

Burak Varıcı

Curriculum Vitae

Machine Learning Department
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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 – **Carnegie Mellon University, Machine Learning Department**, Pittsburgh, PA.
present
 - 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
 - Project: Disentangled generative modeling
- 06–08.2017 **Speech Enabled Smart Technologies**, Istanbul, Turkey.
 - Research Intern
 - Project: Built neural networks for speaker identity verification.

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
- JMLR'23 **Causal Bandits for Linear Structural Equation Models**,
B. Varıcı, K. Shanmugam, P. Sattigeri, and A. Tajer.
Journal of Machine Learning Research, 2023
- ICML'25 **Contextures: Representations from Contexts**,
R. Zhai, K. Yang, **B. Varıcı**, CP. Tsai, and P. Ravikumar.
International Conference on Machine Learning, 2025

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 **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 Systems, 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 **General Identifiability and Achievability for Causal Representation Learning**,
(oral) **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

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

Teaching Experience

- 2024–2025 **Guest Lecturer**, Carnegie Mellon University.
 - o CMU 10716: Advanced Machine Learning - Clustering
 - o CMU 10716: Advanced Machine Learning - Causality
 - o CMU 10741: Representation Learning - Causal Representation Learning
- 2018–2020 **Teaching Assistant**, Rensselaer Polytechnic Institute.
 - o ECSE 2410: Signals and Systems
 - o ECSE 2610: Computer Components and Operations
 - o 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 Mantra (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

- Tutorial Co-lead presenter of Causal Representation Learning Tutorial, **AAAI 2025**, Philadelphia, PA
- Tutorial (Contributor) Causal Representation Learning, **NASIT 2025**, Minneapolis, MN
- Organizer 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
- Committee Secretary at RPI ECSE Graduate Student Council (2019–2022)
- Member

References

Prof. Ali Tajer, Professor
Department of Electrical, Computer, and Systems Engineering
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Prof. Pradeep Ravikumar, Professor
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