# Joshua Agterberg

April 2023

[jagterberg.github.io](jagterberg.github.io)

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## ACADEMIC EMPLOYMENT

**2023-Present**  **University of Pennsylvania**
Postdoctoral Researcher
Innovation for Data Engineering and Sciences (IDEAS) Initiative
Department of Electrical and Systems Engineering
Department of Statistics and Data Science
Advised by Professors René Vidal and Yuxin Chen

## EDUCATION

**2017-2023**  **Johns Hopkins University**
2019-2023  PhD in Applied Mathematics and Statistics
**Dissertation Title**: *Asymptotics and Statistical Inference in High-Dimensional Low-Rank Matrix Models*
2017-2019  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, Majors 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

- Statistical Network Analysis

- High-dimensional Statistics

- Spectral Methods

- Mathematical Data Science

- Nonparametric Statistics

## PUBLICATIONS

1. "Spectral Graph Clustering via the Expectation-Solution Algorithm,"
Zachary Pisano, **Joshua Agterberg**, Carey Priebe, and Daniel Naiman,
*Electronic Journal of Statistics*, 2022.

2. "Entrywise Recovery Guarantees for Sparse PCA via Sparsistent Algorithms,"
   **Joshua Agterberg** and Jeremias Sulam,
   *AISTATS*, 2022.

3. "Entrywise Estimation of Singular Vectors of Low-Rank Matrices with Heteroskedasticity and Dependence,"
   **Joshua Agterberg**, Zachary Lubberts, and Carey Priebe,
   *IEEE Transactions on Information Theory*, 2022.

4. "Valid Two-Sample Graph Testing via Optimal Transport Procrustes and Multiscale Graph Correlation: Applications in Connectomics,"
   Jaewon Chung, Bijan Varjavand, Jesús Arroyo, Anton Alyakin, **Joshua Agterberg**, Minh Tang, Joshua Vogelstein, and Carey Priebe,
   *Stat*, 2021.

5. "Vertex Nomination, Consistent Estimation, and Adversarial Modification,"
   **Joshua Agterberg**, Youngser Park, Jonathan Larson, Chris White, Carey Priebe, and Vince Lyzinski,
   *Electronic Journal of Statistics*, 2020.

6. "Social Determinant-Based Profiles of US Adults with the Highest and Lowest Health Expenditures Using Clusters,"
   Fanghao Zhong, Margie Rosenberg, **Joshua Agterberg**, and Richard Crabb,
   *North American Actuarial Journal*, 2020.

7. "Cluster Analysis Application to Identify Groups of Individuals with High Health Expenditures,"
   **Joshua Agterberg**, Fanghao Zhong, Richard Crabb, and Margie Rosenberg,
   *Health Services and Outcomes Research Methodology*, 2020.

## PREPRINTS

1. "An Overview of Asymptotic Normality in Stochastic Blockmodels: Cluster Analysis and Inference,"
   **Joshua Agterberg** and Joshua Cape,
   Preprint Available Upon Request.

2. "Joint Spectral Clustering in Multilayer Degree-Corrected Stochastic Blockmodels,"
   **Joshua Agterberg**, Zachary Lubberts, and Jesús Arroyo,
   Submitted, 2023.

3. "Estimating Higher Order Mixed Memberships via the $\ell_{2,\infty}$ Tensor Perturbation Bound,"
   **Joshua Agterberg** and Anru Zhang,
   Submitted, 2023.

4. "Nonparametric Two-Sample Hypothesis Testing for Random Graphs with Negative and Repeated Eigenvalues,"
   **Joshua Agterberg**, Minh Tang, and Carey Priebe,
   Submitted, 2020.
   (Won best presentation award in Nonparametric Statistics Student Competition, JSM 2021)
   (Selected as a finalist for the Nonparametric Statistics Student Competition, JSM 2021.)

5. "Correcting a Nonparametric Two-sample Graph Hypothesis Test for Graphs with Different Numbers of Vertices,"

Anton Alyakin, **Joshua Agterberg**, Hayden Helm, and Carey Priebe,
Submitted, 2020.

6. "On Two Distinct Sources of Nonidentifiability in Latent Position Random Graph Models,"
**Joshua Agterberg**, Minh Tang, and Carey Priebe,
Submitted, 2020.

## HONORS AND AWARDS

*Johns Hopkins University*

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| Summer 2022 | Acheson J. Duncan Fund for the Advancement of Research in Statistics Travel Award (awarded twice) |
| Spring 2022 | MINDS (Mathematical Institute of Data Science) Fellowship |
| Summer 2021 | Best Presentation Award, JSM Student Competition in Nonparametric Statistics |
| Spring 2021 | IMS (Institute of Mathematical Statistics) Hannan Graduate Student Travel Award |
| Spring 2021 | MINDS (Mathematical Institute of Data Science) Fellowship |
| Spring 2021 | Finalist for JSM Student Competition in Nonparametric Statistics |
| 2021-2023 | Applied Mathematics and Statistics Teaching Fellow |
| 2020-2021 | Applied Mathematics and Statistics Apprentice Teaching Fellow |
| 2019-2023 | Charles and Catherine Counselman Fellowship |
| Spring 2020 | MINDS (Mathematical Institute of Data Science) Fellowship |

*University of Wisconsin-Madison*

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| Spring 2017 | Graduated with distinction |
| 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) |

## TALKS

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| 2/9/2023 | "Estimating Higher-Order Memberships via the $\ell_{2,\infty}$ Tensor Perturbation Bound," *Statistics Department Seminar*, University of Illinois-Urbana Champaign (Invited Talk) |
| 2/1/2023 | "Estimating Higher-Order Memberships via the $\ell_{2,\infty}$ Tensor Perturbation Bound," *Statistics Department Seminar*, University of California-Riverside (Invited Talk) |
| 1/24/2023 | "Estimating Higher-Order Memberships via the $\ell_{2,\infty}$ Tensor Perturbation Bound," *Statistics Department Seminar*, University of Virginia (Invited Talk) |
| 1/19/2023 | "Estimating Higher-Order Memberships via the $\ell_{2,\infty}$ Tensor Perturbation Bound," *Applied Mathematics and Statistics Department Seminar*, JHU |
| 1/10/2023 | "Estimating Higher-Order Memberships via the $\ell_{2,\infty}$ Tensor Perturbation Bound," *Statistics Department Seminar*, University of South Carolina (Invited Talk) |
| 12/22/2022 | "Estimating Higher-Order Memberships via the $\ell_{2,\infty}$ Tensor Perturbation Bound," *Statistics and Actuarial Science Department Seminar*, University of Waterloo (Invited Talk) |

12/19/2022    "Joint Spectral Clustering in Multilayer Degree-Corrected Stochastic Blockmodels," *Center for Imaging Science Retreat*, JHU

10/4/2022    "Community Detection in Multilayer Degree-Corrected Stochastic Blockmodels," *Applied Mathematics and Statistics Student Seminar*, JHU

8/23/2022    "Community Detection in Multilayer Degree-Corrected Stochastic Blockmodels," *COMPSTAT*, Bologna, Italy (Invited Talk)

8/11/2022    "Entrywise Estimation of Singular Vectors of Low-Rank Matrices with Heteroskedasticity and Dependence," *Joint Statistical Meetings*, Washington, D.C. (Contributed Talk)

7/11/2022    "Community Detection in Multilayer Degree-Corrected Stochastic Blockmodels," *Statistical Inference for Network Models (NETSCI Satellite)*, Virtual (Contributed Talk)

4/19/2022    "Entrywise Recovery Guarantees for Sparse PCA via Sparsistent Algorithms," *Applied Mathematics and Statistics Student Seminar*, JHU

3/30/2022    "Entrywise Recovery Guarantees for Sparse PCA via Sparsistent Algorithms," *AISTATS, 2022*, ~~Valencia, Spain~~Virtual

1/20/2022    "Entrywise Estimation of Singular Vectors of Low-Rank Matrices with Heteroskedasticity and Dependence," *2022 TRIPODS Winter School on Interplay between Artificial Intelligence and Dynamical Systems*, JHU (Invited Talk)

12/6/2021    "From RDPGs to General Signal Plus Noise Models," *Guest Lecture for 553.742 Statistical Inference on Graphs*, JHU

12/6/2021    "Entrywise Estimation of Singular Vectors of Low-Rank Matrices with Heteroskedasticity and Dependence," *Venkataraman Lab*, JHU (Invited Talk)

9/21/2021    "Entrywise Estimation of Singular Vectors of Low-Rank Matrices with Heteroskedasticity and Dependence," *Applied Mathematics and Statistics Student Seminar*, JHU

8/10/2021    "Nonparametric Two-Sample Hypothesis Testing for Random Graphs with Negative and Repeated Eigenvalues," *Joint Statistical Meetings*, ~~Seattle, WA~~Virtual (Topic-Contributed Talk)
        (**Received Best Presentation Award in the Nonparametric Statistics Student Competition**)

2/2/2021    "Nonparametric Two-Sample Hypothesis Testing for Random Graphs with Negative and Repeated Eigenvalues," *Applied Mathematics and Statistics Student Seminar*, JHU

8/6/2020    "Consistent Nonparametric Hypothesis Testing for Low Rank Random Graphs with Negative and Repeated Eigenvalues," *Joint Statistical Meetings*, ~~Philadelphia, PA~~Virtual (Contributed Talk)

4/7/2020    "Nonidentifiability and nonparametric random graph hypothesis testing," *MINDS Seminar*, JHU

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| 1/28/2020 | "On Two Distinct Sources of Nonidentifiability in Latent Position Random Graph Models," *Applied Mathematics and Statistics Student Seminar*, JHU |
| 4/23/2019 | "Vertex Nomination, Consistent Estimation, Adversarial Modification," *Applied Mathematics and Statistics Student Seminar*, JHU |

## TEACHING

*Johns Hopkins University*

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| Fall 2022 | **Instructor**, 500.111: Statistics and Data Science with Networks <br> Undergraduate course for first and second-year engineering students on basics of data science and network analysis |
| Winter 2021 | **Instructor**, 553.283 Introduction to R <br> Undergraduate introduction to statistical computing with R |
| Fall 2021 | **Instructor**, 500.111: Statistics and Data Science with Networks <br> Undergraduate course for first and second-year engineering students on basics of data science and network analysis |
| Summer 2021 | **Instructor**, Master's Program Statistics Review <br> Review sessions on mathematical statistics for Master's students |
| Winter 2021 | **Instructor**, 553.283 Introduction to R <br> Undergraduate introduction to statistical computing with R |
| Summer 2020 | **Instructor**, Master's Program Statistics Review <br> Review sessions on mathematical statistics for Master's students |
| Summer 2020 | **Teaching Assistant**, 553.310 Probability and Statistics for Vittorio Loprinzo <br> Undergraduate introduction to statistics |
| Summer 2019 | **Instructor**, Master's Program Statistics Review <br> Review sessions on mathematical statistics for Master's students |
| Summer 2019 | **Teaching Assistant**, 553.310 Probability and Statistics for Vittorio Loprinzo <br> Undergraduate introduction to statistics |
| Spring 2019 | **Teaching Assistant**, 553.762 Nonlinear Optimization II for Professor Daniel Robinson <br> Graduate-level course on constrained optimization |
| Fall 2018 | **Teaching Assistant**, 553.730 Statistical Theory for Professor Carey Priebe <br> Graduate-level course on statistical theory |
| Summer 2018 | **Instructor**, Master's Program Statistics Review <br> Review sessions on mathematical statistics for Master's students |

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

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| Spring 2017 | **Grader**, ActSci 655 Health Analytics for Professor Margie Rosenberg <br> Upper-level undergraduate course on statisical analysis for health insurance |
| Fall 2016 | **Grader**, ActSci 651 Life Contingencies II for Professor Paul Johnson <br> Upper-level undergraduate course on actuarial mathematics for life insurance |
| Spring 2016 | **Grader**, ActSci 650 Life Contingencies I for Professor Margie Rosenberg <br> Upper-level undergraduate course on actuarial mathematics for life insurance |

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

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| Spring 2015-Spring 2017 | Private Piano Instructor |

## PROFESSIONAL ACTIVITIES

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| **Reviewer** | IEEE Transactions on Signal Processing (1), AISTATS (2), Statistics and its Interface (2), IEEE Transactions on Pattern Analysis and Machine Intelligence (1), Statistics in Medicine (1) |
| **Member** | ASA, IMS |
| **Chair** | 2022 Joint Statistical Meetings session on Network Data Analysis |
| **Organizer** | Summer 2020 and Summer 2021 reading group on eigenvectors and random graph inference, Fall 2021 reading group on deep and graph learning, 2020-2021 Johns Hopkins Applied Mathematics and Statistics student seminar |
| **Attendee** | 2022 International Centre for Mathematical Sciences (ICMS) Workshop on Structural Breaks and Shape Constraints, 2019 Joint Statistical Meetings |
| **Committee Member** | Fall 2019 and Fall 2020 Graduate student committee to meet with potential JHU AMS faculty |

## ADDITIONAL EXPERIENCE

**2018 - 2023**    **Research Assistant**, Johns Hopkins University, Baltimore, MD

Research assistant to Professor Carey Priebe in the Applied Mathematics and Statistics Department.

**Summer 2017**    **Analytics Intern**, CNA Financial, Chicago, IL

Analyzed loss data for products and professional liability for medical devices using new FDA data and GLMs.

**Summer 2016**    **Actuarial Intern**, CNA Financial, Chicago, IL

Developed a model for predicting the probability of payment for insurance.

**Summer 2015**    **Actuarial Intern**, CUNA Mutual Group, Madison, WI

Created spreadsheets to replicate GAAP and Statutory reserves results from PolySystems for equity-indexed annuity policies and analyzed mortality experience data for the purposes of creating a new mortality table.

## TECHNICAL QUALIFICATIONS

Proficient in R, Java, Python, Linux, Git, C++ (Rcpp), Matlab, LaTeX, Microsoft Excel, and VBA
Passed three actuarial exams (P, FM, and MFE)

## HOBBIES

Biking, jazz piano, reading fantasy, and hiking