

Charupriya Sharma

Machine Learning Researcher



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[Google Scholar](https://scholar.google.com/citations?user=...)

About Me

I am a Machine Learning PhD student researching on Bayesian methods and explainable causal models, combining statistical ML and traditional optimization. I am always eager to improve myself and solve real-world problems by designing and implementing ML and optimization models.

From my various projects, I have experience in team and independent work, and have honed my analytical and communication skills. I have contributed to open-source projects during my time as a graduate student.

Education

PhD in Computer Science
Artificial Intelligence
University of Waterloo | 2021

Masters of Mathematics
Combinatorics and Optimization
University of Waterloo | 2017

Bachelor of Technology
Computer Science and Engineering
IIT-Delhi | 2015

Skills

Languages: Very proficient in Python, R and Bash scripting, experienced in C/C++, Java, OpenGL, MATLAB.

Tools: Tensorflow, PyTorch, Keras, XGBoost, Coin-OR, CPLEX, Boost C++, GOBNILP, CUDA, Terrier, Unix, D3.js, Neo4j, Verilog.

Course Work

Deep Learning, Information Theory, Artificial Intelligence, Information Retrieval, Statistical Computing, GPU Computing, Randomized Algorithms, Combinatorial Optimization, Splines.

Research Projects

- 09.18–now Structured Representations of Conditional Probability Distributions
Developed an algorithm (Python, Java) for learning Bayesian networks with Noisy-OR and logistic regression with performance guarantees for model averaging (90%+) and Bayesian inference ($\sim 99\%$). We learn latent variables and can handle Gaussian and discrete data.
- 05.20–now Simplex Optimization with Deep Reinforcement Learning
Developed a deep reinforcement learning algorithm (Python) for learning custom pivot rules for the simplex algorithm to speed up linear programming solvers.
- 10.18–12.18 Theorem Proving with Deep Reinforcement Learning
Developed a deep reinforcement learning algorithm (Python) for automatic theorem using Monte Carlo tree search and LSTM.
- 09.17–08.18 Finding All Bayesian Network Structures within a Factor of Optimal
Designed an algorithm (C++) to find all high scoring Bayesian networks to address uncertainty in data using model averaging. Solved benchmarks 2X larger than state of the art.
- 03.18–04.18 Multi-Dimensional Truncated Hierarchical B-Splines
Rendered surfaces using truncated-hierarchical B-splines (C++,R) to handle local refinement in B-spline surfaces. Extended the algorithms to the multidimensional case.
- 09.15–08.17 Technology Diffusion on Weighted Graphs
Designed polynomial time algorithms and polyhedral characterizations (CPLEX) for weighted cycles and spider graphs in the non-submodular seed minimization and influence maximization case.

Open Source

- 10.19–12.19 [JavaBayes 8](#)
Modified JavaBayes from Java 1.1 to Java 8. Provided scripts for fast Bayesian inference batch queries.
- 04.19–09.18 [GOBNILP](#)
Relaxed pruning rules and provided methods to enumerate all high scoring Bayesian networks.

Positions and Volunteering

- 09.15–now Graduate Teaching Assistant
Held office hours and marked assignments for courses in artificial intelligence, concurrency and parallel programming, logic and optimization. Taught tutorials for an introductory combinatorics course for engineers.
- 09.17–now Webmaster, AI lab

Publications

A Score-and-Search Approach to Learning Bayesian Networks with Noisy-OR with Z. A. Liao, J. Cussens and P. van Beek.

(Proceedings of Probabilistic Graphical Models, 2020)

Structural Properties of Bayesian Network within a Factor of Optimal.

with Z. A. Liao, J. Cussens and P. van Beek. (Under Review)

Learning Bayesian Networks with Structured Representations

with J. Cussens and P. van Beek. (Under Review)

Finding All Bayesian Network Structures within a Factor of Optimal.

with Z. A. Liao, J. Cussens and P. van Beek.

(Proceedings of the AAAI Conference on Artificial Intelligence. Vol. 33. 2019.)

Learning to search more efficiently from experience: A multi-heuristic approach.

with S. Aine and M. Likhachev. (Symposium on Combinatorial Search, 2015.)