

# Bryon Aragam

## Curriculum vitae

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### Current position

2019– **Assistant Professor**, *Econometrics and Statistics*, Booth School of Business, University of Chicago  
Robert H. Topel Faculty Scholar

### Research Interests

- Statistical machine learning and nonparametric statistics
- Latent variable models, generative models, and unsupervised learning
- Causality, graphical models, and deep learning
- Interpretability, fairness, and personalization

### Academic Background

- 2016–2019 **Postdoctoral researcher**, *Machine Learning Department*, Carnegie Mellon University  
UseR!2017 Young Academics Scholarship
- 2010–2015 **Doctor of Philosophy**, *Statistics*, University of California, Los Angeles (UCLA)  
Most Promising Theoretical Statistician  
NSF Graduate Research Fellowship  
UCLA Dissertation Year Fellowship  
Teaching Assistant Coordinator
- 2009–2010 **Master of Arts**, *Applied Mathematics*, University of California, Los Angeles (UCLA)
- 2004–2008 **Bachelor of Science with Honours**, *Mathematics*, University of Tennessee, Knoxville  
John H. Barrett Prize for outstanding undergraduate mathematics major  
Chancellor's Honors Program Undergraduate Research Grant  
First Place, Allen Medal Mathematics Competition

### Publications

*\*alphabetical author order*

**Journals: Stat/ML theory and methodology**

AOS Uniform consistency in nonparametric mixture models

**\*B Aragam** and R Yang

*Annals of Statistics*, Volume 51, Number 1 (2023), 362–390, arXiv:2108.14003

JMLR Fundamental limits and tradeoffs in invariant representation learning

H Zhao, C Dan, **B Aragam**, T Jaakkola, G Gordon, and P Ravikumar

*Journal of Machine Learning Research*, 23(340):1–49, 2022, arXiv:2012.10713

- AOS Identifiability of nonparametric mixture models and Bayes optimal clustering  
**B Aragam**, C Dan, EP Xing, and P Ravikumar  
*Annals of Statistics*, Volume 48, Number 4 (2020), 2277–2302, arXiv:1802.04397
- JSS Learning large-scale Bayesian networks with the sparsebn package  
**B Aragam**, J Gu, and Q Zhou  
*Journal of Statistical Software*, 91(11), 1–38, arXiv:1703.04025
- JMLR Concave penalized estimation of sparse Gaussian Bayesian networks  
**B Aragam** and Q Zhou  
*Journal of Machine Learning Research*, 16:2273–2328, arXiv:1401.0852

### Peer-reviewed ML conferences

*CS/ML conferences are peer reviewed (double-blind) with low acceptance rates (20-30%) and are considered more prestigious than CS/ML journals. Spotlight and oral designations indicate the top few percent of papers. This list does not include workshop papers.*

- NeurIPS Learning nonparametric latent causal graphs with unknown interventions  
Y Jiang and **B Aragam**  
*Advances in Neural Information Processing Systems*, arXiv:2306.02899
- NeurIPS Global optimality in bivariate gradient-based DAG learning  
C Deng, K Bello, **B Aragam** and P Ravikumar  
*Advances in Neural Information Processing Systems*, arXiv:2306.17378
- NeurIPS iSCAN: Identifying causal mechanism shifts among nonlinear additive noise models  
T Chen, K Bello, **B Aragam**, and P Ravikumar  
*Advances in Neural Information Processing Systems*, arXiv:2306.17361
- NeurIPS Uncovering meanings of embeddings via partial orthogonality  
Y Jiang, **B Aragam**, and V Veitch  
*Advances in Neural Information Processing Systems*, arXiv:2310.17611
- NeurIPS Assumption violations in causal discovery and the robustness of score matching  
F Montagna, AA Mastakouri, E Eulig, N Noceti, L Rosasco, D Janzing, **B Aragam**, and F Locatello  
*Advances in Neural Information Processing Systems*, arXiv:2310.13387
- NeurIPS Learning linear causal representations from interventions under general nonlinear  
**(oral)** mixing  
S Buchholz, G Rajendran, E Rosenfeld, **B Aragam**, B Schölkopf, and P Ravikumar  
*Advances in Neural Information Processing Systems*, arXiv:2306.02235
- COLT Tight bounds on the hardness of learning simple nonparametric mixtures  
**\*B Aragam** and WM Tai  
*Conference on Learning Theory*, arXiv:2203.15150
- ICML Learning mixtures of gaussians with censored data  
**\*B Aragam** and WM Tai  
*International Conference on Machine Learning*, arXiv:2305.04127
- ICML Optimizing NOTEARS objectives via topological swaps  
C Deng, K Bello, **B Aragam** and P Ravikumar  
*International Conference on Machine Learning*, arXiv:2305.17277

- NeurIPS Identifiability of deep generative models without auxiliary information  
(spotlight) G Rajendran, B Kivva, P Ravikumar, and **B Aragam**  
*Advances in Neural Information Processing Systems*, arXiv:2206.10044
- NeurIPS DAGMA: Learning DAGs via M-matrices and a log-determinant acyclicity characterization  
 K Bello, **B Aragam**, and P Ravikumar  
*Advances in Neural Information Processing Systems*, arXiv:2209.08037
- AISTATS Optimal estimation of Gaussian DAG models  
 M Gao, WM Tai, and **B Aragam**  
*International Conference on Artificial Intelligence and Statistics*, arXiv:2201.10548
- AISTATS On perfectness in Gaussian graphical models  
 AA Amini, **B Aragam**, and Q Zhou  
*International Conference on Artificial Intelligence and Statistics*, arXiv:1909.01978
- NeurIPS Learning latent causal graphs via mixture oracles  
 G Rajendran, B Kivva, P Ravikumar, and **B Aragam**  
*Advances in Neural Information Processing Systems*, arXiv:2106.15563
- NeurIPS Structure learning in polynomial time: Greedy algorithms, Bregman information, and exponential families  
 G Rajendran, B Kivva, M Gao, and **B Aragam**  
*Advances in Neural Information Processing Systems*, arXiv:2110.04719
- NeurIPS Efficient Bayesian network structure learning via local Markov boundary search  
 M Gao and **B Aragam**  
*Advances in Neural Information Processing Systems*, arXiv:2110.06082
- NeurIPS A polynomial-time algorithm for learning nonparametric causal graphs  
 M Gao, Y Ding, and **B Aragam**  
*Advances in Neural Information Processing Systems*, arXiv:2006.11970
- UAI Automated dependency plots  
 D Inouye, L Liu, J Kim, **B Aragam**, and P Ravikumar  
*Uncertainty in Artificial Intelligence*, arXiv:1912.01108
- AISTATS DYNOTEARS: Structure learning from time-series data  
 R Pamfil, N Sriwattanaworachai, P Pilgerstorfer, S Desai, K Georgatzis, P Beaumont, and **B Aragam**  
*International Conference on Artificial Intelligence and Statistics*, arXiv:2002.00498
- AISTATS Learning sparse nonparametric DAGs  
 X Zheng, C Dan, **B Aragam**, P Ravikumar, and EP Xing  
*International Conference on Artificial Intelligence and Statistics*, arXiv:1909.13189
- NeurIPS Globally optimal score-based learning of directed acyclic graphs in high-dimensions  
**B Aragam**, AA Amini, and Q Zhou  
*Advances in Neural Information Processing Systems*
- NeurIPS Learning sample-specific models with low-rank personalized regression  
 B Lengerich, **B Aragam**, and EP Xing  
*Advances in Neural Information Processing Systems*, arXiv:1910.06939

ICML Fault tolerance in iterative-convergent machine learning

A Qiao, **B Aragam**, B Zhang, and EP Xing

*36th International Conference on Machine Learning*, arXiv:1810.07354

NeurIPS DAGs with NO TEARS: Continuous optimization for structure learning  
(spotlight) X Zheng, **B Aragam**, P Ravikumar, and EP Xing

*Advances in Neural Information Processing Systems*, arXiv:1803.01422

NeurIPS The sample complexity of semi-supervised learning with nonparametric mixture models

C Dan, L Liu, **B Aragam**, P Ravikumar, and EP Xing

*Advances in Neural Information Processing Systems*, arXiv:1809.03073

### Journals: Biomedical applications

JCB Tradeoffs of Linear Mixed Models in Genome-wide Association Studies

H Wang, **B Aragam**, and EP Xing

*Journal of Computational Biology*, 29 (3), 233-242, 2022

Bioinformatics Personalized regression enables sample-specific pan-cancer analysis

B Lengerich, **B Aragam**, and EP Xing

*Bioinformatics*, Volume 34, Issue 13, 1 July 2018, Pages i178–i186

Also appears in the *26th Conference on Intelligent Systems for Molecular Biology (ISMB)*

Bioinformatics Precision Lasso: Accounting for correlations and linear dependencies in high-dimensional genomic data

H Wang, B Lengerich, **B Aragam**, and EP Xing

*Bioinformatics*, Volume 35, Issue 7, 01 April 2019, Pages 1181–1187

Methods Variable selection in heterogeneous datasets: A truncated-rank sparse linear mixed model with applications to genome-wide association studies

H Wang, **B Aragam**, and EP Xing

*Methods*, Volume 145, 2–9

## Preprints and working papers

*For an updated list of preprints, please see my website.*

A non-graphical representation of conditional independence via the neighbourhood lattice

\*AA Amini, **B Aragam**, and Q Zhou

arXiv:2206.05829

Optimal neighbourhood selection in structural equation models

M Gao, WM Tai, and **B Aragam**

arXiv:2306.02244

Neuro-causal factor analysis

A Markham, M Liu, **B Aragam**, and L Solus

arXiv:2305.19802

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## Software

- 2022 DAGMA algorithm ([GitHub link](#))  
Faster and more accurate continuous constrained optimization for structure learning based on a new acyclicity characterization via the log-det function.
- 2021 TAM algorithm ([GitHub link](#))  
Efficient nonparametric DAG learning based on entropic conditions.
- 2020 Automated dependence plots ([GitHub link](#))  
Python library for auditing, checking, and explaining black-box machine learning models by automating the selection of interesting dependence plots
- 2018– NOTEARS algorithm ([GitHub link](#))  
Continuous optimization for Bayesian network structure learning via black-box solvers
- 2018 Personalized regression ([GitHub link](#))  
Python code for learning sample-specific, personalized regression models
- 2018 Precision Lasso ([GitHub link](#))  
A variant of the Lasso designed to adapt to and account for correlations and dependencies in high-dimensional data
- 2016– `sparsebn` package for R ([CRAN link](#), [Github link](#))  
Comprehensive package for learning large-scale Bayesian networks based on sparse regularization
- 2015 `ccdr` package for R ([Github link](#))  
Software for learning Gaussian BNs with thousands of variables

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## Presentations and Talks

- 2024 ACIC, JSM, ISBA  
(upcoming)
- 2023 Institute for Statistical Mathematics (Tokyo), Shiga, Caltech, Columbia, Cornell, MPI-Tübingen, Simons Institute, Workshop on Algebraic Economics (IMSI), Workshop on Bayesian Statistics and Statistical Learning (IMSI), MMLS, EcoSta
- 2022 Balyasny Asset Management, Simons Institute
- 2021 University of Illinois-Chicago, KTH
- 2020 Wisconsin, UChicago, TTIC, Causal Data Science
- 2019 UBC, SFU, UChicago, UToronto, UCL Gatsby, Texas A&M, Chicago Booth, Wisconsin, Michigan, Purdue, ICSA
- 2018 UIUC, UCLA, OSU, CMU, Hulu, IBM

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## Grants

*Also awarded the NSF GRFP fellowship and a dissertation fellowship as a graduate student.*

- 2020–2023 NSF RI MEDIUM IIS-1956330, *A Rigorous, General Framework for Tractable Learning of Large-Scale DAGs from Data*  
Principal Investigator

2020–2024 NIH NIGMS R01GM140467, *Sample-specific Models for Molecular Portraits of Diseases in Precision Medicine*  
Co-Investigator

## Service

### Conference organizing committees

2024 UAI *Sponsorship chair*  
2023 UAI *Discussion chair*

### Editorial

2023– TMLR *Action editor*  
2022– ICML *Area chair*  
2021– ICLR *Area chair*  
2020– NeurIPS *Area chair*

### University service

2023 Rising Stars Conference (Booth) *Moderator*  
2023 Data Science Institute Summer Lab (UChicago) *Mentor and panelist*  
2022– Committee on Quantitative Methods (UChicago) *Faculty member*  
2021 Center for Data and Computing Summer Lab (UChicago) *Mentor and panelist*  
2021 Center for Data and Computing Rising Stars Program (UChicago) *Mentor and panelist*

### Journal and conference reviewing

AOS, JASA, Biometrika, AOAS, IEEE Information Theory, JMLR, JAIR, JMVA, SIMODS, TPAMI, TNNLS, TNSE, JSS, SIAP, JCGS, Bioinformatics, PLoS Computational Biology, PLoS ONE, NeurIPS, ICML, AISTATS

### Grant review

2021 NSF Robust Intelligence (RI) *Panelist and reviewer*  
2017 Machine Learning for Social Good (CMU) *Panelist and reviewer*

### Miscellaneous

2021 AISTATS 2022 Submission Mentorship Program *Mentor*  
2021 LatinX in AI Mentoring Program *Mentor*

## Teaching

### Instructor

2020– **Business Statistics**, *BUSN 41000*, Booth School of Business  
2017 **Data Analysis Project Preparation**, *Machine Learning 10-821*, CMU  
2015–16 **Introduction to Statistical Reasoning**, *Statistics 10*, UCLA  
2015 **Teaching College Statistics**, *Statistics 495A*, UCLA