

Curriculum Vitae

Jonas Peters

Contact Information

Department for Mathematical Sciences
Universitetsparken 5
2100 København Ø
Denmark
jonas.peters@math.ku.dk



Education and Professional Experience

07/2019 – Professor of Statistics, University of Copenhagen
08/2016 – 06/2019 Associate Professor of Statistics, University of Copenhagen
03/2015 – 08/2016 Group Leader at Max Planck Institute for Intelligent Systems, Tübingen
05/2014 – 07/2014 Visiting researcher at CMU, Pittsburgh, USA (host: P. Spirtes)
09/2013 – 12/2013 Visiting researcher at UC Berkeley, USA (host: M. Wainwright)
12/2012 – 02/2015 PostDoc (Marie Curie, IEF) at ETH Zürich, Switzerland
02/2012 – 12/2012 PhD at ETH Zürich, ETH Medal for an outstanding PhD thesis (supervisors: P. Bühlmann, D. Janzing, B. Schölkopf)
08/2011 – 10/2011 Internship at Microsoft Research, Redmond, USA (host: L. Bottou)
01/2009 – 02/2012 PhD at Max Planck Institute for Biological Cybernetics, Tübingen
01/2009 Diploma in mathematics (minor: physics), University of Heidelberg, “with distinction”
06/2007 Master of Advanced Study in Mathematics (Part III), University of Cambridge, UK, “with distinction”
06/2002 – 05/2003 Civilian Service (administration of a children’s home)
06/2002 Abitur at Burg-Gymnasium Bad Bentheim, one year skipped

Research Statement

We are interested in learning causal structures and stable models from data. Our work combines theory, methodology, and applications. It relates to different areas in statistics, data science and artificial intelligence and to several fields of applications, such as Earth system science and biology.

Awards and Honours

Silver Medal of the Royal Danish Academy of Sciences and Letters (2021), COPSS Leadership Academy, awarded by the Committee of Presidents of Statistical Societies (2021), Guy Medal in Bronze, awarded by the Royal Statistical Society (2019), ASA Causality in Statistics Education Award (with D. Janzing and B. Schölkopf, 2018), Teacher of the year at SCIENCE, University of Copenhagen (2018), Read paper to the Royal Statistical Society, London (“Causal inference using invariant prediction: identification and confidence intervals”, with P. Bühlmann and N. Meinshausen, 2016); Member of the Junge Akademie (since 2016; board member 2017–2019), Marie Curie fellowship (2013–2015), ETH medal for an outstanding PhD thesis (2013), scholarship of the Max Planck Society (2009–2012), scholarship of the Studienstiftung des deutschen Volkes (2004–2008), UNWIN prize and election to scholar (Downing College, Cambridge) (2007), European Excellence Programme (DAAD, 2006–2007), Kurt-Hahn-Trust, Hölderlin Programme (Allianz, 2006–2007), Deutsche SchülerAkademie (2001)

Scientific Memberships

Bernoulli Society, Danish Society for Theoretical Statistics, Institute of Mathematical Statistics (IMS), International Statistical Institute (ISI elected), Royal Statistical Society, ELLIS

External Funding

PI: Villum Young Investigator (since 2018):	1,100,000 €
PI: Carlsberg Foundation Distinguished Associate Prof. Fellowship (since 2018):	360,000 €
Co-Investigator: Villum Foundation (since 2016):	648,000 €
PI: Marie Curie Fellowship (IEF) (2013–2015):	184,709 €

Supervision

Postdocs	R. Christiansen; ongoing: S. Weichwald
PhD students	main supervisor: R. Christiansen; co-supervisor: C. Heinze-Deml, N. Pfister; ongoing: M. Jakobsen, R. Nielsen, S. Saengkyongam, N. Thams

Teaching

Lecture courses	Univ. of Copenhagen, ETH Zurich, Univ. of Tübingen
Summer academies	Studienstiftung des deutschen Volkes (two weeks, 2015), Deutsche SchülerAkademie (two weeks, 2009, 2010, 2011, 2012, 2013, 2014, 2016)

Selected invited talks

EMS (keynote, 2022); SIAM Conference on Applied Algebraic Geometry (keynote, 2019); several research institutions (such as Alphabet, Caltech, CMU, ENSEA, EPFL, ETH Zurich, Harvard, International Centre Meetings Mathématiques (Luminy), IST Austria, KTH Stockholm, Mathematisches Forschungsinstitut Oberwolfach, Microsoft Research, MIT, MPI Göttingen, MPI Jena, Novonordisk, Peking University, Pompeu Fabra University, Rutgers, UC Berkeley, UC Los Angeles, UCL, Univ. of Amsterdam, Univ. of Cambridge, Univ. of Florida, Univ. of Frankfurt, Univ. of Göttingen, Univ. of Hamburg, Univ. of Lausanne, Univ. of Linköping, Univ. of Nijmegen, Univ. of Oslo, Univ. of Oxford, Univ. of Regensburg, Univ. of St. Andrews, Univ. of Warwick, WIAS Berlin); several tutorials, such as MIT (more than 40,000 views on youtube), MLSS (Tübingen and Cadiz), GCPR (Aachen)

Reviewing and Editing

Program Chair / Editor	UAI 2020 (program chair); UAI 2021 (general chair); both with D. Sontag (MIT)
Area Chair / AE	IEEE TPAMI (2021–), Journal of Causal inference (2021–), SIAM Journal on Mathematics of Data Science (2020–), Annals of Statistics (2019–), Journal of the American Statistical Association (2019–2021); several years: UAI, AISTATS
Reviewing (journals, books)	ACM Transactions on Intelligent Systems and Technology, Annals of Statistics, Bernoulli Journal, Biometrika, eLife, Electronic Journal of Statistics, IEEE Transactions of Pattern Analysis and Machine Intelligence, IEEE Transactions on Information Theory, Information Fusion, International Journal of Approximate Reasoning, Journal of Artificial Intelligence Journal of Causal Inference, Journal of Machine Learning Research, Journal of the American Statistical Association, Journal of the Royal Statistical Society, MIT Press, Nature – Scientific Reports, Neurocomputing, NeuroImage, Physica A, PLOS ONE, Springer, Statistical Science, Statistics and Computing, Transactions on Intelligent Systems and Technology, Wiley
Reviewing (conferences)	several years: AISTATS, COLT, ECML, ICLR, ICML, ICONIP, NeurIPS, TIME, UAI
Reviewing (grants)	Carl Zeiss Stiftung (Germany), DFG (Germany), NSERC (Canada), ERC (EU), NWO (The Netherlands), SNF (Switzerland)

Additional Skills

Languages	English (fluent), Latin, Danish (advanced), Dutch, French (basic)
Programming	R, Python (current), Matlab, C#, Excel, Visual Basic, Delphi, Turbo Pascal
Other interests	Playing the cello, cycling, hiking, climate change

Books

1. J. Peters and N. Meinshausen. *The Raven's Hat: Fallen Pictures, Rising Sequences, and Other Mathematical Games*. MIT Press, Cambridge, MA, USA, 2021
2. J. Peters, D. Janzing, and B. Schölkopf. *Elements of Causal Inference: Foundations and Learning Algorithms*. MIT Press, Cambridge, MA, USA, 2017

Peer-Reviewed Publications

1. R. Christiansen, M. Baumann, T. Kümmerle, M. Mahecha, and J. Peters. Towards causal inference for spatio-temporal data: Conflict and forest loss in Colombia. *Journal of the American Statistical Association (accepted)*, *ArXiv e-prints (2005.08639)*, 2021
2. M. Migliavacca, T. Musavi, M. D. Mahecha, J. A. Nelson, J. Knauer, D. D. Baldocchi, O. Perez-Priego, R. Christiansen, J. Peters, K. Anderson, M. Bahn, T. A. Black, P. D. Blanken, D. Bonal, N. Buchmann, S. Caldararu, A. Carrara, N. Carvalhais, A. Cescatti, J. Chen, J. Cleverly, E. Cremonese, A. R. Desai, T. S. El-Madany, M. M. Farella, M. Fernández-Martínez, G. Filippa, M. Forkel, M. Galvagno, U. Gomasasca, C. M. Gough, M. Göckede, A. Ibrom, H. Ikawa, I. A. Janssens, M. Jung, J. Kattge, T. F. Keenan, A. Knohl, H. Kobayashi, G. Kraemer, B. E. Law, M. J. Liddell, X. Ma, I. Mammarella, D. Martini, C. Macfarlane, G. Matteucci, L. Montagnani, D. E. Pabon-Moreno, C. Panigada, D. Papale, E. Pendall, J. Penuelas, R. P. Phillips, P. B. Reich, M. Rossini, E. Rotenberg, R. L. Scott, C. Stahl, U. Weber, G. Wohlfahrt, S. Wolf, I. J. Wright, D. Yakir, S. Zaehle, and M. Reichstein. The three major axes of terrestrial ecosystem function. *Nature (accepted)*, x:x–x, 2021
3. M. Jakobsen and J. Peters. Distributional robustness of k-class estimators and the PULSE. *ArXiv e-prints (2005.03353)*, 2020
4. R. Christiansen, N. Pfister, M. Jakobsen, N. Gnecco, and J. Peters. The difficult task of distribution generalization in nonlinear models. *IEEE Transactions on Pattern Analysis and Machine Intelligence (accepted)*; *ArXiv e-prints (2006.07433)*, 2020
5. N. Pfister, E. G. William, J. Peters, R. Aebbersold, and P. Bühlmann. Stabilizing variable selection and regression. *Annals of Applied Statistics*, 15(3):1220–1246, 2021
6. M. Oberst, N. Thams, J. Peters, and D. Sontag. Regularizing towards causal invariance: Linear models with proxies. In *Proceedings of the 38th International Conference on Machine Learning (ICML)*, pages 8260–8270, 2021
7. S. Bongers, P. Forre, J. Peters, and J. M. Mooij. Foundations of structural causal models with cycles and latent variables. *Annals of Statistics (accepted)*, *ArXiv e-prints (1611.06221v4)*, 2021
8. N. Gnecco, N. Meinshausen, J. Peters, and S. Engelke. Causal discovery in heavy-tailed models. *Annals of Statistics*, 49(3):1755–1778, 2021
9. D. Rothenhäusler, P. Bühlmann, N. Meinshausen, and J. Peters. Anchor regression: heterogeneous data meets causality. *Journal of Royal Statistical Society, Series B*, 83(2):215–246, 2021
10. S. Weichwald and J. Peters. Distributional robustness as a guiding principle for causality in cognitive neuroscience. *Journal of Cognitive Neuroscience*, 33(2):226–247, 2021
11. M. D. Mahecha, F. Gans, G. Brandt, R. Christiansen, S. E. Cornell, N. Fomferra, G. Kraemer, J. Peters, P. Bodesheim, G. Camps-Valls, J. F. Donges, W. Dorigo, L. M. Estupinan-Suarez, V. H. Gutierrez-Velez, M. Gutwin, M. Jung, M. C. Londoño, D. G. Miralles, P. Papastefanou, and M. Reichstein. Earth system data cubes unravel global multivariate dynamics. *Earth System Dynamics*, 11(1):201–234, 2020
12. R. Shah and J. Peters. The hardness of conditional independence testing and the generalised covariance measure. *Annals of Statistics*, 48(3):1514–1538, 2020
13. R. Christiansen and J. Peters. Invariant causal prediction in the presence of latent variables.

- Journal of Machine Learning Research*, 21(41):1–46, 2020
14. N. Pfister, S. Bauer, and J. Peters. Learning stable and predictive structures in kinetic systems. *Proceedings of the National Academy of Sciences*, 116(51):25405–25411, 2019
 15. J. Runge, S. Bathiany, E. Bollt, G. Camps-Valls, D. Coumou, E. Deyle, C. Glymour, M. Kretschmer, M. Mahecha, J. Munoz-Mari, E. Van Nes, J. Peters, R. Quax, M. Reichstein, M. Scheffer, B. Schoelkopf, P. Spirtes, G. Sugihara, J. Sun, K. Zhang, and J. Zscheischler. Inferring causation from time series in Earth system sciences. *Nature Communications*, 10(2553), 2019
 16. C. Heinze-Deml, J. Peters, and N. Meinshausen. Invariant causal prediction for nonlinear models. *Journal of Causal Inference*, 6(2):1–35, 2018
 17. M. Rojas-Carulla, B. Schölkopf, R. Turner, and J. Peters. Causal transfer in machine learning. *Journal of Machine Learning Research*, 19(36):1–34, 2018
 18. N. Pfister, P. Bühlmann, and J. Peters. Invariant causal prediction for sequential data. *Journal of the American Statistical Association*, 114(527):1264–1276, 2018
 19. N. Pfister, P. Bühlmann, B. Schölkopf, and J. Peters. Kernel-based tests for joint independence. *Journal of the Royal Statistical Society: Series B*, 80:5–31, 2017
 20. N. Meinshausen, A. Hauser, J. Mooij, J. Peters, P. Versteeg, and P. Bühlmann. Methods for causal inference from gene perturbation experiments and validation. *Proceedings of the National Academy of Sciences*, 113(27):7361–7368, 2016
 21. B. Schölkopf, D. Hogg, D. Wang, D. Foreman-Mackey, D. Janzing, C.-J. Simon-Gabriel, and J. Peters. Modeling confounding by half-sibling regression. *Proceedings of the National Academy of Sciences*, 113(27):7391–7398, 2016
 22. J. Peters, P. Bühlmann, and N. Meinshausen. Causal inference using invariant prediction: identification and confidence intervals. *Journal of the Royal Statistical Society: Series B (with discussion)*, 78(5):947–1012, 2016
 23. S. Bauer, B. Schölkopf, and J. Peters. The arrow of time in multivariate time series. In *Proceedings of the 33rd International Conference on Machine Learning (ICML)*, pages 2043–2051. *Journal of Machine Learning Research: Workshop and Conference Proceedings*, 2016
 24. J. M. Mooij, J. Peters, D. Janzing, J. Zscheischler, and B. Schölkopf. Distinguishing cause from effect using observational data: methods and benchmarks. *Journal of Machine Learning Research*, 17(32):1–102, 2016
 25. S. Sippel, J. Zscheischler, M. Heimann, F. E. L. Otto, J. Peters, and M. D. Mahecha. Quantifying changes in climate variability and extremes: Pitfalls and their overcoming. *Geophysical Research Letters*, 42(22):9990–9998, 2015
 26. D. Rothenhäusler, C. Heinze, J. Peters, and N. Meinshausen. backShift: Learning causal cyclic graphs from unknown shift interventions. In *Advances in Neural Information Processing Systems 28 (NeurIPS)*, pages 1513–1521. Curran Associates, Inc., 2015
 27. B. Schölkopf, D. W. Hogg, D. Wang, D. Foreman-Mackey, D. Janzing, C.-J. Simon-Gabriel, and J. Peters. Removing systematic errors for exoplanet search via latent causes. In *Proceedings of the 32nd International Conference on Machine Learning (ICML)*, pages 2218–2226. ACM Press, 2015
 28. B. Schölkopf, K. Muandet, K. Fukumizu, S. Harmeling, and J. Peters. Computing functions of random variables via reproducing kernel hilbert space representations. *Statistics and Computing*, 25(4):755–766, 2015
 29. J. Peters and P. Bühlmann. Structural intervention distance (SID) for evaluating causal graphs. *Neural Computation*, 27:771–799, 2015
 30. J. Peters. On the intersection property of conditional independence and its application to causal discovery. *Journal of Causal Inference*, 3:97–108, 2014
 31. P. Bühlmann, J. Peters, and J. Ernest. CAM: Causal additive models, high-dimensional order search and penalized regression. *Annals of Statistics*, 42:2526–2556, 2014
 32. J. Peters, J. M. Mooij, D. Janzing, and B. Schölkopf. Causal discovery with continuous additive noise models. *Journal of Machine Learning Research*, 15:2009–2053, 2014

33. J. Peters and P. Bühlmann. Identifiability of Gaussian structural equation models with equal error variances. *Biometrika*, 101(1):219–228, 2014
34. J. Peters, D. Janzing, and B. Schölkopf. Causal inference on time series using structural equation models. In *Advances in Neural Information Processing Systems 26 (NeurIPS)*, pages 585–592. Curran Associates, Inc., 2013
35. L. Bottou, J. Peters, J. Quiñonero-Candela, D. X. Charles, D. M. Chickering, E. Portugualy, D. Ray, P. Simard, and E. Snelson. Counterfactual reasoning and learning systems: The example of computational advertising. *Journal of Machine Learning Research*, 14:3207–3260, 2013
36. E. Sgouritsa, D. Janzing, J. Peters, and B. Schölkopf. Identifying finite mixtures of nonparametric product distributions and causal inference of confounders. In *Proceedings of the 29th Annual Conference on Uncertainty in Artificial Intelligence (UAI)*, pages 556–565. AUAI Press, 2013
37. B. Schölkopf, D. Janzing, J. Peters, E. Sgouritsa, K. Zhang, and J. M. Mooij. On causal and anticausal learning. In *Proceedings of the 29th International Conference on Machine Learning (ICML)*, pages 1255–1262. Omnipress, 2012
38. J. Peters, J. M. Mooij, D. Janzing, and B. Schölkopf. Identifiability of causal graphs using functional models. In *Proceedings of the 27th Annual Conference on Uncertainty in Artificial Intelligence (UAI)*, pages 589–598. AUAI Press, 2011
39. D. Janzing, E. Sgouritsa, O. Stegle, J. Peters, and B. Schölkopf. Detecting low-complexity unobserved causes. In *Proceedings of the 27th Annual Conference on Uncertainty in Artificial Intelligence (UAI)*, pages 383–391. AUAI Press, 2011
40. K. Zhang, J. Peters, D. Janzing, and B. Schölkopf. Kernel-based conditional independence test and application in causal discovery. In *Proceedings of the 27th Annual Conference on Uncertainty in Artificial Intelligence (UAI)*, pages 804–813. AUAI Press, 2011
41. J. Peters, D. Janzing, and B. Schölkopf. Causal inference on discrete data using additive noise models. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 33:2436–2450, 2011
42. J. Peters, D. Janzing, and B. Schölkopf. Identifying cause and effect on discrete data using additive noise models. In *Proceedings of the 13th conference on Artificial Intelligence and Statistics (AISTATS)*, volume 9, pages 597–604. Journal of Machine Learning Research: Workshop and Conference Proceedings, 2010
43. D. Janzing, J. Peters, J. M. Mooij, and B. Schölkopf. Identifying confounders using additive noise models. In *Proceedings of the 25th Annual Conference on Uncertainty in Artificial Intelligence (UAI)*, pages 249–257. AUAI Press, 2009
44. J. M. Mooij, D. Janzing, J. Peters, and B. Schölkopf. Regression by dependence minimization and its application to causal inference. In *Proceedings of the 26th International Conference on Machine Learning (ICML)*, pages 745–752. ACM Press, 2009
45. J. Peters, D. Janzing, A. Gretton, and B. Schölkopf. Detecting the direction of causal time series. In *Proceedings of the 26th International Conference on Machine Learning (ICML)*, pages 801–808. ACM Press, 2009
46. P. O. Hoyer, D. Janzing, J. M. Mooij, J. Peters, and B. Schölkopf. Nonlinear causal discovery with additive noise models. In *Advances in Neural Information Processing Systems 21 (NeurIPS)*, pages 689–696. Curran Associates, Inc., 2009