

DANIEL J. McDONALD

CONTACT INFORMATION

Indiana University
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RESEARCH INTERESTS

Machine learning; risk estimation; computational approximations; time series; applications in economics, biology, chemistry, finance and music

EDUCATION

- 2012 Doctor of Philosophy in Statistics
Carnegie Mellon University, Pittsburgh PA, USA
Dissertation: “Generalization error bounds for state space models”
Advisors: Cosma R. Shalizi and Mark Schervish
- 2008 Master of Science in Statistics
Carnegie Mellon University, Pittsburgh PA, USA
- 2006 Bachelor of Arts in Economics
Indiana University, Bloomington IN, USA
Summa cum laude
- 2006 Bachelor of Science in Music and an Outside Field
Indiana University, Bloomington IN, USA
Majors: Cello Performance and Mathematics
Magna cum laude

ACADEMIC APPOINTMENTS

- 2018– **Associate Professor of Statistics** (with tenure)
Indiana University, Bloomington
Core faculty, Department of Statistics, Program on Data Science
Adjunct Faculty, Department of Computer Science
Affiliate, Center for Algorithms and Machine Learning
- 2018–2019 **Visiting Associate Professor of Econometrics and Statistics**
The University of Chicago Booth School of Business
- 2012–2018 **Assistant Professor of Statistics**
Indiana University, Bloomington
- 2007–2012 **Graduate Research and Teaching Assistant**
Carnegie Mellon University, Pittsburgh

AWARDS AND HONORS

- 2018 National Science Foundation CAREER Award
- 2017 Indiana University Trustees’ Teaching Award
- 2012 Umesh Gavasakar Memorial Thesis Award

2012 American Statistical Association, Pittsburgh Chapter Student of the Year
 2006 Phi Beta Kappa
 2006 Carroll Christenson Award in Economics
 2005 Stadelmann Memorial Scholarship Award in Economics
 2004 Mr. & Mrs. Harold E. Strow Award in Economics
 2004 Hutton Honors College International Experiences Program Award
 2004 Jacobs School of Music Summer Festival Scholarship
 2003 James A. Moffat Award for Scholarship in Economics
 2002 Alice Freese Honors College Scholarship
 2002 Indiana Young Economist Award, Indiana Council of Economic Education
 2002 The Reserve Officers Association White River Chapter Scholarship
 2002 National Merit Scholarship

PEER-REVIEWED PUBLICATIONS

- HOMRIGHAUSEN, D., AND McDONALD, D.J. (2019+), “Compressed and penalized linear regression,” *Journal of Computational and Graphical Statistics*, (in press).
- KHODADADI, A., AND McDONALD, D.J. (2019), “Algorithms for estimating trends in global temperature volatility,” in *Proceedings of the 33rd AAAI Conference on Artificial Intelligence (AAAI-19)*, eds. P. V. Hentenryck and Z.-H. Zhou, [Association for the Advancement of Artificial Intelligence](#).
- HOMRIGHAUSEN, D., AND McDONALD, D.J. (2018), “A study on tuning parameter selection for the high-dimensional lasso,” *Journal of Statistical Computation and Simulation*, **88**, 2865–2892.
- DING, L., AND McDONALD, D.J. (2017), “Predicting phenotypes from microarrays using amplified, initially marginal, eigenvector regression,” *Bioinformatics*, **33**(14), i350–i358.
- McDONALD, D.J. (2017), “Minimax Density Estimation for Growing Dimension,” in *Proceedings of the 20th International Conference on Artificial Intelligence and Statistics (AISTATS)*, eds. A. Singh and J. Zhu, vol. 54, pp. 194–203, [PMLR](#).
- McDONALD, D.J., SHALIZI, C.R., AND SCHERVISH, M. (2017), “Nonparametric risk bounds for time-series forecasting,” *Journal of Machine Learning Research*, **18**(32), 1–40.
- HOMRIGHAUSEN, D., AND McDONALD, D.J. (2017), “Risk consistency of cross-validation for lasso-type procedures,” *Statistica Sinica*, **27**(3), 1017–1036.
- HOMRIGHAUSEN, D., AND McDONALD, D.J. (2016), “On the Nyström and column-sampling methods for the approximate principal components analysis of large data sets,” *Journal of Computational and Graphical Statistics*, **25**(2), 344–362.
- McDONALD, D.J., SHALIZI, C.R., AND SCHERVISH, M. (2015), “Estimating beta-mixing coefficients via histograms,” *Electronic Journal of Statistics*, **9**, 2855–2883.
- LOEWENSTEIN, G., KRISHNAMURTI, T., KOPSIC, J., AND McDONALD, D.J. (2015), “Does increased sexual frequency enhance happiness?” *Journal of Economic Behavior and Organization*, **116**, 206–218.

HOMRIGHAUSEN, D., AND McDONALD, D.J. (2014), “Leave-one-out cross-validation is risk consistent for lasso,” *Machine Learning*, **97**(1-2), 65–78.

HOMRIGHAUSEN, D., AND McDONALD, D.J. (2013), “The lasso, persistence, and cross-validation,” in *Proceedings of the 30th International Conference on Machine Learning (ICML)*, eds. S. Dasgupta and D. McAllester, vol. 28, pp. 1031–1039, [PMLR](#).

JUE, J.J.S., PRESS, M.J., McDONALD, D.J., VOLPP, K.G., ASCH, D.A., MITRA, N., STANOWSKI, A.C., AND LOEWENSTEIN, G. (2012), “The impact of price discounts and calorie messaging on beverage consumption: A multi-site field study,” *Preventive Medicine*, **55**, 629–633.

MCDONALD, D.J., SHALIZI, C.R., AND SCHERVISH, M. (2011), “Estimating beta-mixing coefficients,” in *Proceedings of the Fourteenth International Conference on Artificial Intelligence and Statistics (AISTATS)*, eds. G. Gordon, D. Dunson, and M. Dudík, vol. 15, pp. 516–524, [PMLR](#).

MCDONALD, D.J., AND THORNTON, D.L. (2008), “Primer on the mortgage market and mortgage finance,” *The Federal Reserve Bank of St. Louis Review*, **90**(1), 31–46.

WORKING PAPERS

MCDONALD, D.J., MCBRIDE, M., GU, Y., AND RAPHAEL, C. (2019+), “Markov-switching state space models for uncovering musical interpretation,” submitted, [arXiv:1907.06244](#).

DING, L., AND McDONALD, D.J. (2019+), “Sufficient principal component regression for genomics,” submitted.

MCDONALD, D.J., SHARPNACK, J., BASSETT, R., AND SADHANALA, V. (2019+), “Exponential family trend filtering on grids,” in preparation.

MCDONALD, D.J., AND SHALIZI, C.R. (2019+), “Empirical macroeconomics and DSGE modeling in statistical perspective,” in preparation.

MCDONALD, D.J., AND LOEWENSTEIN, G. (2019+), “Factor analysis for panel data,” in preparation.

MCDONALD, D.J. (2019+), “Sparse additive state-space models,” in preparation.

MCDONALD, D.J., AND SHALIZI, C.R. (2019+), “Rademacher complexity of stationary sequences,” submitted, [arXiv:1106.0730](#).

TECHNICAL REPORTS

HOMRIGHAUSEN, D., AND McDONALD, D.J. (2011), “Spectral approximations in machine learning,” [arXiv:1107.4340](#).

MCDONALD, D.J., SHALIZI, C.R., AND SCHERVISH, M. (2011), “Estimated VC dimension for risk bounds,” [arXiv:1111.3404](#).

MCDONALD, D.J., SHALIZI, C.R., AND SCHERVISH, M. (2011), “Generalization error bounds for stationary autoregressive models,” [arXiv:1103.0942](#).

MCDONALD, D.J., LOEWENSTEIN, G.F., AND KADANE, J. (2009), “The behavior of weight-loss study participants in response to incentives,” tech rep, [technical report](#).

GRANTS

- 2018–2023 [CAREER: Calibrating regularization for enhanced statistical inference](#). PI. National Science Foundation, DMS–1753171, \$400,000.
- 2014–2018 [Collaborative research: Statistical and computational efficiency for massive data sets via approximation-regularization](#). PI. National Science Foundation, DMS–1407439, \$89,911.
- 2014–2016 [High-Dimensional Statistics for Macroeconomic Forecasting](#). Co-PI. (with C. Shalizi as PI), [Institute for New Economic Thinking](#), Grant # INO14–00020, \$146,142.
- 2011–2013 [Model Complexity and Prediction Error in Macroeconomic Forecasting](#). (with C. Shalizi as PI), [Institute for New Economic Thinking](#), \$170,000.

INVITED PRESENTATIONS

- 2019 “Markov-switching state space models for uncovering musical interpretation,” Simon Fraser University, Department of Statistics and Actuarial Sciences
- “Trend filtering in exponential families,” University of Chicago and Toyota Technological Institute Machine Learning Seminar
- “Regularization, optimization, and approximation: The benefits of a convex combination,” Texas A&M University, Department of Statistics
- “Regularization, optimization, and approximation: The benefits of a convex combination,” University of Toronto, Department of Statistics
- “Regularization, optimization, and approximation: The benefits of a convex combination,” Colorado State University, Department of Statistics
- “Regularization, optimization, and approximation: The benefits of a convex combination,” University of Pittsburgh, Department of Statistics
- 2018 “Matrix sketching for alternating direction method of multipliers optimization,” Symposium on Statistics and Data Science
- “A Switching Kalman Filter for Modeling Classical Music Performances,” Institute of Mathematical and its Applications Frontiers in Forecasting Workshop
- “Statistical implications of (some) computational approximations,” University of Virginia, Department of Statistics
- 2017 “Predicting phenotypes from microarrays using amplified, initially marginal, eigenvector regression,” 25th Intelligent Systems for Molecular Biology and the 16th European Conference on Computational Biology
- “Compressed and penalized linear regression,” Toyota Technological Institute at Chicago, Machine Learning Seminar
- “Compressed and penalized linear regression,” Pontificia Universidad Católica del Perú, Department of Mathematics and Statistics
- “Estimating β -mixing coefficients with histograms,” American Mathematical Society Spring Central Sectional Meeting, Special Session on Dependence in Probability and Statistics
- 2016 “Approximation-regularization for analysis of large data sets,” University of Louisville, Department of Bioinformatics and Biostatistics

- “Approximation-regularization for analysis of large data sets,” University of California, Davis, Department of Statistics
- “Approximation-regularization for analysis of large data sets,” Indiana University-Purdue University Indianapolis, Department of Biostatistics
- “Approximation-regularization for analysis of large data sets,” National Center for Atmospheric Research
- “Risk estimation for high-dimensional lasso regression,” Joint Statistical Meetings
- 2015 “Approximate principal components analysis of large data sets,” Yale University, Department of Statistics
- 2014 “Approximate principal components analysis of large data sets,” Joint Statistical Meetings
- “Clustering classical music performance,” Université Laval, Department of Mathematics and Statistics
- 2013 “Clustering classical music performance,” 15th IMS New Researchers Conference
- 2012 “Nonparametric risk bounds for time-series prediction,” Yahoo! Research
- “Nonparametric risk bounds for time-series prediction,” George Mason University, Department of Statistics
- “Nonparametric risk bounds for time-series prediction,” Bocconi University, Department of Decision Sciences
- “Nonparametric risk bounds for time-series prediction,” Indiana University, Department of Statistics
- “Estimating beta-mixing coefficients,” 14th International Conference on Artificial Intelligence and Statistics
- “Estimating beta-mixing coefficients,” American Statistical Association, Pittsburgh Chapter Annual Meeting
- “Spectral approximation methods: performance evaluations in clustering and classification” The Classification Society Annual Meeting
- 2010 “Generalization error bounds for state-space models with an application to economic forecasting,” Joint Statistical Meetings

INVITED SHORT COURSES

- 2015 “Short course on the predictive viewpoint,” Institute for New Economic Thinking Young Scholar Workshop, New York
- 2013 “Short course on the predictive viewpoint,” Institute for New Economic Thinking Young Scholar Workshop, Hong Kong

CONTRIBUTED TALKS

- 2019 “Sufficient principal component regression for genomics,” Joint Statistical Meetings
- 2017 “Compressed and penalized linear regression,” Indiana University, Department of Statistics
- “Predicting phenotypes from microarrays using amplified, initially marginal, eigenvector regression,” Joint Statistical Meetings

- 2015 “Approximate principal components analysis of large data sets,” Indiana University SOIC, Intelligent & Interactive Systems
- 2014 “Statistical machine learning with structured data,” Indiana University, Department of Statistics
- 2012 “Nonparametric risk bounds for time-series prediction,” Indiana University, Department of Economics

COURSE INSTRUCTION

Indiana University Department of Statistics, 2012–present

- S301 Introduction to Business Statistics (Fa13, Sp14, Fa14)
- S432 Applied Linear Models II (Sp16, Sp17, Sp18)
- S682 Topics in Statistical Machine Learning (Sp14)
- S721 Advanced Statistical Theory I (Fa12, Fa14)
- S722 Advanced Statistical Theory II (Sp13)
- S771 Advanced Data Analysis I (Fa16, Sp17, Fa19)
- S772 Advanced Data Analysis II (Fa16, Sp17, Fa19)
- S782 Topics in Statistical Learning Theory (Fa17)
- S785 Seminar on Statistical Theory (Fa17, Sp17, Fa19)

University of Chicago Booth School of Business, 2018

- 41911 Advanced Econometrics (Fa18)

Carnegie Mellon University, 2010–2011

- 36–226 Introduction to Probability and Statistics II (Su10, Su11)

STUDENT ADVISING

(year indicates actual or anticipated completion)

PhD advisor

- 2020 Lei Ding

PhD dissertation committee

- 2021 Sanna Wager (PhD Informatics)
- 2020 Yucong Jiang (IU Computer Science)
- 2020 Chao Tao (IU Computer Science)
- 2020 Shay Liu (IU Geology)
- 2019 Zikun Yang
- 2019 Xuefu Wang
- 2018 Robert Lunde (Carnegie Mellon Statistics)
- 2017 Rong Jin (IU Informatics)
- 2015 Yupeng Gu (IU Informatics)

MS thesis advisor

- 2021 Joe Stoica
- 2020 Haoran Liu
- 2018 Arash Khodadadi
- 2017 Jia Wang

PhD exam advisor

- 2020 Robert Granger
- 2020 Aaron Cohen

2017 Lei Ding
2017 Raksha Kumaraswamy (IU Computer Science)
2015 Sanna Wager (PhD Informatics)
2014 Zikun Yang
2014 Lijiang Guo

MS thesis committee

2016 Scott Brown
2013 Mikyoung Jun

Undergraduate research

2020 Mackenzie Turner
2018 Michael McBride

PROFESSIONAL SERVICE

Associate Editor

Journal of the American Statistical Association
The American Statistician

Conference Program Committee

Neural Information Processing Systems (NeurIPS)
Conference on Uncertainty in Artificial Intelligence (UAI)
International Conference on Artificial Intelligence and Statistics (AISTATS)
International Conference on Machine Learning and Statistics (ICML)

Referee

Electronic Journal of Statistics
IEEE Transactions on Information Theory
International Conference on Learning Theory (COLT)
Journal of the American Statistical Association
Journal of Business and Economic Statistics
Journal of Computational and Graphical Statistics
Journal of Machine Learning Research
Journal of Optimization Theory and Applications
Journal of Statistical Computation and Simulation
Statistics and Computing
Technometrics

Grant reviewer

Division of Mathematics and Statistics, National Science Foundation
Institute for New Economic Thinking

Other

Awards committee, Student Paper Competition ASA SLDS Section
Session chair, Joint Statistical Meetings
Session organizer, Joint Statistical Meetings

Society memberships

American Statistical Association
Institute of Mathematical Statistics
Bernoulli Society

UNIVERSITY SERVICE

- 2019– Academic Fairness Committee, *College of Arts and Sciences*
- 2019– Center of Excellence for Women & Technology. *REU advisor*
- 2017– Center of Excellence for Women & Technology, *Faculty Ally*
- 2015– IU CrossFit Club, *Faculty advisor*
- 2016–2018 Faculty Student Mentoring Initiative, *Office of the Vice President for Diversity Equity and Multicultural Affairs*
- 2014–2018 Data Science Curriculum Committee, *School of Computing, Informatics, and Engineering + College of Arts and Sciences*

DEPARTMENT SERVICE

- 2019– Chair, Executive Committee
- 2019– Chair, Teaching-Track Promotion Committee
- 2019– Computing Committee
- 2019– Committee on Business Statistics
- 2018– Teaching-track Promotion Committee
- 2018– Faculty Hiring Committee
- 2018– Tenure Review Committee
- 2016–2018 Graduate Studies Committee
- 2012–2018 Colloquium Committee
- 2015–2016 Undergraduate Studies Committee
- 2015–2016 Executive Committee
- 2012–2015 Graduate Studies Committee
- 2012–2015 Faculty Hiring Committee
- 2013–2014 Chair, Colloquium Committee

INDUSTRY EXPERIENCE

- 2010 **Statistical Consultant**, *Alvarez & Marsal*, New York, New York
- 2006–2007 **Research Associate**, *Federal Reserve Bank of St. Louis*, St. Louis, Missouri