Michael Schweinberger

Department of Statistics, University of Missouri, Columbia

michael.schweinberger@missouri.edu

Positions

July 2021–May 2022 Visiting Assistant Professor, Department of Statistics, University of Missouri, Columbia, USA

July 2013–June 2021 Assistant Professor, Department of Statistics, Rice University, Houston, TX, USA

January–July 2017 Visiting Scholar, Department of Statistics, University of Washington, Seattle, WA, USA

July 2009–June 2013 Research Associate, Department of Statistics, Pennsylvania State University, PA, USA

July 2007–June 2009 Research Associate, Department of Statistics and Center for Statistics and the Social Sciences, University of Washington, Seattle, WA, USA

September–December 2004 Visiting Ph.D. student, Department of Statistics and Center for Statistics and the Social Sciences, University of Washington, Seattle, WA, USA

Education

5/2007 Ph.D.: *Statistical Methods for Studying the Evolution of Networks and Behavior*, University of Groningen, NL; advisor: Tom A.B. Snijders; Ph.D. committee: Ove Frank, Department of Statistics, University of Stockholm, Sweden; Mark S. Handcock, Department of Statistics, University of California, Los Angeles, CA, USA; Herbert J.A. Hoijtink, Department of Methodology and Statistics, University of Utrecht, NL.

8/2002 Doctorandus (undergraduate degree in NL $\sim$ B.A./M.A. in USA), with distinction, University of Groningen, NL. I received the majority of my training in the Department of Statistics and Measurement Theory in the Faculty of Behavioral and Social Sciences at the University of Groningen and wrote my Master's and my Ph.D. thesis in the same department under the supervision of Tom A.B. Snijders. That said, the Department of Statistics and Measurement Theory was not entitled to grant degrees, so I received my undergraduate degree from one of the neighboring departments (sociology).

Research honors

2017 William D. Richards Software Award of the International Network for Social Network Analysis awarded to the core development team of the statistical software packages (R)Siena. I was one of the earliest members of the core development team of Siena (2002–2007) and helped design and build the statistical engine of (R)Siena (likelihood-based inference; uncertainty quantification; score-type goodness-of-fit tests).

2007 Netherlands Organisation for Scientific Research (NWO): NWO award Rubicon-44606029. The Rubicon awards is a young investigator award of the NWO. The NWO is the Dutch equivalent of the National Science Foundation (NSF).

Research awards

2021–2024 **Principal Investigator:** U.S. Department of Defense – Army Research Office (with Co-PI Johan Koskinen, University of Melbourne and Co-PI Pavel N. Krivitsky, University of New South Wales, Sydney): ARO award W911NF-21-1-0335. $650,429. *Covert networks: How to learn as much as possible about the structure of a network from sampled subnetworks.*

2018–2021 **Sole Principal Investigator:** National Science Foundation (NSF), Division of Mathematical Sciences (DMS), Statistics: NSF award DMS-1812119. $150,000. *Statistical inference for networks with complex topological structures.*

2015–2019 **Sole Principal Investigator:** National Science Foundation (NSF), Division of Mathematical Sciences (DMS), Statistics: NSF award DMS-1513644. $200,001. *Next-generation random graph models.*

2007–2009 **Sole Principal Investigator:** Netherlands Organisation for Scientific Research (NWO): NWO award Rubicon-44606029. $88,759 (EUR 65,520). *Longitudinal network and behavior data: Markov models and latent variables.* The NWO is the Dutch equivalent of the National Science Foundation (NSF).

2006–2006 **Sole Principal Investigator:** Award from Foundation ProGAMMA, Groningen, NL. *Longitudinal network and behavior data: Markov models.*

2018–2019 **Consultant:** NIH / NIMH award 1R01MH100021 *YMAP: Young Men's Affiliation Project of HIV risk and prevention venue.*

2017–2019 **Consultant:** NIH / NIGMS award 1R21GM113694: *iMAN: integrated Molecular & Affiliation Network analysis of HIV transmission.*

Research awards: pending

Co-Principal Investigator: National Science Foundation (NSF), Methodology, Measurement, and Statistics (MMS) (PI: Minjeong Jeon, University of California, Los Angeles): *Supporting instruction and student learning in disadvantaged subpopulations through interaction maps.*

Travel awards

2009 **Travel award** by the University College Dublin, Ireland to attend the workshop on Statistical Methods for the Analysis of Network Data in Practice, University College Dublin, Ireland.

2008 **Travel award** by the Center for Statistics and the Social Sciences, University of Washington, Seattle, WA, USA to attend the International Sunbelt Social Networks Conference, St. Pete Beach, FL, USA.

2004 **Travel award** by the European Union to attend the World Bernoulli Congress and Annual Meeting of the Institute of Mathematical Statistics, Barcelona, Spain.

Submitted papers

Students funded by me are indicated by * and other students are indicated by **. Stewart* is tenure-track Assistant Professor, Department of Statistics, Florida State University. Babkin* is Senior Data & Applied Scientist, Microsoft.

Stewart*, Jonathan R. and **Michael Schweinberger.** Pseudo-likelihood-based M-estimation of random graphs with dependent edges and parameter vectors of increasing dimension. Submitted to *The Annals of Statistics.* Under revision.

Eli*, Sean and **Michael Schweinberger.** *Non-asymptotic model selection for models of network data with parameter vectors of increasing dimension.* Submitted to *Journal of Statistical Planning and Inference.*

Jin, Ick Hoon, Jeon, Minjeong, **Schweinberger, Michael**, Yun, Jonghyun, and Lizhen Lin. Hierarchical network item response modeling for discovering differences between innovation and regular school systems in Korea. Submitted to *Journal of the Royal Statistical Society, Series C (Applied Statistics).* Under revision.

Accepted papers

Students funded by me are indicated by * and other students are indicated by **. Stewart* is tenure-track Assistant Professor, Department of Statistics, Florida State University. Babkin* is Senior Data & Applied Scientist, Microsoft.

Schweinberger, Michael, Bomiriya**, Rashmi P., and Sergii Babkin* (2022). A semiparametric Bayesian approach to epidemics, with application to the spread of the coronavirus MERS in South Korea in 2015. Accepted, *Journal of Nonparametric Statistics,* 1–35.

Park, Jaewoo, Jin, Ick Hoon, and **Michael Schweinberger** (2022). Bayesian model selection for high-dimensional Ising models, with applications to educational data. Accepted, *Computational Statistics & Data Analysis,* 165, 1–20.

Schweinberger, Michael (2021+). Discussion to: "Bayesian graphical models for modern biological applications" by Yang Ni, Veerabhadran Baladandayuthapani, Marina Vannucci, and Francesco C. Stingo. Accepted, *Statistical Methods & Applications (Journal of the Italian Statistical Society),* 1–8. **Invited.**

Published papers

Students funded by me are indicated by * and other students are indicated by **. Stewart* is tenure-track Assistant Professor, Department of Statistics, Florida State University. Babkin* is Senior Data & Applied Scientist, Microsoft.

Jeon, Minjeong, Jin, Ick Hoon, **Schweinberger, Michael,** and Samuel Baugh** (2021). Mapping unobserved item-respondent interactions: A latent space item response model with interaction map. *Psychometrika,* 86, 378–403. **The first three authors made equal contributions. The order of the first three authors is alphabetical.**

Schweinberger, Michael, Krivitsky, Pavel N., Butts, Carter T., and Jonathan R. Stewart* (2020). Exponential-family models of random graphs: Inference in finite, super, and infinite population scenarios. *Statistical Science,* 35, 627–662.

Schweinberger, Michael and Jonathan R. Stewart* (2020). Concentration and consistency results for canonical and curved exponential-family models of random graphs. *The Annals of Statistics,* 48, 374–396.

Schweinberger, Michael (2020). Consistent structure estimation of exponential-family random graph models with block structure. *Bernoulli,* 26, 1205–1233.

Babkin*, Sergii, Stewart*, Jonathan R., Long**, Xiaochen, and **Michael Schweinberger** (2020). Large-scale estimation of random graph models with local dependence. *Computational Statistics & Data Analysis,* 152, 1–19.

Schweinberger, Michael (2020). Statistical inference for continuous-time Markov processes with block structure based on discrete-time network data. *Statistica Neerlandica,* 74, 342–362.

Schweinberger, Michael (2019). Random graphs. *Wiley StatsRef: Statistics Reference Online.* Edited by Brian Everitt, Geert Molenberghs, Walter Piegorsch, Fabrizio Ruggeri, Marie Davidian, and Ron Kenett. **Invited.**

Stewart*, Jonathan R., **Schweinberger, Michael,** Bojanowski, Michal, and Martina Morris (2019). Multilevel networks facilitate statistical inference for curved ERGMs with geometrically weighted terms. *Social Networks,* 59, 98–119.

Schweinberger, Michael and Pamela Luna** (2018). hergm: Hierarchical exponential-family random graph models. *Journal of Statistical Software,* 85, 1–39.

Cao**, Ming, Chen, Yong, Fujimoto, Kayo, and **Michael Schweinberger** (2018). A two-stage working model strategy for network analysis under hierarchical exponential random graph models. *Proceedings of the 2018 IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining,* 290–298. Acceptance rate: 15%.

Schweinberger, Michael, Babkin*, Sergii, and Katherine B. Ensor (2017). High-dimensional multivariate time series with additional structure. *Journal of Computational and Graphical Statistics,* 26, 610–622.

Schweinberger, Michael and Mark S. Handcock (2015). Local dependence in random graph models: Characterization, properties and statistical inference. *Journal of the Royal Statistical Society, Series B (Statistical Methodology),* 77, 647–676.

Schweinberger, Michael, Petrescu-Prahova, Miruna, and Duy Q. Vu** (2014). Disaster response on September 11, 2001 through the lens of statistical network analysis. *Social Networks,* 37, 42–55.

Vu**, Duy Q., Hunter, David R., and **Michael Schweinberger** (2013). Model-based clustering of large networks. *The Annals of Applied Statistics,* 7, 1010–1039.

Hunter, David R., Krivitsky, Pavel N., and **Michael Schweinberger** (2012). Computational statistical methods for social network models. *Journal of Computational and Graphical Statistics,* 21, 856–882. **Invited. The authors made equal contributions. The order of authors is alphabetical.**

Schweinberger, Michael (2012). Statistical modeling of network panel data: goodness-of-fit. *British Journal of Mathematical and Statistical Psychology*, 65, 263–281.

Schweinberger, Michael (2011). Instability, sensitivity, and degeneracy of discrete exponential families. *Journal of the American Statistical Association, Theory & Methods,* 106, 1361–1370.

Lospinoso**, Joshua, **Schweinberger, Michael**, Snijders, Tom A.B., and Ruth Ripley (2011). Assessing and accounting for time heterogeneity in stochastic actor oriented models. *Advances in Data Analysis and Classification*, 5, 147–176.

Snijders, Tom A.B., Koskinen, Johan, and **Michael Schweinberger** (2010). Maximum likelihood estimation for social network dynamics. *The Annals of Applied Statistics*, 4, 567–588.

Schweinberger, Michael and Tom A.B. Snijders (2007). Markov models for digraph panel data: Monte Carlo-based derivative estimation. *Computational Statistics and Data Analysis*, 51, 4465–4483.

Snijders, Tom A.B., Steglich, Christian E.G. and **Michael Schweinberger** (2007). Modeling the co-evolution of networks and behavior. In: Van Montfort, K., Oud, H. and A. Satorra (editors). Longitudinal models in the behavioral and related sciences. Mahwah, NJ: Lawrence Erlbaum.

Schweinberger, Michael and Tom A.B. Snijders (2003). Settings in social networks: A measurement model. *Sociological Methodology*, 33, 307–341.

Other publications

- **Schweinberger, Michael,** Stingo, Francesco C., and Maria P. Vitale (2021). Special issue on statistical analysis of networks. *Statistical Methods & Applications (Journal of the Italian Statistical Society),* 30, 1285–1288.
- **Schweinberger, Michael** (2007). Statistical Methods for Studying the Evolution of Networks and Behavior. Ph.D. thesis, University of Groningen, NL.

Unpublished preprints

Schweinberger, Michael, Krivitsky, Pavel N., and Carter T. Butts (2017). A note on the role of projectivity in likelihood-based inference for random graph models. **The first two authors made equal contributions.**

Vu**, Duy Q. and **Michael Schweinberger** (2014). Model-based clustering of large random graphs with high-dimensional predictors.

Schweinberger, Michael and Tom A.B. Snijders (2007). Random effects models for digraph panel data.

Research software, including manuals

Schweinberger, Michael, Handcock, Mark S., Stewart, Jonathan, Babkin, Sergii, Vu, Duy Q., and Pamela Luna (created, updated, and maintained by Schweinberger since 2010). `R` package hergm. **More than 66,000 downloads from the RStudio CRAN mirror since 2010.**

Stewart, Jonathan R. and Michael Schweinberger (created, updated, and maintained by Stewart since 2018). `R` package mlergm. **More than 18,000 downloads from the RStudio CRAN mirror since 2018.**

Snijders, Tom A.B., Steglich, Christian E.G., Schweinberger, Michael, and Mark Huisman (created, updated, and maintained by Snijders since 2000). Siena. Created in 2000 as software package `Siena` and translated into `R` package `RSiena` in the late 2000s. **More than 153,000 downloads from the RStudio CRAN mirror since 2012.**

Schweinberger, Michael (2003). Ultras. Created by Schweinberger in 2003.

Research presentations

Invited plenary presentations

71. 2015 Plenary Presentation "Statistical Analysis of Network Data" at the Annual Meeting of the German Statistical Society, Hamburg, Germany: Exponential-family random graph models with local dependence.

Other invited presentations

70. 2022 International Symposium on Nonparametric Statistics, Paphos, Cyprus: Generalized β-models with dependent edges capturing brokerage in networks.

69. 2022 Mini-symposium on "High Performance Statistical Computing (HPSC): Challenges and Best Practices" at the SIAM Conference on Parallel Processing for Scientific Computing (PP21), Seattle, WA: Scalable statistical learning from dependent data based on regularized and unregularized decomposable loss functions.

68. 2021 Department of Mathematics, Free University of Amsterdam, NL (Virtual): Scalable statistical learning from dependent, high-dimensional, and structured data.

67. 2021 Faculty of Sciences, University of Konstanz, Germany (Virtual): Scalable statistical learning from dependent, high-dimensional, and structured data.

66. 2021 Faculty of Politics, Law and Economics, University of Konstanz, Germany (Virtual): Statistical learning from high-dimensional data arising in the social and behavioral sciences.

65. 2021 Department of Statistics, Pennsylvania State University: Scalable statistical learning from dependent, high-dimensional, and structured data.

64. 2021 Department of Statistics, University of Missouri, Columbia (Virtual): Learning from dependent, high-dimensional, and structured data: network, spatial, and temporal data.

63. 2021 Joint Statistical Meetings, Seattle, WA (Virtual): Scalable estimation of network models with dependent edges and parameter vectors of increasing dimension based on pseudolikelihood functions.

62. 2021 Statistics Seminar Series, School of Mathematics and Statistics, University of New South Wales, Sydney, Australia (Virtual): Learning from dependent, high-dimensional, and structured data: network, spatial, and temporal data.

61. 2021 Department of Biostatistics and Data Science, University of Texas, School of Public Health, Houston (Virtual): Learning from network data, with applications to the spread of infectious diseases.

60. 2021 School of Computer Science, Carnegie Mellon University (Virtual): Scalable models of social networks and scalable learning from social network data, with theoretical guarantees.

59. 2021 Department of Network and Data Science, Central European University (Virtual): Scalable learning from data about an interconnected and interdependent world.

58. 2021 Department of Statistics, London School of Economics and Political Science, London, UK (Virtual): Scalable statistical learning of models of an network models in single-observation scenarios with $p \to \infty$ parameters, with statistical guarantees.

57. 2021 Mathematics Institute, Leiden University, NL (Virtual): Foundations of learning from network data without independent replications.

56. 2021 Department of Statistics and Actuarial Science, University of Waterloo, Canada (Virtual): Scalable statistical learning of network models in high-dimensional $n = 1$ and $p \to \infty$ scenarios, with statistical guarantees.

55. 2021 Department of Statistics, George Mason University, VA (Virtual): Scalable statistical learning of network models in high-dimensional $n = 1$ and $p \to \infty$ scenarios, with statistical guarantees.

54. 2020 International Conference on Computational and Methodological Statistics (CM-Statistics 2020), London, UK (Virtual): A probabilistic framework for models of dependent network data, with computational advantages and statistical guarantees.

53. 2020 Joint Statistical Meetings, Philadelphia, PA (Virtual): Statistical models of brokerage in social networks: models, methods, and theory. Presented by Jonathan Stewart.

52. 2020 Joint Statistical Meetings, Philadelphia, PA (Virtual): Generalized β-models with dependent edges capturing brokerage.

51. 2019 Department of Mathematics & Statistics, Old Dominion University: High-dimensional multivariate time series with spatial structure.

50. 2018 Social Networks Lab, ETH Zürich, Switzerland: How to reason, and how not to reason, about a connected world.

49. 2018 International Conference on Computational and Methodological Statistics (CM-Statistics 2018), Pisa, Italy: Finite-graph superpopulation inference for random graphs with complex topological structures.

48. 2018 Department of Applied and Computational Mathematics and Statistics, University of Notre Dame: High-dimensional multivariate time series with spatial structure.

47. 2018 Computational and Integrative Biomedical Research Center, Baylor College of Medicine: High-dimensional multivariate time series with spatial structure.

46. 2018 School of Mathematics and Applied Statistics, University of Wollongong, Australia: High-dimensional multivariate time series with spatial structure.

45. 2018 Alan Turing Institute, London, UK: Concentration and consistency results for random graph models with transitivity.

44. 2018 Department of Statistics, Rice University: How to reason, and how not to reason, about a connected world.

43. 2017 International Conference on Computational and Methodological Statistics (CM-Statistics 2017), London, UK: Consistent maximum likelihood estimation of random graph models with local dependence and growing neighborhoods.

42. 2017 Department of Statistics, University of Washington, Seattle: Statistical inference for exponential-family random graph models with additional structure: theoretical and computational advances.

41. 2016 International Conference on Computational and Methodological Statistics (CM-Statistics 2016), London, UK: High-dimensional multivariate time series with additional structure.

40. 2016 ICSA Applied Statistics Symposium, Atlanta, GA: Consistent estimation of curved exponential-family random graph models with local dependence and growing neighborhoods.

39. 2016 Institute of Statistics, University of Munich, Germany: Consistent estimation of curved exponential-family random graph models with local dependence and growing neighborhoods.

38. 2016 Department of Mathematics, University of Houston: The Ising model of network science: exponential-family random graph models with local dependence.

37. 2016 Department of Statistics, Rice University: Dependent and high-dimensional data: random graphs and graphical models.

36. 2015 Department of Applied and Computational Mathematics and Statistics, University of Notre Dame: Exponential-family random graph models with local dependence.

35. 2015 ICSA Applied Statistics Symposium and 13th Graybill Conference, Colorado State University: Exponential-family random graph models with local dependence.

34. 2015 UC Davis Statistical Sciences Symposium "Network Data: Information and Sciences," University of California, Davis: Exponential-family random graph models with local dependence.

33. 2015 Computational and Integrative Biomedical Research Center, Baylor College of Medicine: High-dimensional exponential-family models of networks with applications: challenges and opportunities.

32. 2015 Department of Statistics, University of South Carolina: High-dimensional exponential-family random graph models.

31. 2014 Second Conference of the International Society of NonParametric Statistics, Cadiz, Spain: A non-parametric approach to random graph models with local dependence.

30. 2014 Southern Regional Council on Statistics Summer Research Conference, Galveston, TX: Local dependence in random graphs: Characterization, Properties, and Statistical Inference.

29. 2014 Conference of Texas Statisticians, Dallas, TX: Model-based clustering of large networks.

28. 2014 INFORMS Optimization Society Conference, Houston, TX: Model-based clustering of large networks using variational GEM and MM algorithms.

27. 2014 Department of Biostatistics, University of Texas MD Anderson Cancer Center, Houston, Texas: A semiparametric Bayesian approach to networks-based stochastic epidemics with likelihood-ignorable incomplete-data mechanisms.

26. 2013 Department of Statistics, London School of Economics and Political Science: Discrete exponential-family models of networks: Scaling up.

25. 2013 School of Statistics and Department of Sociology, University of Minnesota: Second-generation exponential-family models of networks: Scaling up.

24. 2013 Department of Statistics, Texas A&M University: Second-generation exponential-family models of networks: Scaling up.

23. 2013 School of Mathematical & Statistical Sciences, Arizona State University: Second-generation exponential-family models of networks: Scaling up.

22. 2013 Department of Statistics, Rice University: Second-generation exponential-family models of networks: Scaling up.

21. 2013 Department of Statistics, West Virginia University: Second-generation exponential-family models of networks: Scaling up.

20. 2013 Department of Statistics, Ohio State University: Second-generation exponential-family models of networks: Scaling up.

19. 2013 University of Manchester, UK: Statistical Models and Methods for Social Networks.

18. 2012 Department of Statistics and Centre for Complexity, University of Warwick, UK: Discrete exponential-family models of networks: local versus global dependence.

17. 2012 Department of Biostatistics and Center for Statistical Sciences, Brown University, RI, USA: Latent structure models of networks with applications in the social sciences and health sciences.

16. 2012 Measurement, Evaluation, and Statistics Program, Teachers College, Columbia University, NY, USA: Latent structure models of social networks with applications in education, social psychology, sociology, and the health sciences.

15. 2011 Methodology Center, Pennsylvania State University, PA, USA: Instability, sensitivity, and degeneracy of discrete exponential families.

14. 2009 Summer Institute in Statistics and Modeling in Infectious Diseases, University of Washington, Seattle, WA, USA: Statistical inference for exponential random graph models with special emphasis on `R` package `statnet`.

13. 2009 Center for Statistics and the Social Sciences, University of Washington, Seattle, WA, USA: Toward a solution of the near-degeneracy problem of exponential-family random graph models.

12. 2007 Research Group of Quantitative Psychology and Individual Differences, K.U. Leuven, Belgium: Random effects models for network panel data.

11. 2006 Workshop on Simulation-based Statistical Inference for the Evolution of Social Networks, University of Groningen, NL: Network and behavior evolution: Introduction to likelihood-based estimation methods.

10. 2006 Workshop on Simulation-based Statistical Inference for the Evolution of Social Networks, University of Groningen, NL: Network and behavior evolution: goodness-of-fit.

9. 2006 Workshop on Simulation-based Statistical Inference for the Evolution of Social Networks, University of Groningen, NL: Random effects modeling for dynamics of networks and behavior.

8. 2005 Workshop on Simulation-based Statistical Inference for the Evolution of Social Networks, University of Groningen, NL: Network and behavior evolution: goodness-of-fit.

7. 2004 Center for Studies for Demography and Ecology, University of Washington, Seattle, WA: Digraph dynamics with heterogeneous vertices.

6. 2004 Working group of Duncan Watts, Columbia University, NY, USA: Network dynamics with heterogeneous actors.

5. 2004 Satellite Symposium: Dynamics of Networks and Behavior, International Sunbelt Social Networks Conference, Portoroz, Slovenia: Network and behavior evolution: goodness-of-fit.

4. 2003 Workshop: Social Network Analysis and its Applications, Indian Statistical Institute, Kolkata, India: Simulation-based statistical inference for evolution of social networks.

3. 2003 Workshop: Social Network Analysis and its Applications, Indian Statistical Institute, Kolkata, India: Statistical modeling of network dynamics given panel data: goodness-of-fit.

2. 2003 Workshop: Social Network Analysis and its Applications, Indian Statistical Institute, Kolkata, India: Settings in social networks: A measurement model.

1. 2003 Center for Statistics and the Social Sciences, University of Washington, Seattle, WA, USA: Settings in social networks.

Contributed presentations

28. 2021 International Sunbelt Social Network Conference, Washington, D.C. (Virtual): Scalable estimation of network models, with statistical guarantees. Presented by Jonathan Stewart.

27. 2020 International Sunbelt Social Network Conference, Paris, France (Virtual): What can we learn about ERGMs?

26. 2019 International Sunbelt Social Network Conference, Montreal, Canada: Multilevel ERGMs with overlapping subsets of nodes: models, methods, and mathematical-statistical theory. Presented by Jonathan Stewart.

25. 2019 International Sunbelt Social Network Conference, Montreal, Canada: Generalizability and subgraph-to-graph estimation of ERGMs with multilevel structure.

24. 2018 The IEEE/ACM International Conference on Social Networks Analysis and Mining, Barcelona, Spain: A two-stage working model strategy for network analysis under Hierarchical Exponential Random Graph Models.

23. 2018 International Sunbelt Social Network Conference, Utrecht, NL: Finite-graph concentration and consistency results for ERGMs with transitive edge terms, GWESP terms, and other sensible model terms.

22. 2018 International Sunbelt Social Network Conference, Utrecht, NL: Multilevel network data facilitate statistical inference for curved ERGMs with geometrically weighted terms. Presented by Michal Bojanwoski.

21. 2016 Rice Data Science Conference, Houston, TX: High-dimensional graphical models and random graphs. Poster presentation.

20. 2016 International Sunbelt Social Network Conference, Newport Beach, CA, USA: Consistent estimation of multilevel exponential-family random graph models.

19. 2015 Joint Statistical Meetings, Seattle, WA, USA: Large-scale estimation of high-dimensional multivariate time series with local dependence. Presented by Sergii Babkin.

18. 2015 International Sunbelt Social Network Conference, Brighton, UK: Consistent estimation of the dependence structure of exponential-family random graph models given a single observation of a large random graph.

17. 2014 Joint Statistical Meetings, Boston, MA, USA: Local Dependence in Random Graph Models: Characterization, Properties, and Statistical Inference.

16. 2014 International Sunbelt Social Network Conference, St. Pete Beach, FL, USA: A Central Limit Theorem for Exponential-Family Random Graph Models with Local Dependence.

15. 2012 NIPS Workshop: Algorithmic and Statistical Approaches for Large Social Network Data Sets, Lake Tahoe, NV, USA: Learning stochastic processes governing the spread of infectious disease through contact networks given incomplete data.

14. 2012 International Sunbelt Social Network Conference, Los Angeles, CA, USA: Hierarchical exponential-family random graph models: local versus global dependence.

13. 2011 International Sunbelt Social Networks Conference, St. Pete Beach, FL, USA: Viable and non-viable models of cross-sectional and longitudinal network data.

12. 2010: International Sunbelt Social Networks Conference, Riva del Garda, Italy: Instability and near-degeneracy of exponential-family random graph models.

11. 2010: International Sunbelt Social Networks Conference, Riva del Garda, Italy: Disaster networks.

10. 2009 Workshop: Statistical Methods for the Analysis of Network Data in Practice, University College Dublin, Ireland: Hierarchical extensions of exponentially-parameterized random graph models.

9. 2009 International Sunbelt Social Network Conference, San Diego, CA, USA: Toward a solution of the near-degeneracy problem of exponential-family random graph models.

8. 2008 International Sunbelt Social Networks Conference, St. Pete Beach, FL, USA: Discrete-time versus continuous-time Markov models.

7. 2005 Annual Meeting of the Psychometric Society, Tilburg, NL: Random effects models for digraph panel data.

6. 2005 International Multilevel Conference, Amsterdam, NL: Random effects models for digraph panel data.

5. 2005 International Sunbelt Social Network Conference, Los Angeles, CA, USA: Network dynamics with heterogeneous actors: developments.

4. 2004 World Bernoulli Congress and Annual Meeting of the Institute of Mathematical Statistics, Barcelona, Spain: Digraph dynamics with heterogeneous vertices.

3. 2004 International Sunbelt Social Network Conference, Portoroz, Slovenia: Network dynamics with heterogeneous actors.

2. 2003 International Sunbelt Social Networks Conference, Cancun, Mexico: Settings in social networks.

1. 2002 Lilnet Conference, Lille, France: Settings in social networks.

Workshops: participated

10. 2021 Online Teaching Certification Seminar, University of Missouri, Columbia

9. 2019 Workshop: Using Models to Estimate Hog Production, Committee on National Statistics, National Academies of Sciences, Engineering and Medicine (NASEM), Washington, D.C. **Invited discussant.**

8. 2013 Workshop: Exponential Random Network Models, American Institute of Mathematics, Palo Alto, CA, USA, organized by Sourav Chatterjee, Persi Diaconis, Susan Holmes, and Martina Morris. **Invited participant.**

7. 2012 NIPS Workshop: Algorithmic and Statistical Approaches for Large Social Network Data Sets, Lake Tahoe, NV, USA. **Contributed poster.**

6. 2009 Workshop: Statistical Methods for the Analysis of Network Data in Practice, University College Dublin, Ireland. **Travel award. Contributed presentation.**

5. 2009 Summer Institute in Statistics and Modeling in Infectious Diseases, University of Washington, Seattle, WA, USA. **Invited presentation.**

4. 2006 Workshop on Simulation-based Statistical Inference for the Evolution of Social Networks, University of Groningen, NL. **Invited presentations.**

3. 2005 Workshop on Simulation-based Statistical Inference for the Evolution of Social Networks, University of Groningen, NL. **Invited presentations.**

2. 2004 Workshop: Bayesian Model Selection, University of Utrecht, NL

1. 2003 Workshop: Social Network Analysis and its Applications, Indian Statistical Institute, Kolkata, India. **Invited presentations and panelist.**

Academic teaching

Courses developed

Stat 648: Graphical Models and Networks (Rice University) and *Stat 9100: Statistical Learning with Networks* (University of Missouri, Columbia). An introduction to three popular streams of research in statistics, machine learning, and artificial intelligence: low- and high-dimensional graphs representing data structure, model structure, and mathematical operations, e.g., neural networks and deep learning.

Courses taught

Student-based teaching evaluations, where available, refer to the effectiveness of the instructor according to students. Peer-reviewed teaching evaluations are available at the Pennsylvania State University. Most courses in 2020 and 2021 were taught partially or fully online due to the COVID-19 pandemic.

Stat 4710 + Stat 7710: Introduction to Mathematical Statistics. Target group: undergraduate students in engineering, computer science, statistics and other areas at the University of Missouri, Columbia. Contents: Introduction to the theory of probability and statistics using concepts and methods of calculus. Instructor: fall 2021, two sections of Stat 4710 + Stat 7710 with separate lectures (both in-person).

Stat 648: Graphical Models and Networks. Target group: graduate students in statistics and data science at Rice University. Contents: An introduction to three popular streams of research in statistics, machine learning, and artificial intelligence: low- and high-dimensional graphs representing data structure, model structure, and mathematical operations. Instructor: spring 2014, spring 2015, spring 2016, fall 2017, fall 2018, spring 2020, spring 2021. **Student evaluations since 2015 from 1 ("outstanding") to 5 ("poor"):** 1.00 (2021: fully online), 1.50 (2020: partially online), 1.12 (2018), 1.25 (2017), 1.38 (2016), 1.46 (2015).

Stat 419 + Stat 519: Statistical Inference. Target group: senior undergraduate and graduate students in statistics at Rice University. Contents: Introduction to statistical inference based on Casella and Berger's *Statistical inference.* Instructor: spring 2018, spring 2019, spring 2020. **Student evaluations since 2015 from 1 ("outstanding") to 5 ("poor"):** 1.25 (2020: partially online), 1.36 (2019), 1.60 (2018).

Stat 532: Foundations of Statistical Inference I. Target group: graduate students in statistics at Rice University. Contents: Measure-theoretic statistical theory based on the first chapters of Shao's *Mathematical Statistics*, including an introduction to measure-theoretic probability and statistics. Instructor: fall 2019. **Student evaluations since 2015 from 1 ("outstanding") to 5 ("poor"):** 1.61 (2019).

Stat 310 + Econ 307: Probability and Statistics. Target group: undergraduate students in engineering, computer science, statistics and other areas at Rice University. Instructor: fall 2013, fall 2014, fall 2015, spring 2016, fall 2016. **Student evaluations since 2015 from 1 ("outstanding") to 5 ("poor"):** 2.73 (fall 2016), 2.17 (spring 2016), 2.61 (fall 2015).

Stat 401: Experimental Methods. An Introduction to Probability Theory and Statistics with `R`. Target group: undergraduate students in statistics and data science at the Pennsylvania State University, PA. Instructor: summer 2012, fall 2012.

An Introduction to Probability Theory. Target group: undergraduate students in artificial intelligence (AI), co-taught with Anne Boomsma, at the University of Groningen, NL. Instructor: spring 2004.

Multivariate Statistics. Target group: undergraduate students in the social sciences at the University of Groningen, NL. Teaching assistant: spring 2004, spring 2005, fall 2005.

Academic advising

Chair of Ph.D. committee

2015–2020 Sole advisor of Jonathan R. Stewart, graduated May 2020. **First placement: tenure-track Assistant Professor, Department of Statistics, Florida State University.** Thesis: *Consistent estimation of high-dimensional random graph models with dependent edge variables.* Department of Statistics, Rice University. Winner of the inaugural James R. Thompson graduate student award.

2014–2017 Sole advisor of Sergii Babkin, graduated May 2017. **First placement: Microsoft, Seattle metropolitan area.** Thesis: *High-dimensional and dependent data with additional structure.* Department of Statistics, Rice University.

Member of Ph.D. committee

2015–2021 Ph.D. committee of David Wallace-Bradley, Department of Statistics, Rice University (chair: Marek Kimmel, Rice University)

2017–2020 Ph.D. committee of Siyi Chen, Department of Statistics, Rice University (graduation: fall 2020; chair: Marek Kimmel, Rice University)

2018–2020 Ph.D. committee of Fengdan Ye, Department of Physics, Rice University (graduation: fall 2020; chair: Maria Pascual, Houston Methodist)

2017–2018 Ph.D. committee of Ryan Warnick, Department of Statistics, Rice University (graduation: fall 2018; chair: Marina Vannucci, Rice University)

2016–2017 Ph.D. committee of Ming Cao, Department of Biostatistics, University of Texas, Health Science Center, Houston (graduation: fall 2017; chair: Wenyaw Chan, University of Texas, School of Public Health, Houston)

2016–2017 Ph.D. committee of Yulia Baker, Department of Statistics, Rice University (graduation: fall 2017; chair: Genevera Allen, Rice University)

2015–2017 Ph.D. committee of Frederick Campbell, Department of Statistics, Rice University (graduation: fall 2017; chair: Genevera Allen, Rice University)

2015–2016 Ph.D. committee of Yue Hu, Department of Statistics, Rice University (graduation: spring 2016; chair: Genevera Allen, Rice University)

2014–2015 Ph.D. committee of Yang Ni, Department of Statistics, Rice University (graduation: fall 2015; chairs: Francesco Stingo and Veerabhadran Baladandayuthapani, University of Texas, MD Anderson Cancer Center; note: Francesco Stingo moved to the University of Florence, Italy and Veerabhadran Baladandayuthapani moved to the University of Michigan)

2014–2015 Ph.D. committee of Linlin Zhang, Department of Statistics, Rice University (graduation: spring 2015; chair: Marina Vannucci, Rice University)

2014–2017 Ph.D. committee of Quan Zhou, Department of Molecular and Human Genetics, Baylor College of Medicine (graduation: spring 2017; chair: Yongtao Guan, Baylor College of Medicine; note: Yongtao Guan moved to Duke University)

Additional advising of graduate students

2020–2021 Advisor of Sean Eli, Department of Statistics, Rice University

2019–2020 Advisor of Xiaochen Long, Department of Statistics, Rice University

2014 Advisor of summer project of Pamela Luna, Department of Statistics, Rice University. Research Associate, Baylor College of Medicine

Advising of undergraduate students

2015 Advisor of summer project, Shan Zhong, Department of Statistics, Rice University

2014 Advisor of Stat 450 senior design project, Sarah Percival, Rice University.

Professional memberships

American Statistical Association

Institute of Mathematical Statistics

International Network for Social Network Analysis

Panelist and reviewer of grant proposals

- 2021 **Panelist:** National Science Foundation (NSF)
- 2017 **Panelist:** National Science Foundation (NSF)
- 2020 **Reviewer of grant proposal:** Netherlands Organisation for Scientific Research (NWO), the Dutch equivalent of the National Science Foundation (NSF)
- 2016 **Reviewer of grant proposal:** National Science Foundation (NSF)
- 2015 **Reviewer of grant proposal:** European Research Council (ERC), the European equivalent of the National Science Foundation (NSF)

Other professional activities

- 2019 **Discussant:** Workshop "Using Models to Estimate Hog Production" organized by the Committee on National Statistics, National Academies of Sciences, Engineering and Medicine (NASEM), Washington, D.C.
- 2019 **Reviewer of workshop proposal:** Banff International Research Station (BIRS) for Mathematical Innovation and Discovery, Banff, Canada
- 2019 **Member of Scientific Program Committee:** International Conference on Computational and Methodological Statistics (CMStatistics 2019), London, UK
- 2019 and 2020 **Session chair:** International Conference on Computational and Methodological Statistics (CMStatistics 2019 and 2020), London, UK

Editorial service

- 2021–present **Associate Editor:** Computational Statistics & Data Analysis
- 2016–present **Section Editor:** Journal of Statistical Software
- 2020–2021 **Guest Editor:** Special issue "Statistical Analysis of Networks" by Statistical Methods & Applications (Journal of the Italian Statistical Society)

Service: reviewer of research papers

Served as reviewer of more than 100 journal submissions for 37 leading journals in theoretical, computational, and applied statistics, machine learning, and network science:

- Annals of Applied Statistics
- Annals of Statistics
- Bayesian Analysis
- Bernoulli
- Biometrika
- Computational Statistics
- Computational Statistics and Data Analysis
- Electronic Journal of Statistics
- Journal of the American Statistical Association
- Journal of Business & Economic Statistics
- Journal of Computational and Graphical Statistics
- Journal of Machine Learning Research
- Journal of Mathematical Sociology
- Journal of Multivariate Analysis
- Journal of Official Statistics
- Journal of the Royal Statistical Society, Series A
- Journal of the Royal Statistical Society, Series B
- Journal of the Royal Statistical Society, Series C
- Journal of Statistical Planning and Inference
- Journal of Statistical Software
- Machine Learning
- Metrika
- Proceedings of the National Academy of Sciences (PNAS)

- Psychometrika
- Science
- Scientific Reviews
- Social Networks
- Social Science Research
- Sociological Methods and Research
- Spatial Statistics
- Statistical Analysis and Data Mining
- Statistics and Computing
- Statistics and Its Interface
- Statistical Science
- Statistical Methodology
- Statistica Sinica
- Wiley Interdisciplinary Reviews: Computational Statistics

Service: university

- Spring 2018 Temporary representative for Senator Marek Kimmel, Faculty Senate, Rice University
- 2015-2016 Faculty Information System replacement project, Rice University

Service: department

- 2019–2020 Coordinator and Examiner of the Ph.D. Qualifying Exam in Statistics (with Marek Kimmel in Probability), Department of Statistics, Rice University
- 2019–2020 Graduate Curriculum Review Committee, Department of Statistics, Rice University
- 2019–2020 Graduate Review Committee, Department of Statistics, Rice University

- 2018–2019 Coordinator and Examiner of the Ph.D. Qualifying Exam in Statistics (with Marek Kimmel in Probability), Department of Statistics, Rice University
- 2018–2019 Graduate Review Committee, Department of Statistics, Rice University
- 2017–2018 Coordinator and Examiner of the Ph.D. Qualifying Exam in Statistics (with Marek Kimmel in Probability), Department of Statistics, Rice University
- 2017–2018 Ph.D. Admissions Committee, Department of Statistics, Rice University
- 2015–2016 Faculty Search Committee, Department of Statistics, Rice University
- 2015–2016 Graduate Review Committee, Department of Statistics, Rice University
- 2014–2015 Graduate Review Committee, Department of Statistics, Rice University
- 2014–2015 Ph.D. Admissions Committee, Department of Statistics, Rice University
- 2013–2014 Faculty Search Committee, Department of Statistics, Rice University
- 2013–2014 Ph.D. Admissions Committee, Department of Statistics, Rice University
- 2014 Jury, Engineering Design Showcase and Poster Competition, Brown School of Engineering, Rice University: Senior Design Projects in Statistics
- 2013 Jury, Poster Competition, 4th Eubank Conference on Real World Markets: Creating Growth. Entrepreneurship and Analytics; Rice University