

Kartikey Sharma

Curriculum Vitae

Room 2105, Zuse Institute Berlin
Berlin, 12167, Germany
✉ kartikey.sharma@zib.de
📄 kartikeyrinwa.github.io

Research Interests

Optimization under uncertainty, Machine Learning, Transportation, Surrogate based Optimization, Power Networks

Education

- 2014 - 2020 **PhD**, IEMS, Northwestern University, Evanston, Advisor: Omid Nohadani.
Title: Optimization under Variable Uncertainty
- 2014 - 2015 **MS**, IEMS, Northwestern University, Evanston, GPA – 3.9.
- 2009 - 2014 **MBA**, Indian Institute of Technology, Roorkee, GPA: 9.1/10.
- 2009 - 2014 **B.Tech**, Indian Institute of Technology, Roorkee, GPA – 9.1/10.

Experience

- 2020 - **Postdoctoral Researcher and Research Area Lead**, ZUSE INSTITUTE BERLIN, Advisor: Sebastian Pokutta.
Worked on topics in Robust Optimization and the both the theoretical and practical aspects of Machine Learning
- 2015 - 2020 **Research Assistant**, NORTHWESTERN UNIVERSITY, IL.
Developed robust optimization models for variable uncertainties:
- *Decision Dependent Uncertainty*: Uncertainty sets can depend on decisions made within the problem. I evaluated the complexity of such problems and provided a family of models which improve the computational performance. These models are applicable to transportation, power distribution etc.
 - *Connected Uncertainty*: The Uncertainty model in a period can depend on uncertainty realizations from previous periods. I provided reformulations for general robust and distributionally robust problems and evaluated their performance for knapsack and portfolio management problems.
 - *Connected Classifier*: I extended the Minimax Probability Machine model to streaming data such that the classifier can adapt to new observations. This has direct applications in credit fraud detection, wind speed detection etc.
- 2018 **Summer Research Scientist Intern**, AMAZON, SEATTLE, WA.
Developed optimal shipment flow models in the Supply Chain and Optimization Department. Developed a novel optimization model along with a parameter estimation procedure. Delivered evaluations of the final model through simulations on historical data.
- 2013 **Summer Intern**, DEUTSCHE BANK, MUMBAI.
At the Custodial Services Department, worked on processes involved in foreign investment into India. Prepared a Key Operating Procedures manual for the bank's Account Documentation Team.

Awards

George Nemhauser Best Paper Award, 2018, by the IEMS department of Northwestern University
Graduate fellowship by Northwestern's Graduate School, 2019

Journal Publications

- [1] Nohadani, O., Sharma, K. *Optimization under Decision Dependent Uncertainty*. **SIAM Journal on Optimization**, 28(2), 1773-1795, 2018

- [2] Nohadani, O., Sharma, K. *Optimization under Connected Uncertainty*. **INFORMS Journal on Optimization**, 2022
- [3] Kossen, T., Hirzel, M. A., Madai, V. I., Boenisch, F., Hennemuth, A., Hildebrand, K., Pokutta, S., Sharma, K., Hilbert, A., Sobesky, J., Galinovic, I., Khalil, A. A., Fiebach, J. B., and Frey, D. (2021). *Towards sharing brain images: Differentially private TOF-MRA images with segmentation labels using generative adversarial networks*. **Frontiers in Artificial Intelligence**, 5, 2022
- [4] Aigner, K., Bärman, A., Braun, K, Liers, F., Pokutta, S., Schneider, O., Sharma, K., Tschuppik, S. *Data-driven Distributionally Robust Optimization Over Time*. **INFORMS Journal on Optimization**, 2023
- [5] Kruser, J., Sharma, K., Holl, J., and Nohadani, O. *Identifying Patterns of Medical Intervention in Acute Respiratory Failure: A Retrospective Observational Study*. **Critical Care Explorations**, 2023

Conference Proceedings

- [1] Sharma, K., Hendrych, D., Besançon, M., and Pokutta, S. *Network Design for the Traffic Assignment Problem with Mixed-Integer Frank-Wolfe*. **Proceedings of INFORMS Optimization Society Conference**, 2024
- [2] Wäldchen, S., Sharma, K., Zimmer, M., Turan, B., and Pokutta, S. *Merlin-Arthur Classifiers: Formal Interpretability with Interactive Black Boxes*. **Proceedings of International Conference on Artificial Intelligence and Statistics**, 2024

Working Papers

- [1] Nohadani, O., Sharma, K. *Fast Robust Classifiers for Streaming Data*. Under Review
- [2] Göß, A., Martin, A., Pokutta, S., and Sharma, K. *Norm-induced Cuts: Optimization with Lipschitzian Black-box Functions*. Under Review
- [3] Han, E., Sharma, K., Singh, K., and Nohadani, O. *Dynamic Capacity Management for Deferred Surgeries*. In-preparation

Presentations

INFORMS Optimization Society, Houston
 INFORMS Annual Meeting 2023, Phoenix
 German OR Society Conference 2023, Hamburg
 Optimization and Machine Learning Workshop, Waischenfeld
 INFORMS Annual Meeting 2022, Indianapolis
 DMV Annual Meeting 2022, Berlin
 ICCOPT 2022, Bethlehem
 Manufacturing Services and Operations Management Conference 2022, Munich
 INFORMS Annual Meeting 2021, Anaheim
 INFORMS Annual Meeting 2019, Seattle
 INFORMS Annual Meeting 2018, Phoenix
 ISMP 2018, Bordeaux
 INFORMS Annual Meeting 2017, Houston
 IFORS 2017, Quebec City
 Poster, NEMFEST Workshop 2017, Atlanta
 INFORMS Annual Meeting 2016, Nashville

Teaching Experience

Summer 2024 Lecturer for Optimization under Uncertainty at TU Berlin
Spring 2019 Teaching Assistant for Foundations of Optimization at NU
Winter 2018 Teaching Assistant for Foundations of Optimization at NU
Fall 2015, 2016 Teaching Assistant for Mathematical Programming at NU

Computer skills

Languages Python, Julia, Java, C++
Software MATLAB, R, Gurobi, LaTeX

Professional Groups

2022- Postdoctoral Representative, MATH+
2016-2017 President, Northwestern University INFORMS Chapter
2015-2016 Secretary, Northwestern University INFORMS Chapter

Organization and Outreach

2024 Presenting GPT enabled interactive robot at LNdW at ZIB
2024 Member of the organizing committee of the BMS-BGSMath Junior Meeting in Berlin
2023 Member of the organizing committee of the MATH+ Thematic Einstein Semester in Berlin

Languages

English, Hindi

Relevant Courses

Mathematical Statistics, Mathematical Optimization I&II (Linear and Nonlinear Optimization), Robust Optimization, Stochastic Optimization, Large Scale Optimization, Dynamic Programming, Combinatorial Optimization