

Elias Bareinboim

Email: eb@purdue.edu — Phone: 310-267-5645

Address: 305 N University Street 2142L, Purdue University, West Lafayette, IN, 47907.

Main Research Interests

- Artificial Intelligence, Machine Learning, Statistics, Data Science.
- Causality and applications in Bioinformatics, Medicine, Public Health, Economics.
- Robotics, Cognitive Science, Philosophy of Science.

Education

- Ph.D. in Computer Science – University of California, Los Angeles (UCLA), 2014.
Dissertation Title: *Generalizability in Causal Inference: Theory and Algorithms*
Committee: Judea Pearl, Eleazar Eskin, David Heckerman, Rosa Matzkin, Song-Chun Zhu.
- M.Sc. in Computer Science – Federal University of Rio de Janeiro (UFRJ), 2007.
- B.Sc. in Computer Science – Federal University of Rio de Janeiro (UFRJ), 2004.

Academic Positions

- Assistant Professor, Computer Science, Purdue University, Fall/2015-now.
- Assistant Professor (courtesy appointment), Statistics, Purdue University, Fall/2015-now.
- Faculty Affiliate, Regenstrief Center for Healthcare Engineering, Purdue University, Jun/2017-now.
- Postdoctoral Scholar, Cognitive Systems Lab/UCLA, Judea Pearl, Fall/2014-Summer/2015.
- Research Assistant, Cognitive Systems Lab/UCLA, Judea Pearl, Fall/2009-Summer/2014.

Teaching

At Purdue (instructor):

- CS 47100 (undergraduate), Introduction to Artificial Intelligence, Spring/2017.
- CS 59000-AI (graduate), Artificial Intelligence, Fall/2016.
- CS 59000-AML (graduate), Advanced Machine Learning / Causal Inference, Spring/2016.
- CS 57800 (graduate) Machine Learning, Fall/2015.

Before Purdue:

- CS 262Z (graduate), Causal Inference, instructor with J. Pearl and J. Tian, UCLA, Spring/2013.
- CS 262Z (graduate), Causal Inference, teaching assistant, UCLA, Spring/2010, Spring/2011.
- MAB 525 (undergrad), Special Topics in Artificial Intelligence, instructor with J. C. P. Silva, Federal University of Rio de Janeiro (UFRJ), Spring/2007.

Awards and Honors

- AI's 10 to Watch, IEEE Intelligent Systems, 2016.
- NIPS-16 Outstanding Reviewer Award, 2016.
- Notable Paper, 19th Annual Best of Computing, ACM Computing Reviews, 2015.
- Edward K. Rice Outstanding Doctoral Student Award (given to a single PhD student in all engineering and applied sciences majors), School of Engineering and Applied Sciences, UCLA, 2014.
- AAAI-14 Outstanding Paper Award (1 out of 1406 papers), 2014.
- Outstanding Graduating PhD Student (commencement award), Computer Science, UCLA, 2014.
- Google Outstanding Graduate Research Award, Computer Science, UCLA, 2014.
- Dan David Prize Scholarship, area Artificial Intelligence (\$15,000), Tel Aviv University, 2014.

- UCLA Dissertation Year Fellowship (DYF) (~\$35,000), 2013-2014.
- Yahoo! Key Scientific Challenges Award, area Machine Learning & Statistics (\$5,000), 2012.
- ACM A.M. Turing Centenary Celebration Student Scholarship - SIGACT, 2012.
- Ph.D.'s Fellowship, UCLA (~\$45,000), 2008-2009.
- Top 10 award – National contest of M.Sc. thesis (2007), Brazilian Computer Society, 2008.
- Ph.D.'s Fellowship, Fulbright – U.S. Dep. of State / CAPES-MEC, declined, 2008-2012.
- Ph.D.'s Fellowship, Brazilian Research Council CNPq, declined, 2008-2012.
- Master's Fellowship, Special Program, Ministry of Education – COPPE / UFRJ, 2005-2007.
- Undergraduate's Fellowship, Brazilian Research Council CNPq, 2003-2005.

Selected Publications

27. Bryant Chen, Daniel Kumor, [Elias Bareinboim](#) (2017)
Identification and Model Testing in Linear Structural Equation Models using Auxiliary Variables
Proceedings of the 34th International Conference on Machine Learning (ICML), 2017.
26. Andrew Forney, Judea Pearl, [Elias Bareinboim](#) (2017)
Counterfactual Data-Fusion for Online Reinforcement Learners
Proceedings of the 34th International Conference on Machine Learning (ICML), 2017.
25. Junzhe Zhang and [Elias Bareinboim](#) (2017)
Transfer Learning in Multi-Armed Bandits: A Causal Approach
Proceedings of the 26th International Joint Conference on Artificial Intelligence (IJCAI), 2017.
24. Juan Correa and [Elias Bareinboim](#) (2017)
Causal Effect Identification by Adjustment under Confounding and Selection Biases
Proceedings of the 31th AAAI Conference on Artificial Intelligence, AAAI Pr, 2017.
23. Junzhe Zhang and [Elias Bareinboim](#) (2016)
Markov Decision Processes with Unobserved Confounders: A Causal Approach
Purdue AI Laboratory, Technical Report (R-23), Dec/2016.
22. Bryant Chen, Judea Pearl, [Elias Bareinboim](#) (2016)
Identification by Auxiliary Instrumental Sets in Linear Structural Equation Models
Proceedings of the 25th International Joint Conference on Artificial Intelligence (IJCAI), AAAI Press, pp. 3577-3583, 2016.
21. [Elias Bareinboim](#) (2016)
Comment on “Causal Inference using invariance prediction: identification and confidence intervals by Peters, Buhlmann and Meinshausen”
Journal of the Royal Statistical Society, Series B, forthcoming.
20. [Elias Bareinboim](#) and Judea Pearl (2016)
Causal Inference and the Data-Fusion Problem
Proceedings of the National Academy of Sciences (PNAS), v. 113(27), 2016.
19. [Elias Bareinboim](#), Andrew Forney, Judea Pearl (2015)
Bandits with Unobserved Confounders: A Causal Approach
Proceedings of the 28th Annual Conference on Neural Information Processing Systems (NIPS), pp. 1342-1350, 2015.

18. [Elias Bareinboim](#) and Jin Tian (2015)
Recovering Causal Effects From Selection Bias
Proceedings of the 29th AAAI Conference on Artificial Intelligence, AAAI Pr, pp. 3475-3481, 2015.
17. Judea Pearl and [Elias Bareinboim](#) (2014)
External Validity: From do-calculus to Transportability across Populations
Statistical Science, v. 29(4), pp. 579-595, 2014.
16. [Elias Bareinboim](#) and Judea Pearl (2014)
Transportability from Multiple Environments with Limited Experiments: Completeness Results
Proceedings of the 27th Annual Conference on Neural Information Processing Systems (NIPS), pp. 280-288, 2014.
15. [Elias Bareinboim](#), Jin Tian, Judea Pearl (2014)
Recovering from Selection Bias in Causal and Statistical Inference
Proceedings of the 28th AAAI Conference on Artificial Intelligence, AAAI Pr, pp. 2410-2416, 2014.
Outstanding Paper Award (1 out of 398 accepted papers).
14. [Elias Bareinboim](#) and Judea Pearl (2013)
A General Algorithm for Deciding Transportability of Experimental Results
Journal of Causal Inference, v. 1(1), pp. 107-134, 2013.
13. [Elias Bareinboim](#), Sanghack Lee, Vasant Honavar, Judea Pearl (2013)
Transportability from Multiple Environments with Limited Experiments
Proceedings of the 26th Annual Conference on Neural Information Processing Systems (NIPS), pp. 136-144, 2013.
12. [Elias Bareinboim](#) and Judea Pearl (2013)
Causal Transportability with Limited Experiments
Proceedings of the 27th AAAI Conference on Artificial Intelligence, AAAI Press, pp. 95-101, 2013.
11. [Elias Bareinboim](#) and Judea Pearl (2013)
Meta-transportability of Causal Effects: A Formal Approach
Proceedings of the 16th International Conference on Artificial Intelligence and Statistics (AISTATS), JMLR, pp. 135-143, 2013.
10. [Elias Bareinboim](#) and Judea Pearl (2012)
Causal Inference by Surrogate Experiments (or, z -Identifiability)
Proceedings of the 28th Conference on Uncertainty in Artificial Intelligence (UAI), AUAI Press, pp. 113-120, 2012.
9. [Elias Bareinboim](#) and Judea Pearl (2012)
Transportability of Causal Effects: Completeness Results
Proceedings of the 26th AAAI Conference on Artificial Intelligence, AAAI Press, pp. 698-704, 2012.
8. [Elias Bareinboim](#), Carlos Brito, Judea Pearl (2012)
Local characterizations of Causal Bayesian Networks
Lecture Notes in Artificial Intelligence, v. 7205, Springer-Verlag, pp. 1-17, 2012.
7. [Elias Bareinboim](#) and Judea Pearl (2012)
Controlling selection bias in Causal Inference

Proceedings of the 15th International Conference on Artificial Intelligence and Statistics (AISTATS), JMLR, pp. 100-108, 2012.

6. Judea Pearl and Elias Bareinboim (2011)
Transportability across studies: A formal approach
Proceedings of the 25th AAAI Conference on Artificial Intelligence, AAAI Press, pp. 247-254, 2011.
5. Judea Pearl and Elias Bareinboim (2011)
External Validity and Transportability: A formal approach
Proceedings of the Joint Statistical Meetings, American Statistical Association, pp. 157-171, 2011.
4. Paulo Carvalho, J. Fischer, J. Perales, J. Yates, V. C. Barbosa, Elias Bareinboim (2011)
A statistical approach for analyzing marginal cases in shotgun proteomics
Bioinformatics, v. 27(2), 2011.
3. Elias Bareinboim, Carlos Brito, Judea Pearl (2011)
Local characterizations of Causal Bayesian Networks
Proceedings of Graph Structures for Knowledge Representation and Reasoning – IJCAI, 2011.
2. Elias Bareinboim and Valmir C. Barbosa (2008)
Descents and nodal load in scale-free networks
Physical Review E, v. 77(4), American Physical Society, 2008.
1. Elias Bareinboim, Ana T. R. Vasconcelos, Joao C. P. Silva (2007)
Grammatical inference applied to linguistic modeling of biological networks
E. Journal of Communication, Information & Innovation in Health, v.1, pp. 329-333, 2007.

Tutorials / Short Courses

- “Causal Inference and the Data-Fusion Problem”
International Conference on Autonomous Agents and Multi-agent Systems (AAMAS), Sao Paulo, Brazil, May/2017, forthcoming.
- “Introduction to Causal Inference”
West Coast Experiments Conference (Graphical Models in Economics), Los Angeles, CA, Apr/2017.
- “Causal Inference and the Data-Fusion Problem”
Association for Advancement of Artificial Intelligence (AAAI), San Francisco, CA, Feb/2017.
- “Causal Inference and the Data-Fusion Problem”
Department of Computing Science, University of Alberta, Edmonton, Canada, August/2016.
- “Causes and Counterfactuals: Concepts, principles, and tools” (with J. Pearl)
Neural Information Processing (NIPS), Lake Tahoe, Nevada, December/2013.
- “Causality and Big Data”
EMC² Summer School on Big Data, Rio de Janeiro, Brazil, February/2013.
- “An Introduction to Causal Inference”
The Second IEEE Conference on Healthcare Informatics and Systems Biology (Analyzing Big Data For Healthcare and Biomedical Sciences), UCSD, La Jolla, California, September/2012.

Invited Talks / Presentations

- 2017 CVRP-17 Workshop “Functionality, Physics, Intentionality, and Causality (FPIC)”, Honolulu, HI, forthcoming.

- 2017 Statistical Society of Canada Annual Meeting, Winnipeg, Canada.
- 2017 School of Engineering, University of São Paulo (USP), São Paulo, Brazil.
- 2017 Institute of Computing, University of Campinas (UNICAMP), Campinas, Brazil.
- 2017 Workshop on Causal Analysis in the Social Sciences (Sloan), UCLA, CA.
- 2017 NSF Workshop: Advancing the Science of Transportation Demand Modeling, UC Berkeley, CA.
- 2017 Computer Science, University of Wisconsin, Madison, WI.
- 2017 Computer Science, ISI / University of Southern California (USC), CA.
- 2016 NIPS-16 Workshop “Inference and Learning of Hypothetical and Counterfactual Interventions in Complex Systems”, Barcelona, Spain.
- 2016 AAAI-16 Fall Symposium on Accelerating Science: A Grand Challenge for AI, Arlington, VA.
- 2016 Department of Public Health Sciences, University of Chicago, Chicago.
- 2016 54th Allerton Conference on Communication, Control, and Computing, UIUC, IL.
- 2016 Department of Computing Science, University of Alberta, Edmonton, Canada.
- 2016 International Conference on Thinking (ICT), Providence, RI.
- 2016 Joint Statistical Meetings (JSM), Chicago, IL.
- 2016 Workshop on Statistical Causal Inference and its Applications to Genetics, Centre de Recherches Mathématiques (CRM), Montreal, Canada.
- 2016 Frontiers of Engineering Symposium (US-JP), National Academy of Engineering (NAE), CA.
- 2016 Max Planck Institute (Empirical Inference), Tübingen, Germany.
- 2016 Department of Computer Science and Mathematics, University of Passau, Germany.
- 2016 Munich Workshop on Causal Inference and Information Theory (MCI), Munich, Germany.
- 2016 Statistics Colloquium, Purdue University, West Lafayette, IN.
- 2015 Computer Science, Purdue University, West Lafayette, Indiana.
- 2015 Biostatistics and Computer Science, Johns Hopkins University, Baltimore, Maryland.
- 2015 Computer Science Division, University of California, Berkeley, California.
- 2015 Department of Computer Science, University of Southern California (USC), CA.
- 2015 School of Information and Computer Science, University of California, Irvine, CA.
- 2015 Department of Computer Science, Cornell University, New York.
- 2015 Department of Statistics, Stanford University, California.
- 2015 World Congress of Statistics, International Statistics Institute, Brazil.
- 2014 Department of Economics, University of Chicago, Chicago.
- 2014 Kyoto International Conference on Modern Statistics, Kyoto.
- 2014 International Workshop on Causal Inference and its related topics, Tokyo.
- 2014 ACM-SIGKDD-14 Workshop on Discovery Informatics, New York.
- 2014 UAI-14 Workshop on Causality: Learning and Prediction, Quebec City, Canada.
- 2014 NICTA, Sydney, Australia.
- 2014 Institute of Mathematical Statistics (IMS) Annual Meeting, Sydney, Australia.
- 2014 MURI, Office of Naval Research (ONR), UCLA, Los Angeles, California.
- 2014 Atlantic Causal Inference Conference, Brown University, Providence, RI.
- 2014 Joint Mathematics Meetings, American Mathematical Society, Baltimore, Maryland.
- 2013 NIPS-13 Workshop on Causality (Large-scale Experimental Design), Lake Tahoe, NV.
- 2013 MURI, Office of Naval Research (ONR), UCLA, Los Angeles, California.
- 2012 Graduate School of Engineering, Federal University of Rio de Janeiro (UFRJ), Brazil.

- 2012 Computer Science Colloquium, Federal University of Rio de Janeiro (UFRJ), Brazil.
- 2012 MURI, Office of Naval Research (ONR), UCLA, Los Angeles, California.
- 2011 International Workshop on Mining Multiple Information Sources, International Conference on Data Mining (ICDM), Vancouver, Canada.
- 2011 58th World Congress of Statistics, International Statistics Institute (ISI), Dublin.
- 2011 DERI/National University of Ireland (NUI), Galway, Ireland.

Funding

- DARPA FunLol (Fundamental Limits of Learning), co-PI
Title: Fundamental Limits of Learning Concepts and Models for Complex Systems
Amount: approx. \$125,000 (=16.6% of total), 10/01/16 - 12/01/17.

Professional Service

- Member of the editorial board, Journal of Causal Inference, 2017-now.
- Chair (with K. Zhang, C. Uhler, J. Zhang, D. Janzing), 7th UAI Causality Workshop, 2017.
- Co-organizer (with K. Zhang, J. Li, L. Liu), KDD Workshop on Causal Discovery, 2016.
- Co-organizer (with F. Eberhardt, R. Silva, J. Mooij, M. Maathuis), UAI Causality Workshop, 2016.
- Guest Editor (with J. Pearl, B. Schölkopf, K. Zhang, J. Li), Special Issue on Causality, ACM Transactions on Intelligent Systems and Technology (TIST), 2015.
- Co-organizer (with B. Schölkopf, K. Zhang, J. Zhang), ICML 2014 Workshop on Causal Modeling and Machine Learning, 2014.
- Reviewer, National Science Foundation (NSF).area: Methodology, Measurement, and Statistics, 2014.
- Program Committee-Conferences:
 - 2017: UAI, AAI, AISTATS, NIPS (rev).
 - 2016: UAI, AAI, IJCAI, ECAI, NIPS (rev).
 - 2015: UAI, UAI-Causality, AAI, AISTATS, NIPS (rev).
 - 2014: UAI, ICML, AISTATS, KDD-DI.
 - 2013: UAI, ICML, AAI, IJCAI, NIPS-Causality, IEEE-BigData, UAI-Causality.
 - 2012: UAI, ICML.
 - 2011: UAI, IJCAI, NIPS (rev), ICDM-MMIS.
 - 2010: KR (rev).
- Reviewer-Journals:
 - 2017: J. of Machine Learning Research (JMLR), J. of Causal Inference.
 - 2016: Biometrika, Bayesian Analysis, J. Causal Inference, Epidemiology, Behaviormetrika.
 - 2015: Artificial Intelligence Journal, Biometrics, J. of Causal Inference, Epidemiology.
 - 2014: Statistical Science, The British Journal for the Philosophy of Science, Annals of Applied Statistics.
 - 2013: Scandinavian Journal of Statistics, Annals of Applied Statistics, J. of Machine Learning Research (JMLR), J. of Causal Inference, Statistics in Medicine, Statistics.
 - 2012: J. of Machine Learning Research (JMLR), IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI), Statistics in Medicine, Bioinformatics, J. of Proteome Research.
 - 2011: J. of Causal Inference.
 - 2009: J. of Proteomics, Bioinformatics, Physica A.
- Computer Science Department/Purdue:

- Member, Admissions Committee, cycle: Fall/2016, Fall/2017.
- Computer Science Department/UCLA:
 - Reviewer for PhD Admissions Committee, 2013-2014;
 - Invited discussant in panel about graduate school for new PhD students, 2013;
 - Mentor for 3 PhD students, 2010-2013.

Professional Associations

- Association for the Advancement of Artificial Intelligence (AAAI), since 2011.
- Association for Computing Machinery (ACM), since 2011.
- Brazilian Computer Society (SBC), since 2004.

Industrial Experience

- Intern (Systems/Data Mining), **Google Inc**, Mountain View/CA, USA, Summer 2009.
- Consultant-Software Engineer, **Programare Software Factory**, Brazil, Feb/2008 – Aug/2008.
- Co-Founder and Director, **Linux Solutions Ltda**, Brazil, 1999 – 2004.