Alex Hayes

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Last updated on 2025-02-10

RESEARCH INTERESTS

Statistical network models, causal inference, spillover effects, multivariate analysis, applications in social science

EDUCATION

University of Wisconsin-Madison	2025
Ph.D. Statistics, advised by Keith Levin and Karl Rohe	
University of Wisconsin-Madison	2020
M.S. Statistics	
Rice University	2018
B.A. Statistics, with Distinction in Research and Creative Work	

PROFESSIONAL EXPERIENCE

University of Wisconsin-Madison PhD Candidate, Department of Statistics	August 2018 – Present
Facebook Research Intern, Core Data Science	Summer 2020 & Summer 2021
RStudio Intern, tidymodels team	Summer 2018
Rice University Undergraduate researcher with <i>Genevera Allen</i>	Fall 2017
Fred Hutchinson Cancer Research Center Undergraduate researcher with <i>Elizabeth Brown</i>	Summer 2017
Houston Parks and Recreation Department	Spring 2016

PRE-PRINTS

- 1. Alex Hayes and Kevin Levin. Peer effects in the linear-in-means model may be inestimable even when identified. *under* review at Biometrika. 2025+.
 - JSM 2025 Student Paper Award Winner

PUBLICATIONS

- 1. Alex Hayes, Mark M. Fredrickson, and Keith Levin. Estimating network-mediated causal effects via principal components network regression. *Journal of Machine Learning Research*. 2025.
- 2. Alex Hayes and Karl Rohe. Co-factor analysis of citation networks. Journal of Computational and Graphical Statistics. 2024.
- 3. Hadley Wickham, Mara Averick, Jennifer Bryan, Winston Chang, Lucy D'Agostino McGowan, Romain François, Garrett Grolemund, **Alex Hayes**, Lionel Henry, Jim Hester, Max Kuhn, Thomas Lin Pedersen, Evan Miller, Kirill Müller, David Robinson, Dana Paige Seidel, Vitalie Spinu, Kohske Takahashi, Davis Vaughan, Claus Wilke, Kara Woo, Hiroaki Yutani. Welcome to the Tidyverse. *Journal of Open Source Software*. 2019.

RESEARCH & STATISTICAL SOFTWARE

- 1. fastRG (CRAN, Github): Sample generalized random dot product graphs linearly in edge counts. Useful to investigate properties of network models and spectral estimators. Easily control expected degree of sampled networks, and efficiently compute population eigendecompositions for large networks.
- 2. vsp (CRAN, Github): Vintage sparse PCA for semi-parametric network analysis. Estimate latent positions in random dot product graphs via spectral embeddings and interpret them via varimax rotation. Easily regularize networks to handle noise.
- 3. aPPR (Github): Approximate personalized pageRank. Locally clusters networks based on degree-regularized PageRank. estimates. Designed specifically for large networks only available via an API.
- 4. gdim (CRAN, Github): Estimate graph dimension using cross-validated eigenvalues. Determine the number of communities in stochastic blockmodels and variants.
- 5. fastadi (CRAN, Github): Self-tuning matrix imputation. Estimating singular subspaces of sparsely observed matrices. Includes specialized methods for upper triangular data.
- 6. broom (CRAN, Github): Convert statistical objects into tidy tibbles. Part of the tidyverse. Puts hundreds of types of statistical estimates into a consistent format to make programming easier.
- 7. distributions3 (CRAN, Github): Probability distributions as S3 Objects. An object-oriented interface to probability computations, with emphasis on careful documentation, beginner friendliness and classroom applicability.

PRESENTATIONS

1.	Estimating network-mediated causal effects via spectral embeddings NetSci 2024	2024-06-17
2.	Asymptotic identification of peer effects in linear models Dissertation defense	2024-04-04
3.	Peer effects are parametrically indistinguishable from baseline behaviors in the asymptotic lim Statistics Graduate Student Seminar, UW-Madison	it 2023-11-27
4.	Latent contagion in low-rank networks Levin Lab Meeting, UW-Madison	2023-10-11
5.	Peer diffusion over uncertain networks IFDS Ideas Seminar, UW-Madison	2023-09-18
6.	Estimating network-mediated causal effects via spectral embeddings JSM 2023	2023-08-09
7.	Estimating network-mediated causal effects via spectral embeddings IFDS Ideas Seminar, UW-Madison	2023-04-24
8.	Estimating network-mediated causal effects via spectral embeddings Statistics Graduate Student Seminar, UW-Madison	2022-10-14
9.	Estimating indirect effects induced by homophily via spectral network regression. Tianxi Li and Can Le Joint Lab Meeting	2022-07-07
10.	distributions3: From basic probability to probabilistic regression UseR 2022	2022-06-23
11.	The Low Hanging Fruit of the Twitter Following Graph JSM 2021	2021-08-11
12.	Solving the model representation problem with broom rstudio::conf(2019)	2019-01-25
13.	Solving the model representation problem with broom Statistics Graduate Student Seminar, UW-Madison.	2018-11-30
14.	Convenient data analysis with broom	2018-11-14
ex F	Hayes Curriculum Vitae	Page 2 of 4

RStudio Webinar Series

15. Solving the model representation problem with broom *Madison R User Group*

POSTERS

1.	Estimating peer influence: limitations of linear-in-means models Wisconsin ASA Chapter Meeting	2024-11-22
2.	Estimating peer influence: limitations of linear-in-means models American Family Funding Initiative Networking Meeting	2024-11-12
3.	Estimating network-mediated causal effects via spectral embeddings IFDS Annual Meeting	2023-08-07
4.	Estimating network-mediated causal effects via spectral embeddings ACIC 2023	2023-05-24
5.	Using data to support real-time decision making by the Hurricane Harvey crisis management team <i>Rice Data Science Conference</i>	2017-10-10
6.	An exploratory analysis of the effect of waiting room interactions on adherence in clinical trials Fred Hutch Intern Poster Competition	2017-08-10

TEACHING

Co-instructor

- Applied Machine Learning Workshop	2019-01-15 & 2019-01-16
Short course on computational tools for machine learning in R	rstudio::conf(2019)
Graduate Teaching Assistant	
 STAT 340 Intro to Data Modeling II Undergraduate introduction to statistics with computational focus 	Fall 2022 UW-Madison
 STAT 324 Intro to Statistics for Engineers Undergraduate introduction to statistics for engineers 	Spring 2019 UW-Madison
 STAT 324 Intro to Statistics for Engineers Undergraduate introduction to statistics for engineers 	Fall 2018 UW-Madison
- Statistics Department Outstanding TA Award	2018-2019 UW-Madison
Undergraduate Teaching Assistant	
 COMP 540 Statistical Machine Learning Masters-level course on theory and algorithms for predictive modeling 	Spring 2018 Rice University
 COMP 330 Data Science: Tools & Models Undergraduate course on databases and computational infrastructure for large scale data analysis 	Fall 2017 Rice University
Guest Lecturer	
- Two sample and paired hypothesis tests. STAT 310. UW-Madison	2024-11-05 & 2024-11-07
- Confidence intervals. STAT 340. UW-Madison	2022-10-25 & 2022-10-27
- Sampling with Twitter following graph with aPPR. STAT 992. UW-Madison	2020-10-08
- Hypothesis testing. STAT 324. UW-Madison	2018-10-18

MENTORING

- Nathan Kolbow (undergraduate research assistant), currently a PhD student in Biostatistics at UW-Madison

SERVICE

Reviews for Applied Network Science (2020, 2021), the R Journal (2020, 2021), the Journal of Open Source Software (2021), Ecology Letters (2024), Sociological Methods and Review (2024), and Journal of Quantitative Analysis in Sports (2024).

I have also collaborated with ROpenSci to design software development standards for statistical software and I helped organize the Chicago R Unconference in 2019.

REFERENCES

 Karl Rohe, Professor of Statistics, UW-Madison 	karl.rohe@wisc.edu
 Keith Levin, Assistant Professor of Statistics, UW-Madison 	kdlevin@wisc.edu
 Hyunseung Kang, Associate Professor of Statistics, UW-Madison 	hkang84@wisc.edu