

Bailey Kathryn Fosdick

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Academic Positions

Assistant Professor 08/2014 - present
Statistics Department, Colorado State University - Fort Collins, CO

Postdoctoral Fellow 08/2013 - 07/2014
Statistical and Applied Mathematical Sciences Institute - Research Triangle Park, NC
Department of Statistical Science, Duke University - Durham, NC

Education

Ph.D. in Statistics 2013
University of Washington - Seattle, WA
Dissertation: Modeling Heterogeneity within and between Matrices and Arrays
Advisor: Peter Hoff

B.S. in Mathematics 2008
Colorado State University - Fort Collins, CO
Concentration: General Mathematics and Statistics, Minor: Computer Science

Attended 2004 - 2005
Colorado School of Mines - Golden, CO

Publications (* denotes equal contribution; † denotes student author)

Publications: Peer Reviewed

1. Fosdick, B.K., De Yoreo, M., and Reiter, J.P., (2016) "Categorical data fusion using auxiliary information." *Annals of Applied Statistics*. 10(4):1907-1929.
2. Scharf, H.R.†, Hooten, M.B., Fosdick, B.K., Johnson D.S., London, J.M., and Durban, J.W., (2016) "Dynamic social networks based on movement." *Annals of Applied Statistics* 10(4):2182-2202.
3. Ellis, J, Fosdick, B.K., and Rasmussen, C., (2016) "Women 1.5 times more likely to leave STEM pipeline after calculus compared to men: Lack of mathematical confidence a potential culprit." *PLoS ONE*. 11(7): e0157447. (doi)10.1371/journal.pone.0157447.
4. Levin, I., Zonana, D., Fosdick, B.K., Song, S.J., Knight, R and Safran, R, (2016) "Stress response, gut microbial diversity, and sexual signals correlate with social interactions." *Biology Letters*. 12(6): (doi)10.1098/rsbl.2016.0352.
5. Fosdick, B.K. and Hoff, P.D., (2015) "Testing and jointly modeling dependencies between a network and nodal attributes." *Journal of the American Statistical Association*. 110(511):1047-1056.
6. Gerland, P., Raftery, A.E., Sevcikova, H., Li, N., Gu, D., Spoorenber, T., Alkema, L., Fosdick, B.K., Chunn, J., Lalic, N., Bay, G., Buettner, T., Heilig, G., Wilmoth, J. (2014) "World population stabilization unlikely this century." *Science*. 346 (6206), 234-237.
7. Fosdick, B.K. and Perlman, M.D., (2014) "Variance-stabilizing and confidence-stabilizing transformations for the normal correlation coefficient with known variances." *Communications in Statistics - Simulation and Computation*. Published online. (doi) 10.1080/03610918.2014.882948
8. Fosdick, B.K. and Raftery, A.E., (2014) "Regional probabilistic fertility forecasting by modeling between-country correlations." *Demographic Research*. 30, 1011-1034.

9. Fosdick, B.K. and Hoff, P.D., (2014) “Separable factor analysis with applications to mortality data.” *Annals of Applied Statistics*. 8(1), 120-147.
10. Hoff, P.D., Fosdick, B.K., Volfovsky, A., and Stovel, K., (2013) “Likelihoods for fixed rank nomination networks.” *Network Science*. 1, 253-277.
11. Fosdick, B.K. and Perlman, M.D., (2013) “Covariate and Newton-Raphson adjustments for a normal correlation coefficient when the variances are known.” *Statistics and Probability Letters*. 83(12), 2627-2633.
12. Fosdick, B.K. and Raftery, A.E., (2012) “Estimating the correlation in bivariate normal data with known variances and small sample sizes.” *The American Statistician*. 66(1), 34-41.
13. von Fischer, J.C., Rhew, R.C., Ames, G.M., Fosdick, B.K., von Fischer, P. E. (2010) “Vegetation height and other controls of spatial variability in methane emissions from the Arctic coastal tundra at Barrow, Alaska.” *Journal of Geophysical Research*. 115, G00103.
14. Draper (Fosdick), B., Marcin, D., Margolskee, A., Murden, R., Attarian, A., Evans, M.V., and Yokley, K.A., (2009) “Feasibility of metabolic parameter estimation in pharmacokinetic models of carbon tetrachloride exposure in rats.” *Toxicological & Environmental Chemistry*, 91(3), 521-546.

Publications: Under Review / Preprints

1. Fosdick, B.K.*, Larremore, D.B.*, Nishimura, J.*, and Ugander, J.*, “Configuring random graph models with fixed degree sequences.” arXiv:1608.00607. *Submitted to SIAM Review*.
2. Fosdick, B.K., McCormick, T.H., Murphy, T.B., Ng, T.L.J.[†], and Westling, T.[†], “Multiresolution network models.” arXiv:1608.07618. *Submitted to the Journal of Computational and Graphical Statistics*.
3. Lee, W.[†], Fosdick, B.K., and McCormick, T.H., “Inferring social structure from continuous-time interaction data.” arXiv:1609.02629. *Submitted to Applied Stochastic Models in Business and Industry*.
4. Ellis, J., Johnson, E., and Fosdick, B.K., “Feeling the squeeze: Factors contributing to experiencing a lack of time in college calculus.” *To be submitted to Learning and Instruction*.
5. Marrs, F.W.*[†], Fosdick, B.K.*, and McCormick, T.H.*, “Standard errors for regression on relational data with exchangeable errors.” arXiv:1701.05530. *To be submitted to the Journal of the American Statistical Association*.

Publications: Other (e.g. magazine articles, conference proceedings)

1. Ellis, J., Johnson, E., and Fosdick, B.K., (2016) “Feeling the squeeze: Factors contributing to experiencing a lack of time in college calculus.” *38th Annual Conference of the North American Chapter of the International Group for the Psychology of Mathematics Education*, Brief Research Report.
2. Huzurbazar, S., Cisewski, J., Fosdick, B.K., and Wang, X., (2014) “Opportunities at SAMSI and NISS.” *Chance*.

Software

1. Hoff, P.D., Fosdick, B.K., Volfovsky, A. and Stovel, K. (2012 -). “amen: Additive and multiplicative effects modeling of networks and relational data”. *R package* <http://CRAN.R-project.org/package=amen>

Grants and Contracts

Current Grants and Contracts:

National Science Foundation (Division of Social and Economic Sciences)

The Bipartite Temporal Event Network (BiTEN) Model, Co-PI (PI: S.J. Cranmer)
06/01/2015 - 05/30/2017

\$224,554
(CSU: \$104,397)

Completed Grants and Contracts:

American Mathematical Society

Collaborative meeting with researchers from the American Mathematical Society \$2,250
 Mathematics Research Community on Network Science, 10/2014.

Presentations**Invited Talks:**

1. Categorical Data Fusion with Auxiliary Information; *NIPS 2016 Practical Bayesian Nonparametrics Workshop, Barcelona, Spain; December 2016.*
2. Multiple Questions on Multiple Scales: Multiresolution Social Network Models; *Conference on Statistical Learning and Data Science, University of North Carolina, Chapel Hill, NC; June 2016.*
3. Multiple Questions on Multiple Scales: Multiresolution Social Network Models; *International Society for Bayesian Analysis 2016 World Meeting, Sardinia, Italy; June 2016.*
4. Multiple Questions on Multiple Scales: Multiresolution Social Network Models; *Joint Statistical Meetings 2015, Seattle, WA; August 2015.*
5. Relaxing Conditional Independence Assumptions in Data Fusion; *International Society for Business and Industrial Statistics 2014 and Statistical Learning and Data Mining Joint Meeting, Durham, NC; June 2014.*
6. Relating Social Networks and Nodal Behaviors; *Western North American Region of The International Biometric Society Conference, Fort Collins, CO; June 2012.*

Departmental Seminars:

1. Johns Hopkins University, Department of Biostatistics, March 2017.
2. Brigham Young University, Department of Statistics, March 2017.
3. Carnegie Mellon University, Department of Statistics, November 2016.
4. University of San Francisco, Department of Mathematics & Statistics, April 2016.
5. Columbia University, Statistics Department, Student Seminar Series, March 2016.
6. University of Minnesota, School of Statistics, March 2016.
7. Rice University, Department of Statistics, November 2015.
8. Colorado State University, Department of Computer Science, September 2015.
9. Colorado State University, Department of Statistics, March 2015.
10. University of Massachusetts Amherst, Department of Mathematics and Statistics, February 2013.
11. Yale University, Department of Statistics, February 2013.
12. University of California, Santa Cruz, Department of Applied Mathematics and Statistics, February 2013.
13. Colorado State University, Department of Statistics, January 2013.
14. University of Texas at Austin, McCombs School of Business, January 2013.
15. Montana State University, Department of Mathematical Sciences, January 2013.

Contributed Talks:

1. Quantifying Uncertainty in Network Regression; *SIAM Workshop on Network Science, Boston, MA; July 2016.*
2. Multiresolution models for networks; *Inference on networks: Algorithms, Phase Transitions, New Models and New Data Workshop, Santa Fe Institute, Santa Fe, NM; December 2015.*

3. Temporal Latent Space Network Models for Dynamic Grooming Interactions in Baboon Troops; *SAMSI Mathematical and Statistical Ecology Transition Workshop, Research Triangle Park, NC; May 2015.*
4. Temporal Latent Space Network Models for Dynamic Grooming Interactions in Baboon Troops; *Joint Statistical Meeting 2014, Boston, MA; August 2014.*
5. Statistical Inference with Topological Features; *SAMSI Low-dimensional Structure in High-Dimensional System Transition Workshop, Research Triangle Park, NC; May 2014.*
6. Relaxing Conditional Independence Assumptions in Data Fusion; *SAMSI Computational Methods in Social Sciences Transition Workshop, Research Triangle Park, NC; May 2014.*
7. Temporal Latent Space Network Models for Dynamic Grooming Interactions in Baboon Troops; *Statistical and Applied Mathematical Sciences Institute Internal Seminar (SAMSI), Research Triangle Park, NC; May 2014.*
8. Temporal Latent Space Network Models for Dynamic Grooming Interactions in Baboon Troops; *Duke Network Analysis Center (DNAC), Durham, NC; April 2014.*
9. Leveraging Spatial Information in Network Modeling, with Applications to Bicycle Sharing Data; *Statistical and Applied Mathematical Sciences Institute Internal Seminar (SAMSI), Research Triangle Park, NC; November 2013.*
10. Testing and Jointly Modeling Dependencies Between a Network and Nodal Attributes; *Joint Statistical Meetings 2013, Montreal, Canada; August 2013.*
11. Estimating Heterogeneity within Multiway Array Data and Dependencies between a Network and Nodal Attributes; *Statistical and Applied Mathematical Sciences Institute (SAMSI) Webinar, Research Triangle Park, NC; January 2013.*

Poster Presentations:

1. Categorical Data Fusion Using Auxiliary Information; *Institute of the Mathematical Sciences 17th Meeting of New Researchers in Statistics and Probability, Seattle, WA; August 2015.*
2. Temporal Latent Space Network Models for Dynamic Grooming Interactions in Baboon Troops; *Women in Statistics Conference, Cary, NC; May 2014.*
3. Regional Probabilistic Fertility Forecasting by Modeling Between-Country Correlation; *Population Association of America Annual Meeting, New Orleans, LA; April 2013.*

Other Presentations:

1. Life as a SAMSI Postdoctoral Fellow; *Women in Statistics Conference, Cary, NC; May 2014.*
2. Social Network Analysis; *Field of Dreams Conference, Math Alliance, Phoenix, AZ; November 2013.*

Media Coverage

Women in STEM (07/2016)

The Huffington Post: *This Popular Math Class Is At The Heart Of The STEM Gender Gap, Study Suggests*
 Vocativ: *The Math Problem Diverting Women Out Of STEM Careers*
 Science Magazine Careers: *Low math confidence discourages female students from pursuing STEM disciplines*
 U.S. News: *Calculus Steers Women Away From STEM*
 Arizona Public Media: *Study: College Calculus Deters Women from STEM Fields*
 The Washington Post: *Calculus apprehensions may steer women away from science careers*
 Dallas Business Journal: *Why do women students drop out of STEM majors? New study pinpoints a culprit*
 Colorado State University Source: *Calculus I factors women out of STEM degrees, researchers find*

Population projections (09/2014)

Science News: *Experts be damned: World population will continue to rise*

The Guardian: *World population to hit 11bn in 2100 ? with 70% chance of continuous rise*

Reuters: *It's not a small world after all: world population will soar*

New Scientist: *Global population may boom well beyond the year 2050*

UW Today: *World population to keep growing this century, hit 11 billion by 2100*

National Geographic: *A World With 11 Billion People? New Population Projections Shatter Earlier Estimates*

Scientific American: *World Should Prepare for 11 Billion or More People*

The Christian Science Monitor: *Why estimate for world population in 2100 is now 11 billion (+video)*

Honors

Population Association of America Annual Meeting Poster Winner (with A.E. Raftery) for “Regional Probabilistic Fertility Forecasting by Modeling Between-Country Correlations,” 2013.

Z.W. Birnbaum Research Award, Department of Statistics, University of Washington, 2012.

Dorothy M. Gilford Teaching Award, Department of Statistics, University of Washington, 2011.

Achievement Rewards for College Scientists (ARCS) Fellow, University of Washington, 2008 - 2011.

National Science Foundation Vertical Integration of Research and Education in the Mathematical Sciences (VIGRE) Fellow, University of Washington, 2008 - 2009.

Teaching**Courses Taught at Colorado State University:**

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|----------|------------------------------------|----------|
| STAT 350 | Design of Experiments | F14 |
| STAT 430 | Probability and Statistics II | S15, S16 |
| STAT 520 | Introduction to Probability Theory | F15, F16 |
| STAA 574 | Multivariate Analysis | S17 |

Advising**Advisor**

Ryan Haunfelder (PhD, In Progress, co-advisor with Haonan Wang)

Frank Marrs (PhD, In Progress)

Bettina Younge (MS, 2016)

Committee Member

Soo-Young Kim (PhD, In Progress)

Henry Scharf (PhD, In Progress)

Karleigh Cameron (MS Mathematics, 2016)

Brett Hunter (PhD, 2016)

Service and Affiliations**Departmental**

Seminar co-organizer S16

Faculty search committee 2016-2017

Graduate admissions committee 2016-2017

Department chair search committee 2016-2017
 Doctoral candidacy exam committee 2015-2016

Refereeing

- 2017: *Journal of Business & Economic Statistics*
- 2016: *Health Services & Outcomes Research Methodology*, *Annals of Applied Statistics*, *Statistical Modelling*
- 2015: *Social Networks*, *Annals of Applied Statistics* (2), *AISTATS*, Grant review for *NSF Methodology, Measurement, and Statistics Program*
- 2014: *Journal of the American Statistical Association*, *Bayesian Analysis*, *Journal of Machine Learning Research*, *Annals of Applied Statistics*, *Journal of Survey Statistics and Methodology*, *Journal of Computational and Graphical Statistics*
- 2013: *Journal of Social Structure*, *Demography*

Conference Organization

Conference Co-organizer

Statistical Inference of Network Models: A NetSci2017 Satellite Symposium (Indianapolis, IN), June 2017.

Statistical Inference of Network Models: A NetSci2016 Satellite Symposium (Seoul, South Korea), June 2016.

Program Committee: reviewing abstracts and paper submissions

5th SIAM Workshop on Network Science (Pittsburgh, PA), July 2017.

NetSci 2017 (Indianapolis, IN), June 2017.

Statistical Learning for Data Science session at 2016 IEEE conference on Data Science and Advanced Analytics (Montreal, Canada), October 2016.

4th SIAM Workshop on Network Science (Boston, MA), July 2016.

Session Co-organizer

Network science: Moving from complex data to practical insights; *Joint Statistical Meetings, invited session for the Section on Statistical Learning and Data Mining, Seattle, WA; August 2015.*

Network Science; *Joint Mathematics Meetings 2015, invited session for the AMS Mathematics Research Communities, San Antonio, TX; January 2015.*

Network Analysis Undergraduate Modeling Workshop; *Statistical and Applied Mathematical Sciences Institute and North Carolina State University; May 2014.*

Professional Offices

Member, IMS New Researchers Committee, 2017 - 2019.

Member, American Statistical Association Waller Education Award Committee, 2015 - 2017.

Other Activities

Federal Highway Administration Technical Experts Meeting - Research Triangle Park, NC - May 2013.

Professional Memberships

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| Institute of Mathematical Statistics | 2015 - Present |
| International Society for Bayesian Analysis | 2015 - Present |
| American Statistical Association | 2007 - Present |

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| International Statistical Institute | 2015 - 2016 |
| American Mathematical Society | 2014 - 2015 |
| Population Association of America | 2013 - 2014 |

⁰Updated 3/2017