for 553.310 Probability and Statistics for Vittorio Loprinzo
- Spring 2019 Teaching Assistant for 553.762 Nonlinear Optimization II for Professor Daniel Robinson
- Fall 2018 Teaching Assistant for 553.730 Statistical Theory for Professor Carey Priebe
- Summer 2018 Instructor for Financial Mathematics Master's Program Statistics Review

### *University of Wisconsin-Madison (Wisconsin School of Business, Risk and Insurance)*

- Spring 2017 Grader for ActSci 655 Health Analytics for Professor Margie Rosenberg
- Fall 2016 Grader for ActSci 651 Life Contingencies II for Professor Paul Johnson
- Spring 2016 Grader for ActSci 650 Life Contingencies I for Professor Margie Rosenberg

### *University of Wisconsin-Madison (School of Music)*

Spring 2015-Spring 2017, Private Piano Instructor

## Professional Experience and Service

**Reviewer** IEEE Transactions on Pattern Analysis and Machine Intelligence

**Member** ASA, IMS

- 2018 - Present    **Research Assistant**, Johns Hopkins University, Baltimore, MD
- Research assistant to Professor Carey Priebe in the Applied Mathematics and Statistics Department. Also served on committee to evaluate potential new JHU AMS faculty head.
- 2017                **Analytics Intern**, CNA Financial, Chicago, IL
- Examined the predictive value of FDA data on losses for products and professional liability for medical devices.
- Cleaned and edited FDA data to merge with internal data and Dun and Bradstreet data. Modeled losses in R using a GLM with Tweedie family and log-link to account for zero-inflation.
- Created univariate with-without plots to examine effect of specific FDA variables on losses
- 2016                **Actuarial Intern**, CNA Financial, Chicago, IL
- Developed a Markov Chain model for predicting the probability of payment for insurance claims given the current legal state.
- Generated piecewise linear splines to implement time dependence of Markov Model.
- 2013                **Actuarial Intern**, CUNA Mutual Group, Madison, WI
- Created spreadsheets from scratch to replicate GAAP and Statutory reserves results from PolySystems for equity-indexed annuity policies as a control for auditors.
- Analyzed mortality experience study data in Excel by comparing actual to expected ratios with the proposed new table and helped management determine to use new table across all annuity products.

## Research Activities

- 2019-Present    `nonparGraphTesting` R Package
- R package implementing the nonparametric hypothesis test studied in the forthcoming paper *Consistent Nonparametric Hypothesis Testing for Random Graphs with Negative or Repeated Eigenvalues*
- Summer 2018    DARPA D3M Summer workshop
- Implemented Python code for graph-related problems for the D3M (Data-Driven Discovery of Models) summer workshop in Arlington, VA, under the direction of Professors Youngser Park and Carey Priebe. Responsibilities included updating primitives (individual algorithms), editing pipelines (collections of algorithms), and submitting results for formal evaluation.
- 2017 - 2018      `iGraphMatch`
- Wrote R code for `splrMatrix` object (a sparse plus low-rank matrix) for faster calculations and cheaper storage of centered adjacency matrices in the `iGraphMatch` R package under direction of Professors Daniel Sussman and Carey Priebe.
- 2016 - 2018      `catDist` R Package

Personal project implementing several different categorical dissimilarity measures for use with K-Medoids and spectral clustering methods.

## **Quantitative Coursework**

### *Johns Hopkins University*

- Statistical Theory I
- Statistical Theory II
- Statistical Inference on Random Graphs
- Statistical Pattern Recognition
- Matrix Analysis
- Combinatorial Optimization
- Nonlinear Optimization I
- Nonlinear Optimization II
- Probability Theory I
- Probability Theory II
- Probability Theory III (co-created this course with another graduate student on topics in Probability)
- Riemannian Geometry
- Complex Variables
- Functional Analysis

### *University of Wisconsin-Madison*

- Introduction to Computer Science
- Data Structures
- Numerical Analysis
- Linear Programming
- Real Analysis I
- Real Analysis II
- Introduction to Probability Theory
- Stochastic Processes
- Stochastic Calculus
- Introduction to Measure Theory
- Probability Theory
- Mathematical Statistics
- Regression and Time Series for Actuaries
- Loss Models I
- Actuarial Mathematics I
- Actuarial Mathematics II

## **Skills and Qualifications**

Proficient in R, Java, Python, Linux, Git, C++ (Rcpp), Matlab, LaTeX, Microsoft Excel, and VBA

Actuarial exams passed: Exam P (July 2014); Exam FM (February 2015), Exam MFE (July 2016); Fulfilled Econ, Finance, and Statistics VEE