Murat Kocaoglu

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West Lafayette, Indiana 47907-2035

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Current Position

Assistant Professor — Jan. 1, 2021 – present
School of Electrical and Computer Engineering
Purdue University
I conduct research on causal inference, machine learning, deep generative models and information theory.

Teaching Experience

Instructor — Spring 2021
ECE302: Probabilistic Methods in Electrical and Computer Eng.
School of Electrical and Computer Engineering, Purdue University
Co-taught with Prof. Saul Gelfand. Enrollment: 265 students.

Education

The University of Texas at Austin, — Sept. 2013 – Aug. 2018
PhD, Electrical and Computer Engineering.
Thesis: Causality: From Learning to Generative Models
Co-advisor: *Prof. Alexandros Dimakis*
Co-advisor: *Prof. Sriram Vishwanath*

Koc University, Istanbul, Turkey — Sept. 2010 – Aug. 2012
Master of Science, Electrical Engineering.
Thesis: Minimum Energy Channel and Network Coding with Applications in Nanoscale Communications
Advisor: *Prof. Ozgur B. Akan*

Middle East Technical University, Ankara, Turkey — Sept. 2006 – Jun. 2010
Major: Bachelor of Science, Electrical and Electronics Engineering.
Graduated with High-honors
Minor: Physics

Prev. Positions

Research Staff Member, MIT-IBM Watson AI Lab, — Sept. 2018 – Dec. 2020
IBM Research MA, USA
I conducted research on causal inference, learning theory, deep generative models and information theory.

Research Assistant, Wireless Networking and Communications Group, — Sept. 2013 – Aug. 2018
The University of Texas at Austin, Austin. USA.
I conducted research on machine learning, specifically on causal inference from data, as well as learning causal graphs using interventions. I also worked on learning theory, and online algorithms.

Research Assistant, Next-generation and Wireless Communications, — Sept. 2010 – Aug. 2013
Laboratory, Koc University, Istanbul, Turkey.
I conducted research on energy-efficient channel and network coding, nanoscale communications, wireless networks, and green communications.

Current Research Interests

- Causal Inference, Learning Causal Graphs
- Generative Adversarial Networks
- Information Theory
- Learning Theory
- Graphical Models

PUBLICATIONS
Machine Learning

1. Kartik Ahuja, Prasanna Sattigeri, Karthikeyan Shanmugam, Dennis Wei, Karthikeyan Natesan Ramamurthy, Murat Kocaoglu, Conditionally Independent Data Generation, in **Proc. UAI'21**, 2021.
2. M. Kocaoglu, S. Shakkottai, A. G. Dimakis, C. Caramanis, S. Vishwanath, "Applications of Common Entropy for Causal Inference," in **Proc. of NeurIPS'20**, Online, Dec. 2020.
3. S. Compton, M. Kocaoglu, K. Greenewald, D. Katz, "Entropic Causality: Identifiability and Finite Sample Results," in **Proc. of NeurIPS'20**, Online, Dec. 2020.
4. A. Jaber, M. Kocaoglu, K. Shanmugam, E. Bareinboim, "Causal Discovery from Soft Interventions with Unknown Targets: Characterization and Learning," in **Proc. of NeurIPS'20**, Online, Dec. 2020.
5. C. Squires, S. Magliacane, K. Greenewald, D. Katz, M. Kocaoglu, K. Shanmugam, "Active Structure Learning of Causal DAGs via Directed Clique Trees," in **Proc. of NeurIPS'20**, Online, Dec. 2020.
6. M. Kocaoglu*, A. Jaber*, K. Shanmugam*, E. Bareinboim, "Characterization and Learning of Causal Graphs with Latent Variables from Soft Interventions," in **Proc. of NeurIPS'19**, Vancouver, Canada, Dec. 2019.
7. K. Greenewald, D. Katz, K. Shanmugam, S. Magliacane, M. Kocaoglu, E. B. Adsera, G. Bresler, "Sample Efficient Active Learning of Causal Trees," in **Proc. of NeurIPS'19**, Vancouver, Canada, Dec. 2019.
8. E. Lindgren, M. Kocaoglu, A. G. Dimakis, S. Vishwanath, "Minimum Cost Intervention Design and Connections to Submodularity," in **Proc. of NeurIPS'18**, Montreal, Canada, Dec. 2018.
9. M. Kocaoglu*, C. Snyder*, A. G. Dimakis, S.Vishwanath, "CausalGAN: Learning Causal Implicit Generative Models with Adversarial Training," in **Proc. of ICLR'18**, Vancouver, May 2018.
10. E. Lindgren, M. Kocaoglu, A. G. Dimakis, S. Vishwanath, "Submodularity and Minimum Cost Intervention Design for Learning Causal Graphs," in **DISCML'17 Workshop, NIPS'17**, Dec. 2017.
11. M. Kocaoglu*, K. Shanmugam*, E. Bareinboim, "Experimental Design for Learning Causal Graphs with Latent Variables," in **Proc. of NIPS'17**, Dec. 2017.
12. M. Kocaoglu, A. G. Dimakis, S. Vishwanath, "Cost-Optimal Learning of Causal Graphs," in **Proc. of ICML'17**, 2017.
13. M. Kocaoglu, A. G. Dimakis, S. Vishwanath, B. Hassibi, "Entropic Causality and Greedy Minimum Entropy Coupling," in **Proc. of ISIT'17**, 2017.
14. R. Sen, K. Shanmugam, M. Kocaoglu, A. G. Dimakis, S. Shakkottai, "Contextual Bandits with Latent Confounders: An NMF Approach," in **Proc. of AISTATS'17**, Fort Lauderdale, USA, Apr. 2017.
15. M. Kocaoglu, A. G. Dimakis, S. Vishwanath, B. Hassibi, "Entropic Causal Inference," in **Proc. of AAAI'17**, San Francisco, USA, Feb. 2017.
16. M. Kocaoglu, A. G. Dimakis, S. Vishwanath, "Learning Causal Graphs with Constraints," in **NIPS'16 Workshop**: What If? Inference and Learning of Hypothetical and Counterfactual Interventions in Complex Systems, Barcelona, Spain, Dec. 2016.
17. K. Shanmugam*, M. Kocaoglu*, A. G. Dimakis, S. Vishwanath, "Learning Causal Graphs with Small Interventions," in **Proc. of NIPS'15**, Montreal, Canada, Dec. 2015.
18. M. Kocaoglu*, K. Shanmugam*, A. G. Dimakis, A. Klivans, "Sparse Polynomial Learning and Graph Sketching," in **Proc. of NIPS'14 (Oral)**, Montreal, Canada, Dec. 2014.

PUBLICATIONS
Communications, Coding Theory

1. M. Kocaoglu, O. B. Akan, "Energy Minimization with Network Coding," **IEEE Systems Journal**, Special Issue on Green Comm., Comp. and Sys., vol. 11, no. 2, pp. 696-705, June 2017.
2. M. Kocaoglu, B. Gulbahar, O. B. Akan, "Stochastic Resonance in Graphene Bi-layer Optical Nanoreceivers," **IEEE Transactions on Nanotechnology**, vol. 13, no. 6, pp. 1107-1117, Nov. 2014.
3. D. Malak, M. Kocaoglu, O. B. Akan, "Communication Theoretic Analysis of Synaptic Channel for Cortical Neurons," **Nano Communication Networks Journal**, vol. 4, no. 3, pp. 131-141, Sept. 2013.

4. M. Kocaoglu, C. Oksuz, O. B. Akan, "Effect of Channel Conditions on Inventory Database Update in Supply Chains." in **Proc. IEEE BlackSeaCom'13**, May 2013.
5. M. Kocaoglu, O. B. Akan, "Minimum Energy Channel Codes for Nanoscale Wireless Communications," **IEEE Transactions on Wireless Communications**, vol. 12, no. 4, pp. 1492-1500, April 2013.
6. M. Kocaoglu, D. Malak, O.B. Akan, "Fundamentals of Green Communications and Computing: Modeling and Simulation," **IEEE Computer**, vol. 45, no. 9, pp. 40-46, Sept. 2012.
7. M. Kocaoglu, D. Malak, "On the Node Density Limits and Rate-Delay-Energy Tradeoffs in Ad Hoc Nanonetworks with Minimum Energy Coding," in **Proc. IEEE MoNaCom 2012 (in IEEE ICC 2012)**, Ottawa, Canada, Jun. 2012.
8. M. Kocaoglu, O. B. Akan, "Minimum Energy Coding for Wireless NanoSensor Networks," in **Proc. IEEE INFOCOM'12** Mini Conference, Orlando, FL, 2012.

Talks

Purdue ECE Talk: Entropic Methods for Causal Discovery, Online talk for graduate students and the faculty, Mar. 4, 2021.

Activities

Session chair for IJCAI'20 [Machine Learning] Learning Generative Models, Jan. 2021.

Lightning Talk in Young Researchers Workshop on CausalGAN, ORIE, Cornell University, Ithaca, NY, Oct. 2019.

Co-organized "Bridging Causal Inference, Reinforcement Learning and Transfer Learning Workshop" in IBM AI Research Week, 2019.

Invited Talk in AAAI-WHY19 Spring Symposium on CausalGAN, Stanford, CA, March 25-27, 2019.

Shannon Channel Talk: Entropic Methods for Causal Discovery, Online talk hosted by Salim El Rouayheb, Mar. 1st, 2019.

Hands-on machine learning workshop (jointly with Alex Dimakis), 2018 North American School of Information Theory, Texas A&M University, May 20-23, 2018.

Invited Talk in Los Alamos National Laboratories (LANL) on Causality, Los Alamos, NM, Aug. 2017.

Organized student seminar series in machine learning in WNCG, UT Austin, 2015-2016.

PhD Advisory Committee Member

Teng-Hui Huang (Advisor: Aly El Gamal)

Senior Program Committee Member

IJCAI 2021
AAAI 2021
IJCAI 2020

Reviewer

NeurIPS, ICML, AISTATS, AAAI, IJCAI, UAI, COLT, ISIT and many others.
Journal of Machine Learning Research (JMLR), IEEE Transactions on Information Theory, IEEE Journal on Selected Areas in Information Theory (JSAIT), Neural Networks (ACM) Annals of Statistics.

Teaching Assistant

Teaching Assistant,Dept. of Electrical and Computer Engineering, 2013 – 2014
The University of Texas at Austin *EE313: Linear Systems and Signals, Problem solving and review sessions, homework grading, office hours.*

Teaching Assistant,Dept. of Electrical and Computer Engineering, Koc University, Istanbul, Turkey. *ELEC513: Information Theory, ELEC201: Signals and Systems, ELEC100: Introduction to Electrical and Electronics Engineering, COMP110: Introduction to Programming with MATLAB.* — 2013 – 2014

Honors

Reviewer Award for UAI'21 — *May 2021*
Amongst Top 5% of Reviewers

Reviewer Award for ICLR 2021 — *Mar. 2021*
Outstanding Reviewer

Reviewer Award for ICML 2020 — *Sept. 2020*
Amongst Top 33% of Reviewers

Reviewer Award for NeurIPS 2019 — *Sept. 2019*
Amongst Top 50% of Reviewers

Reviewer Award for NeurIPS 2018 — *Sept. 2018*
Amongst Top 218 Reviewers

Student Travel Award for ICLR 2018 — *Mar. 2018*

Student Travel Award for NIPS 2017 — *Oct. 2017*

Student Travel Award for ICML 2017 — *June 2017*

Student Travel Grant for ISIT 2017 — *Apr. 2017*

Short Course Travel Support — *May. 2016*
Center for Causal Discovery (CCD), Pittsburgh

Student Travel Award for NIPS 2015 — *Oct. 2015*

Best Senior Design Project, Dept. of Electrical and Electronics Engineering Middle East Technical University, Ankara, Turkey. — *Spring, 2010*
A wireless helmet design to detect user's head movements and facial gestures to accomplish certain tasks on the computer.

Bulent Kerim Altay Award, Dept. of Electrical and Electronics Engineering — *Spring, 2009*
Ranked 1st in the Department of Electrical and Electronics Engineering

Ranked Top 100 in National University Selection Exam of Turkey, — *Jun. 2006*
Among more than 1.5 million students nation-wide

Internship

Intern, Citium Advisors LLC — Jun. 2016 – Aug. 2016
Quantitative Analyst Intern: Developed graph algorithms for futures markets, worked on price prediction, efficient price calculation and testing.

Intern, ASELSAN Inc., Ankara, Turkey — Jun. 2009 – Jul. 2009
Image and Video Processing with MATLAB

Intern, RENAULT Turkey, Bursa, Turkey — Aug. 2008 – Sept. 2008
PLC Programming