Joshua Agterberg

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jagterberg.github.io

jagt@illinois.edu

ACADEMIC EMPLOYMENT

2024-Present **University of Illinois Urbana-Champaign**
Assistant Professor
Department of Statistics

2023-2024 **University of Pennsylvania**
Postdoctoral Researcher
Innovation in 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
- Nonconvex Optimization

JOURNAL ARTICLES (PUBLISHED OR ACCEPTED)

(* denotes students supervised or mentored)

1. "Joint Spectral Clustering in Multilayer Degree-Corrected Stochastic Blockmodels,"
   Joshua Agterberg, Zachary Lubberts, and Jesús Arroyo,
   Journal of the American Statistical Association, Accepted.

2. "An Overview of Asymptotic Normality in Stochastic Blockmodels: Cluster Analysis and Inference,"
   Joshua Agterberg and Joshua Cape,
   Statistical Science, To Appear.

3. "Estimating Higher Order Mixed Memberships via the $\ell_{2,\infty}$ Tensor Perturbation Bound,"
   Joshua Agterberg and Anru Zhang,
   Journal of the American Statistical Association, 2024+.

4. "Correcting a Nonparametric Two-sample Graph Hypothesis Test for Graphs with Different Numbers of Vertices,"
   Anton Alyakin, **Joshua Agterberg**, Hayden Helm, and Carey Priebe,
   Applied Network Science, 2024.

5. "Semisupervised Regression in Latent Structure Networks on Unknown Manifolds,"
   Aranyak Acharyya, **Joshua Agterberg**, Michael Trosset, Youngser Park, and Carey Priebe,
   Applied Network Science, 2023.

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

7. "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.

8. "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.

9. "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.

10. "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.

11. "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.

CONFERENCE PAPERS (PEER-REVIEWED)

(* denotes students supervised or mentored)

1. "Nonconvex Linear System Identification with Minimal State Representation,"
   Uday Kiran Reddy Tadipatri*, Benjamin D. Haeffele, **Joshua Agterberg**, Ingvar Ziemann, and René Vidal,
   Learning For Dynamics and Control (L4DC), 2025.

2. "A Convex Relaxation Approach to Generalization Analysis for Parallel Positively Homogeneous Networks,"
   Uday Kiran Reddy Tadipatri*, Benjamin D. Haeffele, **Joshua Agterberg**, and René Vidal,
   AISTATS, 2025. (31.3% Acceptance Rate)

3. "TSVD: Bridging Theory and Practice in Continual Learning with Pre-Trained Models,"
   Liangzu Peng, Juan Elenter, **Joshua Agterberg**, and René Vidal,
   ICLR, 2025. (32.08% Acceptance Rate)

4. "Entrywise Recovery Guarantees for Sparse PCA via Sparsistent Algorithms,"
   Joshua Agterberg and Jeremias Sulam,
   AISTATS, 2022. (29.2% Acceptance Rate)

PREPRINTS

(* denotes students supervised or mentored)

1. "A High-Dimensional Statistical Theory for Convex and Nonconvex Matrix Sensing,"
   Joshua Agterberg and René Vidal,
   Submitted, 2024.

2. "Distributional Theory and Statistical Inference for Linear Functions of Eigenvectors with Small Eigengaps,"
   Joshua Agterberg,
   Submitted, 2024.

3. "Statistical Inference for Low-Rank Tensors: Heteroskedasticity, Subgaussianity, and Applications,"
   Joshua Agterberg and Anru Zhang,
   Submitted, 2024.

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

TALKS

Statistical Inference for Linear Functions of Eigenvectors with Small Eigengaps

- 4/3/2025, Statistics Seminar, University of Wisconsin-Madison (Invited Talk)
- 4/25/2025, Econometrics Seminar, University of Illinois Urbana-Champaign (Invited Talk)

A Precise High-Dimensional Statistical Theory for Convex and Nonconvex Matrix Sensing

- 6/13/2024, Banff International Research Station Workshop on the Mathematics of Deep Learning, Oaxaca, Mexico (Invited Talk)

Statistical Inference for Low-Rank Tensors: Heteroskedasticity, Subgaussianity, and Applications

- 10/19/2024, Statistics Seminar, University of Illinois Urbana-Champaign (Invited Talk)
- 4/6/2024, Statistics Seminar, University of Virginia (Invited Talk)

Estimation and Inference in Tensor Mixed Membership Blockmodels

- 6/14/2025, International Indian Statistical Association Conference, Lincoln, Nebraska (Invited Talk)
- 5/8/2025, IMSI Workshop on Tensor Data Analysis and Statistics
- 12/16/2024, IMS International Conference on Statistics and Data Science, Nice, France (Invited Talk)
- 11/2/2023, Stochastics Seminar, Georgia Tech (Invited Talk)
- 10/18/2023, Statistical Inference on Networks and High-Dimensional Data Workshop, Brin Mathematics Research Center, University of Maryland College Park (Invited Talk)
- 9/28/2023, Applied Mathematics and Statistics Postdoc Seminar, Johns Hopkins University (Invited Talk)
- 8/21/2023, TRIPODS Postdoc Workshop, Toyota Technology Institute of Chicago

Estimating Higher-Order Mixed Memberships via the $\ell_{2,\infty}$ Tensor Perturbation Bound

- 2/9/2023, Statistics Department Seminar, University of Illinois-Urbana Champaign (Invited Talk)
- 2/1/2023, Statistics Department Seminar, University of California-Riverside (Invited Talk)
- 1/24/2023, Statistics Department Seminar, University of Virginia (Invited Talk)
- 1/19/2023, Applied Mathematics and Statistics Department Seminar, JHU
- 1/10/2023, University of South Carolina (Invited Talk)
- 12/22/2022, Statistics and Actuarial Science Department Seminar, University of Waterloo (Invited Talk)

Joint Spectral Clustering in Multilayer Degree-Corrected Stochastic Blockmodels

- 12/19/2022, Center for Imaging Science Retreat, JHU
- 10/4/2022, Applied Mathematics and Statistics Student Seminar, JHU
- 8/23/2022, COMPSTAT, Bologna, Italy (Invited Talk)
- 7/11/2022, Statistical Inference for Network Models (NETSCI Satellite), Virtual (Contributed Talk)

Entrywise Estimation of Singular Vectors of Low-Rank Matrices with Heteroskedasticity and Dependence

- 8/11/2022, Joint Statistical Meetings, Washington, D.C. (Contributed Talk)
- 1/20/2022, 2022 TRIPODS Winter School on Interplay between Artificial Intelligence and Dynamical Systems, JHU (Invited Talk)

- 12/6/2021, Venkataraman Lab, JHU (Invited Talk)
- 9/21/2021, Applied Mathematics and Statistics Student Seminar, JHU

Entrywise Recovery Guarantees for Sparse PCA via Sparsistent Algorithms

- 4/19/2022, Applied Mathematics and Statistics Student Seminar, JHU
- 3/30/2022, AISTATS, 2022, ~~Valencia, Spain~~Virtual

From RDPGs to General Signal Plus Noise Models

- Guest Lecture for 553.742 Statistical Inference on Graphs, JHU

Nonparametric Two-Sample Hypothesis Testing for Random Graphs with Negative and Repeated Eigenvalues

- 8/10/2021, Joint Statistical Meetings, ~~Seattle, WA~~Virtual (Topic-Contributed Talk) (**Received Best Presentation Award in the Nonparametric Statistics Student Competition**)
- 2/2/2021, Applied Mathematics and Statistics Student Seminar, JHU
- 8/6/2020, Joint Statistical Meetings, ~~Philadelphia, PA~~Virtual (Contributed Talk)
- 4/7/2020, MINDS Seminar, JHU

On Two Distinct Sources of Nonidentifiability in Latent Position Random Graph Models

- 1/28/2020, Applied Mathematics and Statistics Student Seminar, JHU

Vertex Nomination, Consistent Estimation, Adversarial Modification

- 4/23/2019, Applied Mathematics and Statistics Student Seminar, JHU

TEACHING

University of Illinois Urbana-Champaign

Fall 2025	**Instructor**, Statistics 578, Topics in Statistics PhD-level topics course on spectral methods, network analysis, and nonconvex optimization
Fall 2025	**Instructor**, Statistics 511, Advanced Mathematical Statistics PhD-level required course on mathematical statistics
Fall 2024	**Instructor**, Statistics 410, Probability and Statistics II Upper level undergraduate and master's-level course on calculus-based probability and statistics

Johns Hopkins University

Fall 2022	**Instructor**, 500.111: Statistics and Data Science with Networks 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 Undergraduate introduction to statistical computing with R

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

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

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

University of Wisconsin-Madison (School of Music)

2015-2017	Private Piano Instructor

STUDENTS SUPERVISED OR MENTORED

- Georgios Avdis (Statistics PhD, UIUC), 2024-Present.
- Zhexu (Alex) Jin (Statistics PhD, UIUC), 2025-Present.
- Rajdeep Brahma (Statistics PhD, UIUC), 2024-Present (Co-advised with Yuguo Chen).
- Yanlin Wang (Statistics Master's, UIUC), 2024-Present.
- Uday Kiran Reddy Tadipatri (ESE PhD, University of Pennsylvania), 2023-2025.

PROFESSIONAL ACTIVITIES

Reviewer	Journal of the Royal Statistical Society, Series B (1), Annals of Statistics (3), Electronic Journal of Statistics (3), Journal of the American Statistical Association (4), Journal of Computational and Graphical Statistics (4), IEEE Transactions on Information Theory (1), IEEE Signal Processing Letters (3), Biometrika (1), Journal of Business and Economic Statistics (2), Journal of the Korean Statistical Society (2), IEEE Transactions on Signal Processing (2), AISTATS (4), Statistics and its Interface (1), IEEE Transactions on Pattern Analysis and Machine Intelligence (1), Statistics in Medicine (2), Journal of Statistical Planning and Inference (3), Journal of Multivariate Analysis (1), European Journal of Applied Mathematics (2), DeepMath (1)
Member	ASA, IMS, PhD Student Committee (UIUC)
Chair	2022 Joint Statistical Meetings session on Network Data Analysis

HONORS AND AWARDS

Johns Hopkins University

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

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

ADDITIONAL EXPERIENCE

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.

ADDITIONAL TECHNICAL QUALIFICATIONS

Passed three actuarial exams (P, FM, and MFE)

HOBBIES

Trail and ultra running, lifting weights, biking, jazz piano, and reading fantasy