AI Institute for Advances in Optimization

Opt-In Newsletter | March 2025

One of the goals of AI4OPT is to be a nexus point for AI and optimization, both in research and education. To achieve this goal, AI4OPT members are traveling all over the world to make new connections and participate in events that connect communities. AI4OPT played a major role in the bridge program on AI and optimization at the AAAI conference in Philadelphia; a student, Weimin Huang, will share some of her experience in the spotlight below. As a personal highlight, I really enjoyed my visit to Georgia Tech Panama to meet the group there and to talk about AI for engineering.

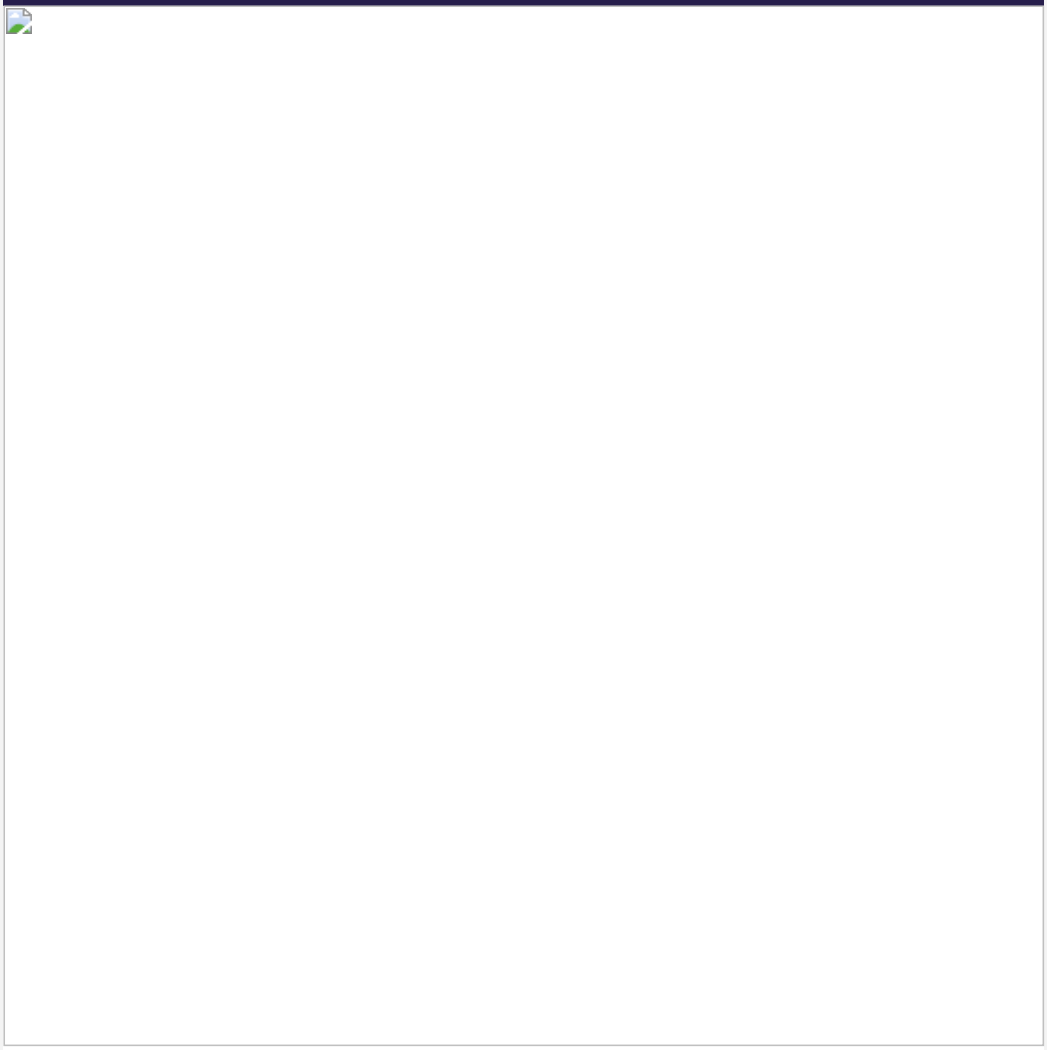
Looking ahead, I am very excited about the upcoming Tech AI Fest on March 26-28 in Atlanta. This event will showcase the role of AI in industry, government, and research, and will prominently feature AI4OPT and the other AI Institutes at Georgia Tech. I'm grateful to the organizers and the many volunteers who are making this possible and I look forward to a great event.

I have more news to share! As we are getting ready for another summer full of educational activities, I am excited to announce a new "Level 4" Seth Bonder summer camp that will introduce high school students to Generative AI and Agentic AI. More

information on this program and many other upcoming events is all contained in this newsletter. I hope to see many of you there!

- Pascal Van Hentenryck

AI4OPT Student Spotlight



ML Driven Breakthroughs in Decision Making

I am broadly interested in data-driven decision-making, mathematical optimization, and machine learning. I am currently working on using machine learning (ML) to accelerate the solving of discrete optimization problems, including both Mixed-Integer Linear Programs and Mixed-Integer Quadratic Programs.

Key Contributions and Findings

I designed Distributional MIPLIB, which is a library for advancing ML-guided Mixed-Integer Linear Programming (MILP) methods. Motivated by the fact that instances from the same mathematical model are repeatedly solved in many real-world settings, that has been a growing body of research that uses ML to learn search policies tailored to each problem distribution. This library contains precompiled MILP distributions of varying hardness levels and from multiple problem domains, which can be used for developing and evaluating ML-guided MILP solving methods.

Conference Presentations and Recognition

I presented my work on Distributional MIPLIB at the AAAI 2025 Bridge Program on Combining AI and OR/MS for Better Trustworthy Decision-Making. My work on a GNN-guided primal heuristics for Mixed-Integer Quadratic Programs (work done during my internship at the Pacific Northwest National Laboratory) was presented as a poster by my mentors in INFORMS 2024.

Outside The Office

Outside of research, I like hiking, bouldering, and playing badminton.

Check Out Distributional MIPLIB

AI4OPT Researcher Spotlight

Optimizing Paths: Innovation & Discovery

From Academia to AI4OPT

How a passion for ML and optimization led to a perfect fit at AI4OPT

I did my PhD in industrial and systems engineering at NC State University, focusing on using fusing ML and Optimization methods for resource allocation in healthcare and manufacturing. I wanted to continue my work on fusing ML and optimization, and I found AI4OPT where I fit perfectly!

Driving Innovation in Supply Chain & Logistics

Leading a team to develop AI-powered solutions for end-to-end supplychain management

I currently lead the AI for Supply Chains group at Georgia Tech, working with an amazing team to develop reliable, efficient and scalable solutions for end to end supply chain management using AI and optimization.

Our work includes a data-driven, contextual stochastic optimization framework for large-scale e-commerce order fulfillment under delivery delay uncertainty. This problem involves selecting the optimal fulfillment center and shipping carrier for each incoming e-order while minimizing costs and ensuring on-time delivery.

To tackle this challenge, we design a distributional machine learning model to predict delivery delays, which we then integrate with stochastic and robust order fulfillment

optimization models, enhancing decision-making in dynamic logistics environments.

In addition to e-commerce fulfillment, I also work on freight load planning in the trucking industry, where similar variability and uncertainty challenge operational efficiency. Demand fluctuations often render the tactical plan less effective on the day of operations, requiring planners to manually shift volume between buildings or adjust processing times. To automate and improve the reliability of this process, we developed a confidence-aware decision-support tool that predicts the processing building and time of each planned load. This framework effectively balances the need for proactive planning with the flexibility to adapt to real-time conditions while ensuring that decisions at the building level are informed by a comprehensive understanding of the entire transportation network.

My work also extends to locomotive assignment in freight railway transportation, where the goal is to optimize locomotive allocation while accounting for tonnage variability. By fusing AI and optimization models, we aim to improve efficiency across large-scale freight rail networks.

Beyond the Office

Outside work, I love visiting new places and trying local coffee shops!

Words of Inspiration

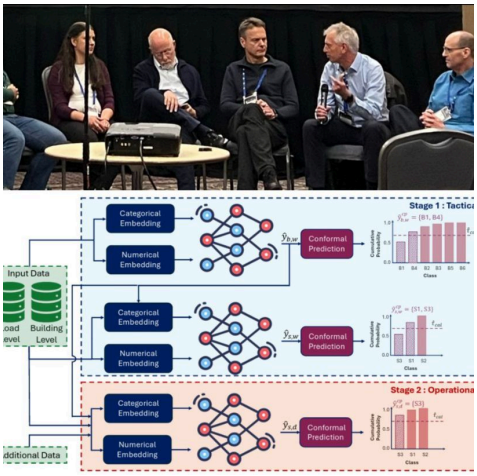
Whenever there is a challenging moment or situation, I think about what's the worst that could happen, and I realize it's not really that bad. There is always a way out.

News and Featured Events

Leveraging AI and Deep Learning in the Music Industry

Pascal Van Hentenryck Highlights AI at Georgia DHS HR Conference

Georgia Legislator AI Workshop Showcases Georgia Tech's Expertise

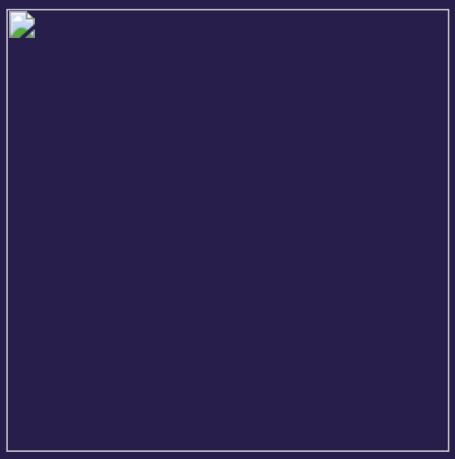


AI4OPT Members Attend The AAAI Conference on Artificial Intelligence

ISyE PhD Students Visit to Learn More About AI4OPT

Upcoming Events

Tech AI Fest 2025



Sora Shorts in the OpenAI Forum

2025 AI4OPT Retreat & Student Day

Seth Bonder Camp 2025

QUAD-AI ENGAGE Workshop

Publications

*AI4OPT publications available on **Google Scholar***

Engage with the NSF AI4OPT Institute on Social Media