

# DANIEL J. McDONALD

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## CONTACT INFORMATION

University of British Columbia  
3106 Earth Sciences Building  
2207 Main Mall  
Vancouver, BC Canada V6T 1Z4

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*www:* <https://dajmcdon.github.io/>  
*email:* [daniel@stat.ubc.ca](mailto:daniel@stat.ubc.ca)

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## RESEARCH INTERESTS

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

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## 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

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## ACADEMIC APPOINTMENTS

- 2020– **Associate Professor of Statistics**  
University of British Columbia
- 2018–2020 **Associate Professor of Statistics**  
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

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## 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

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## PEER-REVIEWED PUBLICATIONS

- [21] CRAMER, E.Y., RAY, E.L., LOPEZ, V.K., BRACHER, J., . . . , McDONALD, D., . . . , JOHANSSON, M., BIGGERSTAFF, M., AND REICH, N.G. (2022), "Evaluation of individual and ensemble probabilistic forecasts of COVID-19 mortality in the US," *Proceedings of the National Academy of Sciences*, 119, e2113561119.
- [20] DING, L., ZENTNER, G.E., AND McDONALD, D.J. (2022), "Sufficient principal component regression for genomics," *Bioinformatics Advances*, 2, vbac033.
- [19] REINHART, A., BROOKS, L., JAHJA, M., RUMACK, A., TANG, J., SAEED, . . . , McDONALD, D.J., . . . , ROSENFELD, R., AND TIBSHIRANI, R.J. (2021), "An open repository of real-time COVID-19 indicators," *Proceedings of the National Academy of Sciences*, 118, e2111452118.
- [18] McDONALD, D.J., BIEN, J., GREEN, A., HU, A.J., DEFRIES, N., HYUN, S., OLIVEIRA, N.L., SHARPNACK, J., TANG, J., TIBSHIRANI, R., VENTURA, V., WASSERMAN, L., AND TIBSHIRANI, R.J. (2021), "Can auxiliary indicators improve COVID-19 forecasting and hotspot prediction?" *Proceedings of the National Academy of Sciences*, 118, e2111453118.
- [17] POLICASTRO, R.A., McDONALD, D.J., BRENDEN, V.P., AND ZENTNER, G.E. (2021), "Flexible analysis of TSS mapping data and detection of TSS shifts with TSReXploreR," *NAR Genomics and Bioinformatics*, 3(2), 1–10.
- [16] McDONALD, D.J., MCBRIDE, M., GU, Y., AND RAPHAEL, C. (2021), "Markov-switching state space models for uncovering musical interpretation," *Annals of Applied Statistics*, 15(3), 1147–1170.
- [15] HOMRIGHAUSEN, D., AND McDONALD, D.J. (2020), "Compressed and penalized linear regression," *Journal of Computational and Graphical Statistics*, 29(2), 309–322.

- [14] 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, vol. 33, pp. 614–621, [Association for the Advancement of Artificial Intelligence](#).
- [13] 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.
- [12] DING, L., AND McDONALD, D.J. (2017), “Predicting phenotypes from microarrays using amplified, initially marginal, eigenvector regression,” *Bioinformatics*, 33(14), i350–i358.
- [11] McDONALD, D.J. (2017), “Minimax Density Estimation for Growing Dimension,” in *Proceedings of the 20<sup>th</sup> International Conference on Artificial Intelligence and Statistics (AISTATS)*, eds. A. Singh and J. Zhu, vol. 54, pp. 194–203, [PMLR](#).
- [10] 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.
- [9] HOMRIGHAUSEN, D., AND McDONALD, D.J. (2017), “Risk consistency of cross-validation for lasso-type procedures,” *Statistica Sinica*, 27(3), 1017–1036.
- [8] 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.
- [7] McDONALD, D.J., SHALIZI, C.R., AND SCHERVISH, M. (2015), “Estimating beta-mixing coefficients via histograms,” *Electronic Journal of Statistics*, 9, 2855–2883.
- [6] 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.
- [5] HOMRIGHAUSEN, D., AND McDONALD, D.J. (2014), “Leave-one-out cross-validation is risk consistent for lasso,” *Machine Learning*, 97(1-2), 65–78.
- [4] HOMRIGHAUSEN, D., AND McDONALD, D.J. (2013), “The lasso, persistence, and cross-validation,” in *Proceedings of the 30<sup>th</sup> International Conference on Machine Learning (ICML)*, eds. S. Dasgupta and D. McAllester, vol. 28, pp. 1031–1039, [PMLR](#).
- [3] 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.
- [2] 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](#).
- [1] 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.

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## OTHER PUBLICATIONS

- [1] McDONALD, D.J. (2020), “Book review: Sufficient dimension reduction: Methods and applications with R,” *Journal of the American Statistical Association*, 115(532), 1032–1033.

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## WORKING PAPERS

- [5] LIANG, X., COHEN, A., HEINSFELD, A.S., PESTILLI, F., AND McDONALD, D.J. (2022), “Estimating sparse group lasso with the sparsegl R package,” in preparation.
- [4] PHAM, D., DING, L., McDONALD, D.J., NEBEL, M.B., AND MEJIA, A. (2022+), “Less is more: balancing noise reduction and data retention in fmri with projection scrubbing,” in preparation, [2108.00319](#).
- [3] TUZHILINA, E., HASTIE, T.J., McDONALD, D.J., TAY, J.K., AND TIBSHIRANI, R. (2022), “Smooth multi-period forecasting with application to prediction of COVID-19 cases,” in preparation.
- [2] SADHANALA, V., BASSETT, R., SHARPNACK, J., AND McDONALD, D.J. (2022+), “Exponential family trend filtering on grids,” in preparation.
- [1] McDONALD, D.J., AND SHALIZI, C.R. (2019+), “Empirical macroeconomics and DSGE modeling in statistical perspective,” in preparation.

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## TECHNICAL REPORTS

- [5] McDONALD, D.J., AND SHALIZI, C.R. (2017), “Rademacher complexity of stationary sequences,” [arXiv:1106.0730](#).
- [4] HOMRIGHAUSEN, D., AND McDONALD, D.J. (2011), “Spectral approximations in machine learning,” [arXiv:1107.4340](#).
- [3] McDONALD, D.J., SHALIZI, C.R., AND SCHERVISH, M. (2011), “Estimated VC dimension for risk bounds,” [arXiv:1111.3404](#).
- [2] McDONALD, D.J., SHALIZI, C.R., AND SCHERVISH, M. (2011), “Generalization error bounds for stationary autoregressive models,” [arXiv:1103.0942](#).
- [1] McDONALD, D.J., LOEWENSTEIN, G.F., AND KADANE, J. (2009), “The behavior of weight-loss study participants in response to incentives,” [technical report](#).

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## GRANTS AWARDED

- 2021–2025 Regularization and approximation: Statistical inference, model selection, and large data. PI. National Sciences and Engineering Research Council of Canada, Discovery Grant, RGPIN-2021-02618; 135,000 CAD
- 2020–2021 Detecting anomalies in COVID19 indicators. PI. Canadian Statistical Sciences Institute, Rapid Response Program; 5,000 CAD.
- 2019–2020 Indiana University Institute for Advanced Studies, Recently Tenured Working Group Research Stipend; 8,000 USD.
- 2018–2023 [CAREER: Calibrating regularization for enhanced statistical inference](#). PI. National Science Foundation, DMS-1753171; 400,000 USD.

- 2014–2018 Collaborative research: Statistical and computational efficiency for massive data sets via approximation-regularization. PI. National Science Foundation, DMS–1407439; 90,000 USD.
- 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 USD.
- 2011–2013 Model Complexity and Prediction Error in Macroeconomic Forecasting. (with C. Shalizi as PI), Institute for New Economic Thinking; 170,000 USD.

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## INVITED PRESENTATIONS

- 2021 “Your model is beautiful, but does it predict?” NeurIPS I Can’t Believe It’s Not Better Workshop  
 “Markov-switching state space models for uncovering musical interpretation,” International Conference on Computational and Methodological Statistics
- 2020 “Compressed and penalized linear regression,” International Conference on Computational and Methodological Statistics  
 “Delphi’s COVIDcast Project: An Ecosystem for Tracking and Forecasting the Pandemic,” British Columbia COVID-19 Modeling Group  
 “Minimax density estimation under triangular array asymptotics,” International Workshop on Applied Probability (cancelled, COVID19)  
 “Trend filtering in exponential families,” Conference on Statistical Learning and Data Science (cancelled, COVID19)  
 “Trend filtering in exponential families,” Simon Fraser University, Department of Statistics and Actuarial Sciences  
 “Trend filtering in exponential families,” University of British Columbia, Department of Statistics
- 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,” 25<sup>th</sup> Intelligent Systems for Molecular Biology and the 16<sup>th</sup> 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  $\beta$ -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,” 15<sup>th</sup> 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,” 14<sup>th</sup> 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

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## 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

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## CONTRIBUTED TALKS

- 2021 “COVID-19 modeling and forecasting in the US and Canada: A statistician’s perspective,” University of British Columbia, Department of Statistics
- 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

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## COURSE INSTRUCTION

### **University of British Columbia, 2020–**

- Stat 550 Techniques of Statistical Consulting (W21T2, W22T2)
- Stat 535a Computational Statistics - Convex optimization (W20T2)
- Stat 406 Methods for Statistical Learning (W20T1, W21T1, W22T1)

### **Indiana University Department of Statistics, 2012–2020**

- 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)

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## STUDENT ADVISING

*(year indicates actual or anticipated completion)*

**PhD advisor**

- 2025 Rachel Lobay (UBC Statistics)
- 2024 Jiaping Liu (UBC Statistics)
- 2020 Lei Ding (IU Statistics)

**PhD dissertation committee**

- 2024 Ning Shen (Statistics)
- 2024 Lin Zhang (Statistics)
- 2021 Sanna Wager (IU Informatics)
- 2020 Yucong Jiang (IU Computer Science)
- 2020 Chao Tao (IU Computer Science)
- 2020 Shay Liu (IU Geology)
- 2019 Zikun Yang (IU Statistics)
- 2019 Xuefu Wang (IU Statistics)
- 2018 Robert Lunde (Carnegie Mellon Statistics)
- 2017 Rong Jin (IU Informatics)
- 2015 Yupeng Gu (IU Informatics)

**MSc thesis advisor**

- 2022 William Laplante (UBC Statistics, co-advisor B. Bloem-Reddy)
- 2022 Elvis Cai (UBC Statistics, co-advisor P. Gustafson)
- 2021 Xiaoxuan Liang (UBC Statistics)
- 2021 Wei Tang (UBC Statistics)
- 2020 Haoran Liu (IU Statistics)
- 2018 Arash Khodadadi (IU Statistics)
- 2017 Jia Wang (IU Statistics)

**PhD exam advisor**

- 2020 Robert Granger (IU Statistics)
- 2020 Aaron Cohen (IU Statistics)
- 2017 Lei Ding (IU Statistics)
- 2017 Raksha Kumaraswamy (IU Computer Science)
- 2015 Sanna Wager (PhD Informatics)
- 2014 Zikun Yang (IU Statistics)
- 2014 Lijiang Guo (IU Statistics)

**Undergraduate research**

- 2022 Ken Mawer (UBC NSERC USRA)
- 2020 Mackenzie Turner (IU Center for Women in Technology REU)
- 2018 Michael McBride (IU)

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**PROFESSIONAL SERVICE****Associate Editor**

Journal of the American Statistical Association  
The American Statistician

**Conference Area Chair**

International Conference on Learning Representations (ICLR)  
International Conference on Machine Learning and Statistics (ICML)

**Conference Program Committee**

Midwest Machine Learning Symposium (cancelled, COVID19)



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  
Harvard Data Science Review  
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  
Machine Learning Journal  
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; 2018–  
Session organizer, CMStatistics; 2020  
Session chair, Joint Statistical Meetings; 2016  
Session organizer, Joint Statistical Meetings; 2016

**Society memberships**

American Statistical Association  
Institute of Mathematical Statistics  
Bernoulli Society

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**UNIVERSITY SERVICE**

**Indiana University**

2019–2020 Academic Fairness Committee, *College of Arts and Sciences*  
2019–2020 Center of Excellence for Women & Technology. *REU advisor*  
2017–2020 Center of Excellence for Women & Technology, *Faculty Ally*  
2015–2020 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*

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**DEPARTMENT SERVICE**

**University of British Columbia**

2022– Co-Chair, Graduate Operations Committee

- 2020– Member, Graduate Operations Committee  
**Indiana University**
- 2019–2020 Chair, Executive Committee
- 2019–2020 Chair, Teaching-Track Promotion Committee
- 2019–2020 Computing Committee
- 2019–2020 Committee on Business Statistics
- 2018–2020 Teaching-track Promotion Committee
- 2018–2020 Faculty Hiring Committee
- 2018–2020 Tenure Review Committee
- 2016–2020 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

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#### INDUSTRY EXPERIENCE

- 2020– **COVID-19 Forecasting team lead**, *Delphi Group, Carnegie Mellon University*, Pittsburgh, PA
- 2010 **Statistical Consultant**, *Alvarez & Marsal*, New York, New York
- 2006–2007 **Research Associate**, *Federal Reserve Bank of St. Louis*, St. Louis, Missouri