

# Burak Varici

## 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
  - 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. Varici**, 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. Varici**, K. Shanmugam, P. Sattigeri, and A. Tajer.  
*Journal of Machine Learning Research*, 2023
- ICML'25 *Contextures: Representations from Contexts*,  
R. Zhai, K. Yang, **B. Varici**, CP. Tsai, and P. Ravikumar.  
*International Conference on Machine Learning*, 2025

## Preprints and Others

- 2025 **Eigenfunction Extraction for Ordered Representation Learning**,  
**B. Varici\***, 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. Varici**, 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. Varici**, K. Shanmugam, and A. Tajer.  
(*working paper*)
- 2023 **Score-based Causal Representation Learning with Interventions**,  
**B. Varici**, 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. Varici**, 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. Varici**, 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. Varici**, and A. Tajer.  
*IEEE Journal on Selected Areas in Information Theory, 2024*
- JMLR'23 **Causal Bandits for Linear Structural Equation Models**,  
**B. Varici**, 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. Varici**, C.P. 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. Varici**, and P. Ravikumar.  
*International Conference on Artificial Intelligence and Statistics, 2025*
- NeurIPS'24 **Linear Causal Representation Learning from Unknown Multi-node Interventions**,  
**B. Varici**, 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. Varici**, K. Shanmugam, and A. Tajer.  
*Conference on Neural Information Processing Systems, 2024*
- NeurIPS'24 **Interventional Causal Discovery in a Mixture of DAGs**,  
**B. Varici**, 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. Varici**, 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. Varici**, and A. Tajer.  
*International Symposium on Information Theory, 2024*

- UAI'22 **Intervention Target Estimation in the Presence of Latent Variables**,  
**B. Varici**, 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. Varici**, K. Shanmugam, P. Sattigeri, and A. Tajer.  
*Conference on Neural Information Processing Systems, 2021*
- AISTATS'21 **Learning Shared Subgraphs in Ising Model Pairs**,  
**B. Varici\***, S. Sihag\*, and A. Tajer.  
*International Conference on Artificial Intelligence and Statistics, 2021*

### Book Chapters

- 2025 Causal Representation Learning,  
**B. Varici\***, 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

## 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

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## 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.)

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## Academic Service

- 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 (2020–2022)
- Member

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## 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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Carnegie Mellon University, Pittsburgh, PA  
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**Dr. Karthikeyan Shanmugam**, Senior Research Scientist

Google DeepMind India, Bengaluru, India  
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**Prof. Tianyi Chen**, Associate Professor

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Cornell Tech and Cornell University, New York City, NY  
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**Prof. Aapo Hyvärinen**, Professor

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