Kartik Ahuja

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Information **Phone:** +1 626-362-8188 Scholar, Website, Github

Research Machine Learning, Optimization and Causality

Interests

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

EXPERIENCE

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 Visiting PhD student

Jan -Dec 2017

University of British Columbia

May -July 2012

Internship

Publications

K. Ahuja, J. Hartford, Y. Bengio. Machine

Learning & OPTIMIZATION Properties from mechanisms: An equivariance perspective on identifiable represen-

TATION LEARNING

International Conference on Learning Representations (ICLR), 2022. (arXiv)

K. Ahuja, D. Mahajan, V. Syrgkanis, I. Mitliagkas.

TOWARDS EFFICIENT REPRESENTATION IDENTIFICATION IN SUPERVISED LEARNING Causal Learning and Reasoning (CLeaR), 2022.

A. Shah, K. Shanmugam, K. Ahuja.

FINDING VALID ADJUSTMENTS UNDER NON-IGNORABILITY WITH MINIMAL DAG KNOWLEDGE International Conference on Artificial Intelligence and Statistics (AISTATS), 2022. (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 GEN-ERALIZATION

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

International Conference on 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).
- Co-authored a successful grant application to Microsoft research on Causal Machine Learning resulting in a funding of 54,000 CAD.
- 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.

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)
- Marcel Nwaunka (BS Student at University of Arkansas)
- Naveene Raya (BS Student at California State University)

Professional SERVICE

Reviewer

- 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)
- IEEE Journal of Selected Areas in Communications (JSAC)
- ACM/IEEE Transactions on Networking (TNET)
- National Conference on Communications (NCC), India

Programming SKILLS

Languages: Python, R, Java, Matlab

Frameworks for machine learning: Tensorflow, Keras.