Burak Varıcı

Curriculum Vitae

Machine Learning Department
Carnegie Mellon University
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Research Interests: I am broadly interested in the theoretical foundations of AI/ML, particularly in representation learning and causality. This involves developing novel theoretical results and scalable algorithms for identifiable representation learning, causal discovery, and intervention design, with a recent focus on applications in robotics.

Academic Position

07.2024 – present **Carnegie Mellon University, Machine Learning Department**, Pittsburgh, PA.
- Postdoctoral Research Associate
- Advisor: Prof. Pradeep Ravikumar

Education

2024 **Rensselaer Polytechnic Institute**, Troy, NY.
- Ph.D. in Electrical Computer, and Systems Engineering
- Advisor: Prof. Ali Tajer
- Dissertation: Causal Learning via Interventions: Estimation and Design

2020 **Rensselaer Polytechnic Institute**, Troy, NY.
- M.S. in Electrical Computer, and Systems Engineering

2018 **Bogazici University**, Istanbul, Turkey.
- B.S. in Electrical and Electronics Engineering

Professional Experience

09–12.2022 **MIT-IBM Watson AI Lab**, Cambridge, MA.
- Visiting Research Scholar
- Collaborators: Dr. Dmitriy A Katz, Dr. Prasanna Sattigeri, Dr. Dennis Wei

05–08.2020 **IBM Research**, remote.
- Research Intern
- Mentors: Dr. Prasanna Sattigeri, Dr. Karthikeyan Shanmugam

06–08.2017 **Speech Enabled Smart Technologies**, Istanbul, Turkey.
- Research Intern

Publications

* *denotes equal contribution .*

Selected Publications

JMLR'25 Score-based Causal Representation Learning: Linear and General Transformations,
B. Varıcı, E. Acartürk, K. Shanmugam, A. Kumar, and A. Tajer.
Journal of Machine Learning Research, 2025

ICML'25 Contextures: Representations from Contexts,
R. Zhai, K. Yang, **B. Varıcı**, CP. Tsai, and P. Ravikumar.
International Conference on Machine Learning, 2025

JMLR'23 Causal Bandits for Linear Structural Equation Models,
B. Varıcı, K. Shanmugam, P. Sattigeri, and A. Tajer.
Journal of Machine Learning Research, 2023

Preprints and Others

2025 Eigenfunction Extraction for Ordered Representation Learning,
B. Varıcı*, C.P. Tsai*, R. Ray, N. Boffi, and P. Ravikumar.
arXiv:2510.24672 (under review, submitted at October 2025)

2025 ROPES: Robotic Pose Estimation via Score-based Causal Representation Learning,
P. Kulkarni, P. Datta, E. Acartürk, **B. Varıcı**, K. Shanmugam, and A. Tajer.
arXiv:2510.20884, NeurIPS 2025 Workshop on Embodied World Models, also under review

2025 Stretch Transformation for Tabular Data,
Z. Ye, J. Kim, J. Sundberg, **B. Varıcı**, and P. Ravikumar.
(under review, submitted at September 2025)

2025 Causal Disentanglement from Evolving Latent Distributions,
E. Acartürk, **B. Varıcı**, K. Shanmugam, and A. Tajer.
(*working paper*)

2023 Score-based Causal Representation Learning with Interventions,
B. Varıcı, E. Acartürk, K. Shanmugam, A. Kumar, and A. Tajer.
arXiv:2301.08230, 2023

Peer-reviewed Journals

JMLR'25 Score-based Causal Representation Learning: Linear and General Transformations,
B. Varıcı, E. Acartürk, K. Shanmugam, A. Kumar, and A. Tajer.
Journal of Machine Learning Research, 2025

TMLR'24 Separability Analysis for Causal Discovery in Mixture of DAGs,
B. Varıcı, D. Katz-Rogozhnikov, D. Wei, P. Sattigeri, and A. Tajer.
Transactions on Machine Learning Research, 2024

JSAIT'24 Robust Causal Bandits for Linear Models,
Z. Yan, A. Mukherjee, **B. Varıcı**, and A. Tajer.
IEEE Journal on Selected Areas in Information Theory, 2024

JMLR'23 Causal Bandits for Linear Structural Equation Models,
B. Varıcı, K. Shanmugam, P. Sattigeri, and A. Tajer.
Journal of Machine Learning Research, 2023

Peer-reviewed Conferences

AI/ML conferences are peer-reviewed with low acceptance rates (20-30%) .

ICML'25 Contextures: Representations from Contexts,
R. Zhai, K. Yang, **B. Varıcı**, CP. Tsai, and P. Ravikumar.
International Conference on Machine Learning, 2025

AISTATS'25 On the Consistent Recovery of Joint Distributions from Conditionals,
M. Majid, R. Pukdee, V. Agrawal, **B. Varıcı**, and P. Ravikumar.
International Conference on Artificial Intelligence and Statistics, 2025

NeurIPS'24 Linear Causal Representation Learning from Unknown Multi-node Interventions,
B. Varıcı, E. Acartürk, K. Shanmugam, and A. Tajer.
Conference on Neural Information Processing Systems, 2024

NeurIPS'24 Sample Complexity of Interventional Causal Representation Learning,
E. Acartürk, **B. Varıcı**, K. Shanmugam, and A. Tajer.
Conference on Neural Information Processing Sytems, 2024

NeurIPS'24 Interventional Causal Discovery in a Mixture of DAGs,
B. Varıcı, D. Katz-Rogozhnikov, D. Wei, P. Sattigeri, and A. Tajer.
Conference on Neural Information Processing Systems, 2024

AISTATS'24 (oral) General Identifiability and Achievability for Causal Representation Learning,
B. Varıcı, E. Acartürk, K. Shanmugam, and A. Tajer.
International Conference on Artificial Intelligence and Statistics, May 2024

ISIT'24 Improved Bound for Robust Causal Bandits with Linear Models,
Z. Yan, A. Mukherjee, **B. Varıcı**, and A. Tajer.
International Symposium on Information Theory, 2024

UAI'22 Intervention Target Estimation in the Presence of Latent Variables,
B. Varıcı, K. Shanmugam, P. Sattigeri, and A. Tajer.
The Conference on Uncertainty in Artificial Intelligence, 2022

NeurIPS'21 Scalable Intervention Target Estimation in Linear Models,
B. Varıcı, K. Shanmugam, P. Sattigeri, and A. Tajer.
Conference on Neural Information Processing Systems, 2021

AISTATS'21 Learning Shared Subgraphs in Ising Model Pairs,
B. Varıcı*, S. Sihag*, and A. Tajer.
International Conference on Artificial Intelligence and Statistics, 2021

Book Chapters

2025 Causal Representation Learning,
B. Varıcı*, C. Squires*, and P. Ravikumar.
Book Chapter in Neuro-symbolic AI: Foundations and Applications, Wiley, December 2025.

Honors & Awards

2025 NeurIPS Top Reviewer
2020–2024 IBM AI Horizons Fellowship
2024 Allen B. Dumont Prize (RPI ECSE doctoral dissertation award)
2023 NeurIPS Top Reviewer, UAI Top Reviewer
2022 Belsky Award for RPI Computational Sciences and Engineering
2022 Jerry Dziuba ECSE Graduate Student Service Award
2013–2018 TUBITAK (Turkish Equivalent of NSF) Undergraduate Fellowship
2012 Silver Medal, Turkish National Mathematical Olympiad
2012 Silver Medal, International Balkan Mathematical Olympiad
2010 Gold Medal, International Junior Balkan Mathematical Olympiad

Talks

Identifiable Representation Learning
01.2026 INFORMED-AI Seminar Series - University of Bristol
Causal Representation Learning
10.2025 CMU - Statistics and Machine Learning Reading Group
10.2025 KUIS (Koc University & Is Bank) AI Center
03.2025 Artificial Intelligence with Causal Techniques Workshop at AAAI
02.2025 Booth School of Business at University of Chicago – Aragam Group
03.2024 CMU - Statistical & Symbolic Learning Group
12.2023 NeurIPS Causal Representation Learning Workshop
Causal Bandits
02.2023 IBM Causal Reinforcement Learning Group

Tutorials

06.2025 (Contributor) Causal Representation Learning, NASIT, Minneapolis, MN
02.2025 (Presenter) Causal Representation Learning, AAAI Conference, Philadelphia, PA

Teaching Experience

2024–2025 **Guest Lecturer**, Carnegie Mellon University.
- CMU 10716: Advanced Machine Learning - Clustering
- CMU 10716: Advanced Machine Learning - Causality
- CMU 10741: Representation Learning - Causal Representation Learning

2018–2020 **Teaching Assistant**, Rensselaer Polytechnic Institute.
- ECSE 2410: Signals and Systems
- ECSE 2610: Computer Components and Operations
- ECSE 1010: Introduction to Electrical, Component, and Systems Engineering

Mentorship

2025– Utkarsh Priyam (CMU M.S. → CMU Ph.D.)

2025– Zihao Ye (CMU M.S.)

2025– Arnav Mantro (CMU Undergrad → Bloomberg Data Science)

2025– Hugo Contant (CMU Undergrad)

2024 Vishwajeet Agrawal (CMU M.S. → Skild AI)

2024 Mahbod Majod (CMU Ph.D. → MIT Ph.D.)

2022-2024 Emre Acartürk (RPI Ph.D.)

Academic Service

2026 Co-organizer of upcoming **Identifiable Representation Learning Workshop** in Fall 2026, The Banff International Research Station, Banff, Alberta, Canada

Journal Reviewer for IEEE Transactions on Signal Processing (2022–2025), Transactions on Machine Learning Research (2024,2025)

Conference Regularly reviewing since 2021 for conferences NeurIPS, ICML, AISTATS, AAAI, UAI, CLeaR

References

Prof. Ali Tajer, Professor
Department of Electrical, Computer, and Systems Engineering
Rensselaer Polytechnic Institute, Troy, NY
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Prof. Pradeep Ravikumar, Professor
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Google DeepMind India, Bengaluru, India
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Department of Electrical and Computer Engineering,
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