Kartik Ahuja

Contact Information

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Scholar, Website, Linkedin, Github

Research Interests

Machine Learning, Optimization and Game Theory

Postdoctoral Experience

Postdoctoral fellow, **Mila - Quebec AI Institute** **Dec 2020 -present**

AI Resident, **IBM Research, TJ Watson Research Center, NY** **Nov 2019 -Nov 2020**

Education

University of California, Los Angeles **Sep 2013-2019**
PhD in Electrical and Computer Engineering

- GPA: **4.0/4.0**
- Thesis: "Optimizing Methods for Resource Allocation and Machine Learning Applications."
- Advisor: Gregory J. Pottie

Indian Institute of Technology, Kanpur **2008-2013**
B. Tech - M. Tech Dual Degree in Electrical Engineering

- GPA: **8.8/10** (B. Tech) and **9.6/10** (M. Tech)
- Thesis: "Optimizing Signal Constellations."
- Advisor: Ajit K. Chaturvedi

Visiting Positions & Internship

University of Oxford **Jan -Dec 2017**
Visiting PhD student

University of British Columbia **May -July 2012**
Internship

Publications

Machine Learning & Optimization

K. Ahuja, J. Hartford, Y. Bengio.
Properties from mechanisms: An equivariance perspective on identifiable representation learning
under review, 2021. (arXiv)

K. Ahuja, D. Mahajan, V. Syrgkanis, I. Mitliagkas.
Towards Efficient Representation Identification in Supervised Learning
under review, 2021.

A. Shah, K. Shanmugam, **K. Ahuja**.
Finding Valid Adjustments under Non-Ignorability with Minimal DAG Knowledge
under review, 2021. (arXiv)

K. Ahuja, E. Caballero, D. Zhang, J.C. Audet, Y. Bengio, I. Mitliagkas, I. Rish.
Invariance Principle Meets Information Bottleneck for Out-of-Distribution Generalization
Neural Information Processing Systems (NeurIPS), 2021. **(Spotlight presentation)**

P. Bashivan, R. Bayat, A. Ibrahim, **K. Ahuja**, M. Faramarzi, T. Laleh, B. Richards, I. Rish.
Adversarial Feature Desensitization
Neural Information Processing Systems (NeurIPS), 2021.

K. Ahuja, P. Sattigeri, K. Shanmugam, D. Wei, K.N. Ramamurthy, M. Kocaglu.
Conditional Independent Data Generation
Uncertainty in Artificial Intelligence (UAI), 2021.

D. Zhang, **K. Ahuja**, Y. Xu, Y. Wang, A. Courville.
Can Subnetwork Structure be the Key to Out-of-Distribution Generalization?
International Conference on Machine Learning (ICML), 2021. **(Oral presentation)**

Abhin Shah, **K. Ahuja**, K. Shanmugam, D. Wei, K. Varshney, A. Dhurandhar.
Treatment Effect Estimation Using Invariant Risk Minimization
IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), 2021.

K. Ahuja, K. Shanmugam, A. Dhurandhar.
Linear Regression Games: Convergence Guarantees to Approximate Out-of-Distribution Solutions
Artificial Intelligence and Statistics Conference (AISTATS), 2021.

K. Ahuja, J. Wang, A. Dhurandhar, K. Shanmugam, K. Varshney.
Empirical or Invariant Risk Minimization? A Sample Complexity Perspective
International Conference on Learning Representations (ICLR), 2021.

K. Ahuja, K. Shanmugam, K. R. Varshney, A. Dhurandhar.
Invariant Risk Minimization Games
International Conference on Machine Learning (ICML), 2020.

K. Ahuja, K. Shanmugam, K. R. Varshney, A. Dhurandhar.
On the Equivalence of Bi-Level Optimization and Game-Theoretic Formulations of Invariant Risk Minimization
Inductive Biases, Invariances and Generalization in RL Workshop, International Conference on Machine Learning (ICML), 2020.

K. Ahuja, A. Dhurandhar, K. Shanmugam, K. R. Varshney.
Learning to Initialize Gradient Descent using Gradient Descent
preprint, 2020. (arXiv)

K. Ahuja
Estimating Kullback-Leibler Divergence Using Kernel Machines
53rd Annual Asilomar Conference on Signals, Systems, and Computers (ACSSC), 2019.

K. Ahuja, W. Zame, M. van der Schaar.
Optimal Piecewise Approximations for Model Interpretation
53rd Annual Asilomar Conference on Signals, Systems, and Computers (ACSSC), 2019.
(Second best student paper award)

K. Ahuja, M van der Schaar.
Joint Concordance Index
53rd Annual Asilomar Conference on Signals, Systems, and Computers (ACSSC), 2019, and *Neural Information Processing Systems workshop on Machine Learning for Health (NeurIPS, ML4H), 2017.*

K. Ahuja, W. Zame, M. van der Schaar.
Dpscreen: Dynamic Personalized Screening
Neural Information Processing Systems (NeurIPS), 2017.

K. Ahuja, M. van der Schaar.
Dynamic Matching and Allocation of Tasks
ACM Transactions on Economics and Computation, vol. 7 no. 1, pp 1-27, 2019.

K. Ahuja, Y. Xiao, M. van der Schaar.
Efficient Interference Management Policies for Femtocell Networks
IEEE Transactions on Wireless Communications, vol. 14, no. 9, pp 4879-4893, 2015.
Featured in IEEE-spotlight , UCLA-news.

K. Ahuja, Y. Xiao, M. van der Schaar.
Distributed Interference Management Policies for Heterogeneous Networks
IEEE Journal on Selected Areas in Communications, vol. 33, no. 6, pp. 1112-1126, 2015.
Featured in IEEE MMTC letter, December, 2016.

Y. Xiao, **K. Ahuja**, M. van der Schaar.
Spectrum Sharing For Delay-Sensitive Applications with Continuing QoS Guarantees
IEEE Global Communications Conference (GLOBECOM), 2014.
Nominated for the best paper award (top 50 papers among 2100 submissions.)

K. Ahuja, M. Hasan, J. Hossain.
To Participate or Not in Spectrum Auctions with Entry fee: Bayesian Game Theoretic Approach
IEEE Wireless Communications and Networking Conference (WCNC), 2014.

Network Science

K. Ahuja, M. van der Schaar, W. Zame.
Working alone and working with others: implications for the malthusian era
Economic Theory, pp.1-35, 2019.

A. Alaa, **K. Ahuja**, and Mihaela van der Schaar.
A Micro-Foundation of Social Capital in Evolving Social Networks
IEEE Transactions on Network Science and Engineering vol. 5, no. 1, pp. 14-31, 2017.

A. Alaa, **K. Ahuja**, M. van der Schaar.
Self-organizing Networks of Information Gathering Cognitive Agents
IEEE Transactions on Cognitive Communications and Networking, vol. 1. no. 1, pp 100-112, 2015.

K. Ahuja, S. Zhang, M. van der Schaar
Towards a Theory of Societal Co-Evolution: Individualism versus Collectivism
IEEE Global Conference on Signal and Information Processing (GlobalSIP), 2014.

K. Ahuja, S. Zhang, M. van der Schaar.
The Population Dynamics of Websites
Netecon workshop at ACM Conference on Economics and Computation (EC), 2015.

Patents

K. Ahuja, A. Dhurandhar, K. Shanmugam, and K R. Varshney.
Learning Robust Predictors Using Game Theory
17/115,489, filed December 8, 2020.

K. Ahuja, A. Dhurandhar, K. Shanmugam, and K R. Varshney.
Initializing Optimization Solvers
17/101,019, filed November 23, 2020.

K. Ahuja, P. Sattigeri, K. Shanmugam, D. Wei, M. Kocaglu, K.N. Ramamurthy
Conditional Independent Data Generation for Training Machine Learning Systems
filed June 26, 2021.

Academic Achievements

- IVADO postdoctoral fellowship (2021-2023).
- Top 8 percent reviewer NeurIPS, 2021, top 10 percent reviewer NeurIPS, 2020 and ICML, 2021.
- Second best student paper award at the 53rd Annual Asilomar Conference on Signals, Systems, and Computers (ACSSC), 2019.
- UCLA Dissertation Year Fellowship (2018-19).
- Guru Krupa Foundation Fellowship by the ECE Department at UCLA (2013-14).
- Departmental Fellowship by the ECE Department at UCLA (Fall, 2013).
- All India Rank of 584 in Joint Entrance Examination 2008 (99.8 percentile) among more than 3,50,000 students.
- All India Rank of 1131 in All India Engineering Entrance Examination 2008 (99.8 percentile) among more than 7,50,000 students.

Invited Talks

- "Invariant Risk Minimization Games", Facebook Artificial Intelligence Research (FAIR), NY.
- "Invariant Risk Minimization Games", Computer Science Department, Yale University.

Other Talks

- "Linear Regression Games", 32nd International Conference on Game Theory, 2021.
- "Dynamic Matching and Allocation of Tasks", 30th International Conference on Game Theory, 2019.

Teaching Experience

- Teaching Assitant at UCLA: Digital Signal Processing, Network Economics and Game Theory, and Multimedia Communications.
- Teaching Assitant at IIT Kanpur: Representation and Analysis of Random Signals.

Professional Experience

Reviewer for Neural Information Processing Systems (NeurIPS) 2019, 2020, 2021, International Conference on Machine Learning (ICML) 2019, ICML 2021 (**Expert Reviewer**), Artificial Intelligence and Statistics Conference (AISTATS), 2021,2022, International Conference and Learning Representations (ICLR), 2021, 2022, Journal of Machine Learning Research (JMLR), Association for Advancement of Artificial Intelligence (AAAI) conference 2020, IEEE Global Communciations Conference (GLOBECOM), National Conference on Communications (NCC), India, IEEE Journal of Selected Areas in Communications (JSAC), ACM/IEEE Transactions on Networking (TNET).

Students Mentored

Abhin Shah (PhD student at MIT), Jun Wang (PhD student at Rensselaer Polytechnique), Amin Mansouri (MSc. student at Mila), Dinghuai Zhang (PhD student at Mila), Jean-Christophe Gagnon-Audet (MSc. student at Mila), Divyat Mahajan (MSc. Student at Mila).

Programming Skills

Languages: Python, R, Java, Matlab
Frameworks for machine learning: Tensorflow, Keras.