Karl Rohe

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Positions

Associate Professor with tenure, Department of Statistics, University of Wisconsin-Madison. Sept 2017 - Present.

Affiliate Faculty, Department of Educational Psychology, University of Wisconsin-Madison, Spring 2018 - Present.

Affiliate Faculty, School of Journalism and Mass Communication, University of Wisconsin-Madison, Fall 2018 - Present.

Affiliate Faculty, Department of Electrical and Computer Engineering, University of Wisconsin-Madison, Spring 2015 - Present.

Assistant Professor, Department of Statistics, University of Wisconsin-Madison. Sept 2011 - Sept 2017.

Education

Ph.D., University of California, Berkeley, Statistics. May 2011
Designated Emphasis in Communication, Computation, and Statistics.
Thesis: "Analysis of Spectral Clustering and the Lasso under Nonstandard Statistical Models"

B.S., Michigan State University, Statistics. May 2006. *Summa cum laude.* Minor in Environmental Economics. *Study Abroad*: Argentina; Switzerland; China; and Netherlands, France, and Spain.

Editorial Service

Associate Editor:
Journal of the Royal Statistical Society: Series B (JRSS-B)

Awards

Army Research Office. Resolving an age old enigma (500k-ish / 3 years / fall 2020 - fall 2023). PI. Joint with Miaoyan Wang.

National Science Foundation - Division of Mathematical Sciences. Scalable Statistical Inference in Small-World Networks. Grant number DMS-1916378 (300k / 3 years / summer 2019 - summer 2022). Co-PI with Sebastien Roch.

Army Research Office. Exploiting the Twitter friendship graph to identify trusted sources of information (300k-ish / 2 years / summer 2019 - spring 2021). PI, Sole Investigator.

Hewlett Foundation (CO-I) Communication Ecologies, Political Contention, and the Crisis of Democracy (150k / 2 years / fall 2018 - fall 2020). Katherine Cramer (PI), Lew Friedland, Karl Rohe, William Sethares, Dhavan Shah, Michael Wagner and Chris Wells.

Vice Chancellor for Research and Graduate Education (CO-I) UW2020 Program. Communication Ecologies, Political Contention, and the Crisis of Democracy. (411k / 2 years / summer 2018 - summer 2020). Lew Friedland (PI), Katherine Cramer, Karl Rohe, William Sethares, Dhavan Shah, Michael Wagner and Chris Wells.

National Science Foundation - Division of Mathematical Sciences. With additional support from NSF-MMS and other Federal Statistical Agencies. A spectral framework for network driven sampling. Grant number DMS-1612456 (172k / 3 years / summer 2016 - summer 2019). PI, Sole Investigator.

Army Research Office. A spectral framework for multi-resolution graph sampling and clustering (520k / 4 years / summer 2015 - summer 2019). PI, Sole Investigator.

National Science Foundation - Division of Mathematical Sciences. Spectral Methods for Contextualizing relational data. Grant number DMS-1309998 (120k / 3 years / summer 2013 - summer 2016). PI.

UW Graduate School fall research competition June 2012, 2013, 2015, 2018

Evelyn Fix Memorial Medal and Citation, awarded to the PhD student on the Berkeley campus showing the greatest promise in statistical research, with preference for applications to biology and problems of health. (2011)

National Science Foundation Funded Research Experience for Undergraduates in China. (Summer 2005)

Lumsden-Valrance Scholarship (Fall 2004 - Spring 2006)

L.C. Plant Merit Award (Spring 2006)

Publications

[1] Yuling Yan, Bret Hanlon, Sebastien Roch, and Karl Rohe. Asymptotic seed bias in respondent-driven sampling. *Electron. J. Statist.*, 14(1):1577–1610, 2020.

[2] Fan Chen, Yini Zhang, and Karl Rohe. Targeted sampling from massive block model graphs with personalized pagerank. *Journal of the Royal Statistical Society: Series B (Statistical Methodology)*, 2019.

[3] Karl Rohe. A critical threshold for design effects in network sampling. *The Annals of Statistics*, 47(1):556–582, 2019.

[4] Karl Rohe, Jun Tao, Xintian Han, and Norbert Binkiewicz. A note on quickly sampling a sparse matrix with low rank expectation. *Journal of Machine Learning Research*, 2018.

[5] Yilin Zhang and Karl Rohe. Understanding regularized spectral clustering via graph conductance. In *Advances in Neural Information Processing Systems*, pages 10631–10640, 2018.

[6] Sebastien Roch and Karl Rohe. Generalized least squares can overcome the critical threshold in respondent-driven sampling. *Proceedings of the National Academy of Sciences*, 2018.

[7] Yilin Zhang, Marie Poux-Berthe, Chris Wells, Karolina Koc-Michalska, Karl Rohe, et al. Discovering political topics in facebook discussion threads with graph contextualization. *The Annals of Applied Statistics*, 12(2):1096–1123, 2018.

[8] Juhee Cho, Donggyu Kim, and Karl Rohe. Intelligent initialization and adaptive thresholding for iterative matrix completion: Some statistical and algorithmic theory for adaptive-impute. *Journal of Computational and Graphical Statistics*, 28(2):323–333, 2019.

[9] Mohammad Khabbazian, Bret Hanlon, Zoe Russek, Karl Rohe, et al. Novel sampling design for respondent-driven sampling. *Electronic Journal of Statistics*, 11(2):4769–4812, 2017.

[10] Xiao Li, Karl Rohe, et al. Central limit theorems for network driven sampling. *Electronic Journal of Statistics*, 11(2):4871–4895, 2017.

[11] N Binkiewicz, JT Vogelstein, and K Rohe. Covariate-assisted spectral clustering. *Biometrika*, 104(2):361–377, 2017.

[12] Karl Rohe, Tai Qin, and Bin Yu. Co-clustering directed graphs to discover asymmetries and directional communities. *Proceedings of the National Academy of Sciences*, 113(45):12679–12684, 2016.

[13] Juhee Cho, Donggyu Kim, and Karl Rohe. Asymptotic theory for estimating the singular vectors and values of a partially-observed low rank matrix with noise. *Statistica Sinica*, 27(4), 2017.

[14] Thu Le, Daniel Bolt, Eric Camburn, Peter Goff, and Karl Rohe. Latent factors in student–teacher interaction factor analysis. *Journal of Educational and Behavioral Statistics*, 42(2):115–144, 2017.

[15] Mohammad Khabbazian, Ricardo Kriebel, Karl Rohe, and Cécile Ané. Fast and accurate detection of evolutionary shifts in ornstein-uhlenbeck models. *Methods in Ecology and Evolution*, 7(7):811–824, 2016.

[16] Jinzhu Jia and Karl Rohe. Preconditioning to comply with the irrepresentable condition. *Electronic Journal of Statistics 2015, Vol. 9, No. 0, 1150-1172.*, 2015.

[17] Karl Rohe. Preconditioning for classical relationships: a note relating ridge regression and ols p-values to preconditioned sparse penalized regression. *Stat (International Statistical Institute journal for rapid publication)*, 4(1):157–166, 2015.

[18] K Rohe, T Qin, and H Fan. The highest dimensional stochastic blockmodel with a regularized estimator. *Statistica Sinica*, 24(4), 2014.

[19] Tai Qin and Karl Rohe. Regularized Spectral Clustering under the Degree-Corrected Stochastic Blockmodel. *Neural Information Processing Systems (NIPS)*, 2013.

[20] V Vu, J Cho, J Lei, and K Rohe. Fantope Projection and Selection: A near-optimal convex relaxation of sparse PCA. *Neural Information Processing Systems (NIPS)*, 2013.

[21] J Jia, K Rohe, and B Yu. The Lasso under poisson-like heteroskedasticity. *Statistica Sinica*, 23:99–118, 2013.

[22] K Rohe, B Yu, and S Chatterjee. Spectral clustering and the high dimensional stochastic blockmodel. *The Annals of Statistics*, 39(4):1878–1915, 2011.

Manuscripts and non-peer reviewed articles

[1] Yilin Zhang, Karl Rohe, and Sebastien Roch. Reducing seed bias in respondent-driven sampling by estimating block transition probabilities. *arXiv preprint arXiv:1812.01188*, 2018.

[2] Karl Rohe and Tai Qin. The blessing of transitivity in sparse and stochastic networks. *arXiv preprint arXiv:1307.2302*, 2013.

[3] Song Wang and Karl Rohe. Don't mind the (eigen) gap; a comment on a discussion paper. *The Annals of Applied Statistics (Accepted)*, 2016.

[4] Q Cui, K Rohe, and Z Zhang. Discussion of: Estimating the historical and future probabilities of large terrorist events. *The Annals of Applied Statistics*, 7(4):1891–1894, 2014.

[5] Karl Rohe. A tale of two researchers. *Amstat News*, October1, 2012.

Paper Presentations

[1] K. Rohe, S. Chatterjee, and B. Yu. Spectral clustering under the Stochastic Block Model with a growing number of blocks. In *Invited Session, JSM 2010*, Vancouver, B.C.

[2] K. Rohe, S. Chatterjee, and B. Yu. Spectral clustering under the Stochastic Block Model with a growing number of blocks. In *RAND Corp. July 14, 2010*, Santa Monica, CA. Simulcast to Pittsburgh, PA and Washington D.C.

[3] K. Rohe and B. Yu. A Spectral Technique to Explore the Asymmetric Flow of Information in Directed Networks. In *Army Conference on Applied Statistics. October 20, 2011*, Annapolis, MD.

[4] K. Rohe and B. Yu. Clustering in directed graphs; a statistical model and a spectral algorithm. In *Information Theory and Applications. February 9, 2012*, San Diego, CA.

[5] K. Rohe and B. Yu. Co-clustering for Directed Graphs; the Stochastic Co-Blockmodel and a Spectral Algorithm. In *Machine Learning: Theory and Computation. March 29, 2012*, Minneapolis, MN.

[6] K. Rohe and B. Yu. Co-clustering for Directed Graphs; the Stochastic Co-Blockmodel and a Spectral Algorithm. In *Invited Session, Biennial conference of the ASA's Section on Statistical Learning and Data Mining. June, 2012*, Ann Arbor, MI.

[7] K. Rohe and B. Yu. Co-clustering for Directed Graphs; the Stochastic Co-Blockmodel and a Spectral Algorithm. In *Invited Session, International Chinese Statistical Association Applied Statistics Symposium. June, 2012*, Boston, MA.

[8] K. Rohe and B. Yu. Co-clustering for Directed Graphs; the Stochastic Co-Blockmodel and a Spectral Algorithm. In *Invited Session, WNAR, June 2012*, Fort Collins, CO.

[9] K. Rohe and B. Yu. Co-clustering for Directed Graphs; the Stochastic Co-Blockmodel and a Spectral Algorithm. In *Invited Session, JSM, Summer 2012*, San Diego, CA.

[10] Rohe and Jia. Preconditioning for sparse inference. In *Johns Hopkins Applied Math Department Colloquium, November 2012*.

[11] K. Rohe, T. Qin, and F. Haoyang. The blessing of dimensionality for sparse Stochastic Blockmodels. In *Invited speaker for Workshop on Statistics in Complex Networks: Theory and Applications, January 2013*, Eindhoven, The Netherlands.

[12] Rohe and Jia. Preconditioning for sparse inference. In *Duke ECE Department Colloquium, February 2013*.

[13] K. Rohe, T. Qin, and M. Khabbazian. Local inference, Transitivity, and Small World Stochastic Blockmodels. In *NYU Stern's IOMS Colloquium, April 2013.*

[14] Rohe and Jia. Preconditioning for sparse inference. In *Duke Workshop on Sensing and Analysis of High-Dimensional Data, 2013.*

[15] K. Rohe, J. Cho, and S.. Roy. Studying the context-specificity of network structure. In *Invited session, JSM Montreal 2013.*

[16] Rohe and Qin. The blessing of transitivity. In *University of Washington, Statistics Department Seminar, October 2013*.

[17] Rohe and Qin. The blessing of transitivity. In *SAMSI workshop "Social Network Data: Collection and Analysis", October 2013*.

[18] Rohe and Qin. The blessing of transitivity. In *Simons Institute for the theory of Computing at UC Berkeley, November 2013*.

[19] Rohe and Qin. The blessing of transitivity. In *ERCIM at University of London, December 2013*.

[20] Qin and Rohe. Regularized spectral clustering and the degree corrected Stochastic Blockmodel. In *SIAM conference on optimization, May 2014*, San Diego, CA.

[21] Binkiewicz and Rohe. Covariate Assisted Spectral Clustering. In *International Symposium on Business and Industrial Statistics/ Conference of the ASA Section on Statistical Learning and Data Mining, June 2014*, Duke University.

[22] Cho and Rohe. Estimating Induced Subgraphs in Samples of Labeled Graphs. In *Joint Applied Statistics Symposium of International Chinese Statistical Association and Korean International Statistical Society, June 2014*, Portland, OR.

[23] Qin and Rohe. Regularized spectral clustering and the degree corrected Stochastic Blockmodel. In *JSM, August 2014*, Boston, MA.

[24] Rohe Binkiewicz, Vogelstein. Contextualizing spectral network analysis. In *Northwestern Department of Statistics Department Seminar, October 2014*.

[25] Rohe and Jia. Preconditioning the Lasso. In *Stanford Department of Statistics Department Seminar, November 2014*, Boston, MA.

[26] Binkiewicz, Vogelstein, and Rohe. Contextualizing spectral network analysis. In *Workshop at Centre International de Rencontres Mathematiques (CIRM), December 2014*, Luminy, Fr.

[27] Binkiewicz, Vogelstein, and Rohe. Contextualizing spectral network analysis. In *Joint Math Meetings, AMS Special Session on Network Science, January 2015*, San Antonio, TX.

[28] Rohe. A critical threshold fornetwork driven sampling. In *Michigan State University Department of Statistics Seminar, April 2015*, Lansing, MI.

[29] Rohe. Design effects in respondent driven sampling. In *Topic Contributed, JSM 2015*, Seattle, WA.

[30] Rohe. A critical threshold fornetwork driven sampling. In *University of Iowa Department of Statistics Seminar, April 2015*, Iowa City, IA.

[31] Rohe. A critical threshold fornetwork driven sampling. In *Joint seminar between the Department of Statistics and the Center for the Study of Complex Systems at University of Michigan. October 20.*, Ann Arbor, MI.

[32] Rohe. A critical threshold fornetwork driven sampling. In *Yale Statistics Department Seminar. November 16*, New Haven, CT.

[33] Rohe. Health Care Communities. In *Yale Biostatistics Department Seminar. Nov 17*, New Haven, CT.

[34] Rohe. A critical threshold fornetwork driven sampling. In *Santa Fe Institute workshop on networks. December 14-18*, Santa Fe, NM.

[35] Rohe. A critical threshold fornetwork driven sampling. In *Boston U Stat and Math Department Seminar. March 2016*, Boston, MA.

[36] Rohe. Making spectral clustering work via regularization and contextualization. In *Johns Hopkins Center for Imaging Sciences. April 2016*, Baltimore, MD.

[37] Rohe. A critical threshold fornetwork driven sampling. In *Invited session at Population Association of America. 2016*, Washington DC.

[38] Rohe. A critical threshold fornetwork driven sampling. In *Workshop: Theoretical Foundations for Statistical Network Analysis at the Isaac Newton Institute. July 2016*, Cambridge UK.

[39] Rohe. Circumventing the critical threshold in RDS. In *JSM, August 2016*, Chicago, IL.

[40] Rohe. Circumventing the critical threshold in RDS. In *Wilks Seminar at Princeton ORFE, Dec 2016*, Princeton, NJ.

[41] Rohe. Circumventing the critical threshold in RDS. In *Neyman Seminar, UC Berkeley Statistics Department, February 2017.*

[42] Rohe. Circumventing the critical threshold in RDS. In *University of Washington Statistics Department Seminar, April 2017.*

[43] Rohe. Circumventing the critical threshold in RDS, invited speaker. In *Satellite conference of NetSci17 on Statistical Inference of Network Models, June 2017.*

[44] Rohe and Y Zhang. Spectral clustering is dead. long live spectral clustering. In *Joint Math Meetings, January 2018*, San Diego, CA.

[45] Rohe. Circumventing the critical threshold in RDS. In *University of Chicago Statistics Department Seminar, May 2018.*

[46] Rohe. Sampling networks, invited speaker. In *Satellite conference of NetSci18 on Network Causal Inference and Design of Experiments, June 2018*, Paris.

[47] Rohe. Regularized spectral clustering. In *Max Planck Institute for Intelligent Systems*, Tubingen.

[48] Rohe. Network Sampling. In *Workshop on High-dimensional Statistics and Random Structures*, Barcelona Graduate School of Economics.

Graduate student advising

Former PhD Students:

1. Tai Qin (co-advised with Grace Wahba), Statistical Justifications for Computationally Tractable Network Data Analysis, Spring 2015.
2. Norbert Binkiewicz, Contextualized Network Analysis: Theory and Methods for Networks with Node Covariates, Summer 2015.
3. Juhee Cho, Statistical Inferences and applications for a low-rank matrix, Spring 2016.
4. Mohammad Khabbazian, Statistical inference with tree-indexed Markov processes, Fall 2016.
5. Thu Le, Statistical inference with social networks: applications in Health Care and Education, Summer 2017.
6. Song Wang, Spectral methods for community detection, Fall 2017.
7. Yilin Wang, Community detection and sampling networks, Spring 2019.

Current PhD students: Fan Chen, Muzhe Zeng, Emma Krauska, Alex Hayes, Sijia Fang

Undergraduate honors projects with: Eric Swaney, Xiaoyi Yang, Nick Zaborek, Kaizheng Wang (Peking U), Haoyang Liu (Peking U), Zoe Russek, Alan Sayler, Emma Krauska, Jacob Rich, Jun Tao (Peking U), Xintian Han (Peking U), Yuling Yan (Peking U).

Teaching

Introduction to Mathematical Statistics (Stat 311) Fall 2011, Spring 2012, Fall 2012, Spring 2013, Spring 2014 (twice).

Applied Linear Regression (Stat 333) Spring 2013, Fall 2013, Fall 2014, Spring 16, Fall 16, Fall 17.

Statistical Machine Learning (Stat 479) Spring 2015.

Data Science with R (Stat 479) Spring 2016, Spring 2017.

Data Science with R (Stat 679) Fall 2016.

Theory and Methods for Social Network Analysis (Stat 992) Fall 2015.

Graduate Student Instructor @ Berkeley Ph.D. level Applied Statistics (stat 215), Upper Division Math Stat (stat 135), Intro to Prob and Stat for Business (stat 21).

Outreach

Creator and Organizer of the Data Science Seminar Series (DS3). This seminar series has hosted data scientists working for professional sports teams, political consulting firms, and in health technology. The talks are public and should be accessible to anyone interested in data science. Homepage: `http://stat.wisc.edu/~karlrohe/ds3`

Creator of `murmuration.wisc.edu`. This is a website which updates everyday to characterize how different twitter "flocks" are processing and discussing the events of the day.

Professional Service

Chair for the 18th New Researchers conference–sponsored by IMS, NSF, ONR and Google–in Madison WI, July 2016.

NSF review panelist.

Ad hoc reviewer: Annals of Statistics, Proceedings of the National Academy of Sciences, Statistical Analysis and Data Mining, Journal of Computational and Graphical Statistics, Political Analysis, Statistica Sinica, Biometrika, Journal of Multivariate Analysis, Neural Information Processing Systems (NIPS), Annals of Applied Statistics, Technometrics, COLT, Journal of the American Statistical Association, World Wide Web Conference (WWW), etc.

IMS Committee: New Researchers. This committee seeks to serve the broad community of new researchers in Statistics. The primary activity of this committee is to promote, plan, and execute the New Researchers Conference.