Harshit Kothari

+1 (608) 977-4259 | hkothari2@wisc.edu | linkedin.com/in/kothariharshit | Madison, WI - 53703

Summary

Fifth year Ph.D. student in operations research with interests in large-scale optimization and mathematical modeling.

Education

University of Wisconsin-Madison — Madison, USA
Ph.D. in Industrial & Systems Engineering - Operations Research — May 2026 (expected)
Relevant Courses - Integer Optimization, Nonlinear Optimization I and II, Stochastic Optimization

University of Wisconsin-Madison — Madison, USA
Master of Science in Computer Sciences | *GPA - 3.73/4* — Dec 2023
Relevant Courses - Linear Optimization, Stochastic Modeling, Machine Learning

Indian Institute of Technology Bombay — Bombay, India
Bachelor of Technology in Chemical Engineering | *GPA - 8.69/10* — Jul 2021
Relevant Courses - Optimization Modeling, Network Analysis, AI in Process Engineering

Research Experience

Research Intern, Microsoft Research — Summer 2024, Summer 2025
Collaborators: Dr. Luke Marshall, Dr. Konstantina Mellou

Accelerating stochastic generalized assignment problems using column generation:

- Developed a stochastic programming model to optimize job allocation across machines while considering capacity constraints and uncertain resource requirements
- Implemented and analyzed multiple column generation formulations to identify one with the fastest solve time
- Developed methods for constraint aggregation and incorporated additional constraints using a row-and-column generation framework which can be generalized to all stochastic programs

Graduate Research Assistant, UW-Madison — Aug 2021 - Present
Advisor: Dr. Jim Luedtke

Accelerating Benders decomposition for solving a sequence of stochastic programs:

- Developed techniques to accelerate solving a sequence of Sample Average Approximation problems to obtain a confidence interval on the optimal value of the stochastic program using Benders decomposition
- Leveraged similarities in the problem structure and devised methods to reuse information from initial replications to later ones for accelerating both subproblem and master problems using initialization techniques
- Provided empirical evidence of the improved efficiency of the methods through extensive computational experiments on large scale stochastic facility location and network design scale instances using Gurobi in Python

Training optimal multi-class Support Vector Machines (SVM) using integer programming:

- Developed an optimization model to extend SVMs to construct multi-class classifiers using hyperplane arrangement
- Introduced symmetry-breaking inequalities to strengthen the model and improve computational efficiency
- Designed dimensionality reduction techniques to approximate the model for larger datasets, and validated the approach through comprehensive computational experiments

Undergraduate Research Assistant, IIT Bombay — Jan 2019 - Dec 2020
Collaborators: Dr. Avinash Bhardwaj, Prachi Shah

Optimizing Bag Creation Operation for a large supply chain network for 'Delhi-very', a logistics company:

- Developed a multi-commodity network flow model to optimize the grouping of shipments at processing centers
- Implemented the formulation on AMPL as proof of concept and then the full scale model in Python using CPLEX
- Proved total unimodularity of a sub structure within the constraint matrix leading to an integral polyhedron
- Solved the resulting lagrangian relaxation using subgradient method to get a feasible solution

Publications

H. Kothari, J. Luedtke, "*Accelerating Benders decomposition for solving a sequence of sample average approximation problems*", (Under review)

V. Blanco, H. Kothari, J. Luedtke, "*Training optimal multiclass Support Vector machines using integer programming*", (In Progress)

Presentations

Training optimal multiclass Support Vector Machines using integer programming

INFORMS Annual Meeting — Oct 2024

Accelerating Benders decomposition for solving a sequence of stochastic programs (SP)

International Symposium on Mathematical Programming — Jul 2024
INFORMS Annual Meeting — Oct 2023
SIAM Conference on Optimization — Jun 2023

Optimizing Bag Creation Operation

Operations Research Society of India Annual Convention — Dec 2019

Technical Skills

Languages: Python, Julia, AMPL

Tools/Packages/Frameworks: Gurobi, SCIP, CPLEX, Vim, LaTeX, scikit-learn, git

Course Projects

Predicting branching decisions for Stochastic Programs

- Studied techniques to predict the branching decisions for SAA problems by training on strong branching scores

Windfarm Layout Optimization

- Optimized placement of wind turbines to maximize the energy production subject to proximity constraints
- Implemented genetic algorithm to search the feasible region as the objective function was not known explicitly

Fatigue Crack Growth Calculation using Machine learning

- Validated results of the paper 'A Comparison Study of ML Algorithms for Fatigue Crack Growth Calculation' by Wang et al. by implementing a linear regression model, SVM and one hidden layer neural network to test for the best model

Honors and Awards

Graduate student travel award, UW-Madison — 2024
Chancellor's Opportunity Award, UW-Madison — 2022
Institute Undergraduate Research Award, IIT Bombay — 2020

Leadership and Mentorship Experience

President, INFORMS Student Chapter (UW-Madison) — 2023
Vice President, INFORMS Student Chapter (UW-Madison) — 2022
Department Academic Mentor, Student Mentorship Program (IIT Bombay) — 2020
Convener, Consult Club (IIT Bombay) — 2019

Interests

Biking, Sailing, Skiing, Basketball