

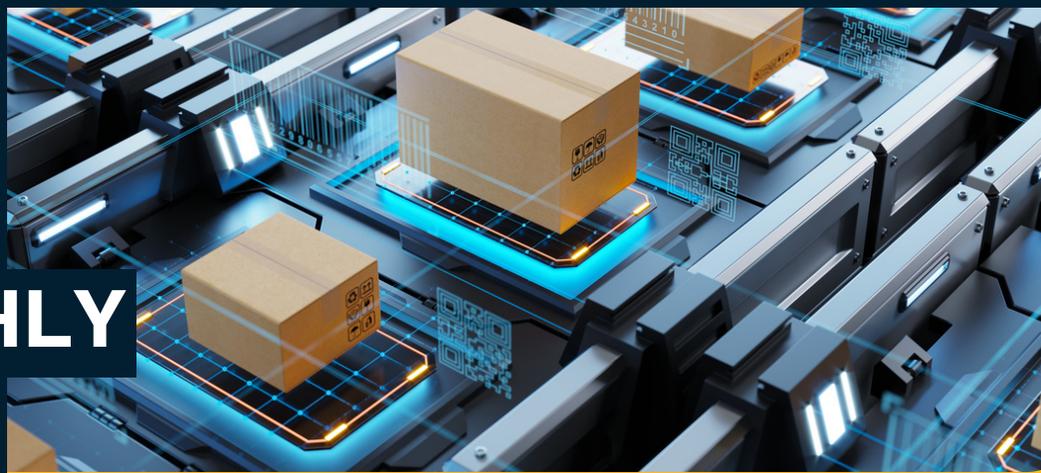


THE MONTHLY OPT-IN

AI4OPT Monthly Newsletter

Table of Contents

- Page 01**
Director's Letter
- Page 02**
Member Spotlight
- Page 03**
Developments & Accomplishments
- Page 04**
Student Highlights
- Page 05**
News & Publications
- Page 06**
Upcoming Events & Conferences
- Page 07**
Outreach & Seth Bonder Camp



FROM THE DIRECTOR

Until recently, not many shoppers gave any thought to the supply chains necessary to support e-commerce, although sustainability concerns were emerging in some circles. The pandemic changed all this: supply chains made it to the front pages of national news and have become a board-level topic for many corporations. Even before the pandemic, AI4OPT set course to combine AI and optimization to make supply chains more resilient, more sustainable, more efficient, and ready for the future.



AI4OPT is working together with industrial partners in new creative ways to truly make an impact on how supply chains are operated. In one direction, the Institute runs an internship program that allows students to spend half of their research time at AI4OPT and half as an intern to apply their work in real life. This is how AI4OPT collaborates with Intel and Kinaxis, for example. In the other direction, the Institute allows for reverse interns who are employed by the partner and join the research team to pursue an advanced degree. This is the case for UPS, where the first reverse intern started last January. This newsletter features a spotlight on two people who play an important role in this area. Postdoc Vahid Eghbal Akhlaghi is responsible for overseeing many of the supply chain projects at Georgia Tech. Ph.D. student Wenbo Chen is an expert in optimization proxies, which see many applications in supply chains. Both also became certified Kinaxis planners to enable the intense collaboration that AI4OPT stands for.

- Pascal Van Hentenryck



MEMBER SPOTLIGHT

GET TO KNOW OUR MEMBERS!

Vahid Eghbal Akhlaghi is a postdoctoral fellow for the AI Institute for Advances in Optimization (AI4OPT). He earned his Ph.D. in Business Analytics from the University of Iowa, where he utilized operations research methodologies to solve logistical challenges related to disaster preparedness and recovery. He currently serves as Chief of Staff for the AI4OPT supply chain projects at Georgia Tech, where he provides strategic leadership and technical expertise in overseeing and contributing to various supply chains, transportation, and scheduling projects.



We spoke with Vahid and summarized our conversation with him about how AI and optimization is being used to tackle key challenges facing supply chains.

What would you say are some of the biggest challenges facing supply chains today, and how can AI4OPT help address these challenges?

The world's supply chains face many challenges as of late, and the Covid-19 pandemic has shown how natural disasters can cause major problems within the industry.

Issues such as political instability, trade conflicts, and supplier issues, can lead to delays and increased costs. Making supply chains sustainable is another concern, with a focus on reducing waste, carbon emissions, and harm to the environment. Complexity is also a challenge, with many different people and processes involved.

Our research revolves around solving these problems by fusing AI and optimization to create advanced decision-making tools and algorithms, leveraging time and effort, especially for complex systems. By using AI algorithms, businesses can improve the developing of their supply chain operations.

AI4OPT is also developing algorithms to identify potential risks in the supply chain, so companies can minimize disruptions. We can also help businesses forecast demand by analyzing large datasets and recognizing patterns that traditional methods may miss. Finally, AI4OPT can help companies meet sustainability goals while optimizing their supply chain operations.

It's important to note that the challenges facing supply chains today vary, and the solutions the AI4OPT Institute are working towards are foundational.

What guides the ethical use of AI in supply chain?

There are currently seven principles that guide the ethical use of AI in supply chains management that we focus on: transparency, fairness, privacy and data security, collaboration and stakeholder engagement, sustainability, accountability, and human control. These principles allow us keep track of AI-driven solutions and help us prioritize ethical considerations while protecting the interests of all stakeholders involved in the supply chain industry.

How can AI be used specifically to address and optimize supply chain operations, such as inventory management, demand forecasting, and logistics planning?

AI can optimize inventory management operations by analyzing historical demand patterns, current inventory levels, and lead times to predict future demand. Based on these predictions, it can continuously update inventory levels to meet anticipated demand.

AI algorithms can ultimately optimize transportation routes, warehouse operations, fleet performance, and "the selection" of transportation modes, which can result in cost reduction, improved efficiency, and increased customer satisfaction in supply chain operations.



Looking ahead to the future, where do you see your work with AI4OPT in the next 5 to 10 years as new technologies in this field arise?

As new technologies continue to emerge, it's hard to say what AI4OPT's work will look like in the next 10 years, but rest assured, AI4OPT is making waves in the advancement of algorithms and solutions to address more substantial and complex optimization problems using AI. We put emphasis on sustainable and circular economy solutions, advancing collaboration and ethical AI use, as well as dedicate our resources to the educational initiatives, which include the Seth Bonder Camp in Computational and Data Science for Engineering and the Faculty Training Program, in hopes of encouraging the next generation of supply chain professionals and STEM students.

ADDITIONAL WORK

- Models for disaster response
- Fuel Distribution Planning for Disasters on Islands
- Akhlaghi's full list of citations



DEVELOPMENTS & ACCOMPLISHMENTS

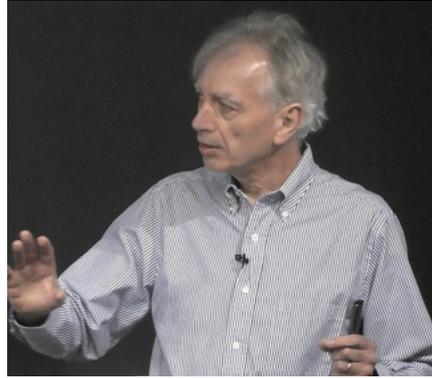
WE TAKE PRIDE IN OUR WORK AND ACHIEVEMENTS

AI4OPT members presented on Artificial Intelligence during the UCLA IPAM Workshop on Machine Learning and Discrete Optimization. Pascal and Bistra were also part of the organizing committee. **To watch, click thumbnails.**



Bistra Dilkina

Machine Learning for MIP Solving



Pascal Van Hentenryck

Fusing Machine Learning and Optimization



Paul Grigas

Offline and Online Learning for Contextual Stochastic Optimization

Pascal Van Hentenryck won the Outstanding Achievement in Research Engagement and Outreach Award

This award is among other accomplishments for his role in AI4OPT educational programs.



Winners were selected in nine areas, from achievements in innovation to engagement and outreach. Two of the awards were given to groups of researchers who are making an impact collectively. This year, more than 150 researchers were nominated for these prestigious awards.



You deserve all this success and more!

CONGRATULATIONS, PASCAL!



STUDENT HIGHLIGHTS

GET TO KNOW OUR STUDENTS!

Meet **Wenbo Chen**, a fourth-year Ph.D. student at Georgia Tech. As an AI4OPT graduate research assistant, Chen's focus is on fusing machine learning (ML) and mathematical optimization into large-scale, intelligent systems. His research can be applied to energy systems through risk-aware market clearing (RAMC), data-driven tactical load planning in supply chains, and ride-hailing systems, with a focus on reinforcement learning for vehicle relocation. Chen has also taken on the role leading a reading group in AI4OPT on machine learning methodologies.



What sparked your interest in AI and optimization?

My research aspirations involve contributing towards social goods by developing reliable and economical power systems and supply chains. By combining AI and optimization, I hope to integrate the strengths of both model-driven and data-driven approaches. This amalgamation can lead to more potent techniques to efficiently solve the problems at a massive scale.

Tell us a little about your work in AI and optimization and how you got involved with AI4OPT.

I joined the Georgia Tech's RAMC team in 2020. My current focus is on developing optimization proxies (i.e., machine learning surrogates) for large-scale, industrial-level optimization problems, such as optimal power flow and unit commitment. Such optimization problems are typically challenging to solve given the tight time budget. For example, in real-time market, optimal power flow must be solved in 2 minutes. In real-time risk analysis, thousands of optimal power flow instances must be solved in 2 minutes. In day-ahead market, unit commitment problem must be solved in 1 hour. By integrating ML, the optimization proxies have the potential to deliver feasible solution in milliseconds.

AI4OPT aligns with the research I'm pursuing and facilitates it along with my leadership skills. Through this Institute, I get the opportunities to have industrial impacts by extending the application of optimization proxies to supply chains with the cooperation of industrial partners. Additionally, my work in this field has allowed me to develop new methodologies, such as self-supervised learning, fast feasibility restoration, and reliable machine learning.

What's something unique about you?

I am into the history of multiple countries. I like reading books, lectures, and absorbing information about the people, events, and cultures that shape our world. My interests in history have also led me to visit museums, historical sites, and landmarks to experience history firsthand.



Tell us something fun you do when you're not studying or researching.

I enjoy short-term getaways with my girlfriend. We love to explore many stunning cities, beaches, and mountains in the South.

Meet the AI4OPT Student Leadership Council



Jorge Huertas
Georgia Tech



Rachel Harris
Georgia Tech



Ritesh Ojha
Georgia Tech



Anna Deza
UC Berkeley



Guillaume Goujard
UC Berkeley



Alicia Tsai
UC Berkeley



Haoming Li
USC



Taoan Hua
USC



NEWS & PUBLICATIONS

CURATED COVERAGE OF OUR RESEARCH AND EVENT APPEARANCES



AI4OPT attends 2023 Logistics Summit:

The summit covered a variety of topics, including a presentation on forecasting freight delivered by the Georgia Ports Authority and panel discussions with experts and leaders in logistics and supply chain. The event, held in Savannah, GA, is considered the top supply chain & logistics event in the Southeast.



Pascal Van Hentenryck, director of AI4OPT, and Ms. Beth White, a teacher at Drew Charter High School, will lead a class on Deep Learning. Students will create an algorithm to greet fellow students when entering the classroom and will teach it to recognize emotions and whether students are wearing the tie that comes with their school uniform. This is the second time Van Hentenryck and Ms. White are teaching this module. It serves as a pilot for the Seth Bonder Camp (level 3), which will be released sometime next year.

Findings and Recommendations of the May 2022 US-UK AI Workshop

Jeannette Wing (Columbia University) and
Michael Wooldrige (University of Oxford & Alan Turing Institute)



Findings and Recommendations of the May 2022 US-UK AI Workshop released:

The initial workshop brought together some 50 leading researchers, including Pascal Van Hentenryck, the director of AI4OPT, and practitioners in AI from both nations, with the goals of sharing knowledge and experience, and identifying and prioritizing possible areas for US-UK cooperation going forward.

AI4OPT member attends ProMat 2023:

Corporate Relations Manager, Stephanie Sigler attended the event held in Chicago. The three-day event is an esteemed trade show for manufacturing and supply chain industry and showcases 1,000+ leading manufacturing and supply chain solution providers.



AI4OPT Tutorial Lectures Causal Inference

Sanjay Shakkottai
University of Texas at Austin



Tutorial Lecture continues through Spring: Sanjay Shakkottai, a professor in the Engineering department at University of Texas at Austin, gave a short course on "Causal Inference" as part of the AI4OPT Tutorial Lectures series.

Publications

In addition to logistics and supply chains, AI4OPT is making an impact in the end use cases of power systems, hardware design and control, and resilient systems.

- Terrence W. K. Mak, Minas Chatzos, Mathieu Tanneau, and Pascal Van Hentenryck. Learning Regionally Decentralized AC Optimal Power Flows with ADMM. IEEE Transactions on Smart Grid, 2023. doi: 10.1109/tsg.2023.3251292.
- Kourosh Hakhamaneshi, Marcel Nassar, Mariano Phielipp, Pieter Abbeel, and Vladimir Stojanovic. Pretraining Graph Neural Networks for few-shot Analog Circuit Modeling and Design. IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems, 2023. doi: 10.1109/tcad.2022.3217421.
- Haiping Gao, Shifa Zhong, Raghav Dangayach, and Yongsheng Chen. Understanding and Designing a High-Performance Ultrafiltration Membrane Using Machine Learning. Environmental Science & Technology, 2023. doi: 10.1021/acs.est.2c05404.

MARK YOUR CALENDAR!

AI4OPT EVENTS

AI4OPT Seminar Series

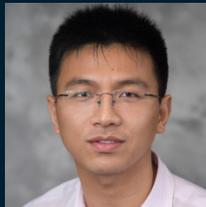


Joining us March 30 from noon to 1 pm ET will be Eytan H. Modiano, a professor and associate head of the Department of Aeronautics and Astronautics and associate director of the Laboratory for Information and Decision Systems at the Massachusetts Institute of Technology (MIT).



AI4OPT Tutorial Lectures

Jiaming Xu, an associate professor in the Fuqua School of Business at Duke University will lead a week-long tutorial lecture starting the week of April 17.



- To watch past seminars, click [here](#).
- To sign up to our seminar series mailing list, click [here](#).

CONFERENCES

AI4OPT will be attending the Institute of Industrial and Systems Engineers (IISE) Annual Conference & Expo Fri. May 19 – Mon, May 22 at the Hyatt Regency in New Orleans, LA.

EARLY BIRD RATES FOR NEW ORLEANS DATES



ANNUAL
CONFERENCE & EXPO 2023

SAVE UP TO \$400 ON
THE IISE ANNUAL
CONFERENCE & EXPO
MAY 20-23, 2023.



**REGISTER
BY
MARCH 25**

Our members will showcase AI for engineering during the largest industrial and systems engineering event of the year and talk about our work in application to power systems and transportation.

For more information, click [here](#).

OUTREACH & SETH BONDER CAMP

Providing High School Students Opportunities to Explore Industrial Engineering & Operations Research



The **Seth Bonder Camp (SBC) in Computational and Data Science for Engineering** is designed to give high school students a better understanding of the careers and opportunities available in industrial engineering and operations research. The camp is offered in an online format and an on-campus summer camp at Georgia Tech.

2023 Seth Bonder Camps Schedule

- June 5-9: Seth Bonder Camp (Student Camp, Level 1)
- June 5-9: Seth Bonder Camp (Teacher Development Camp, Level 1)
- June 26-30: Seth Bonder Camp (Student Camp, Level 1)
- July 24-28: Seth Bonder Camp (Student Camp, Level 2)

[More Information](#)

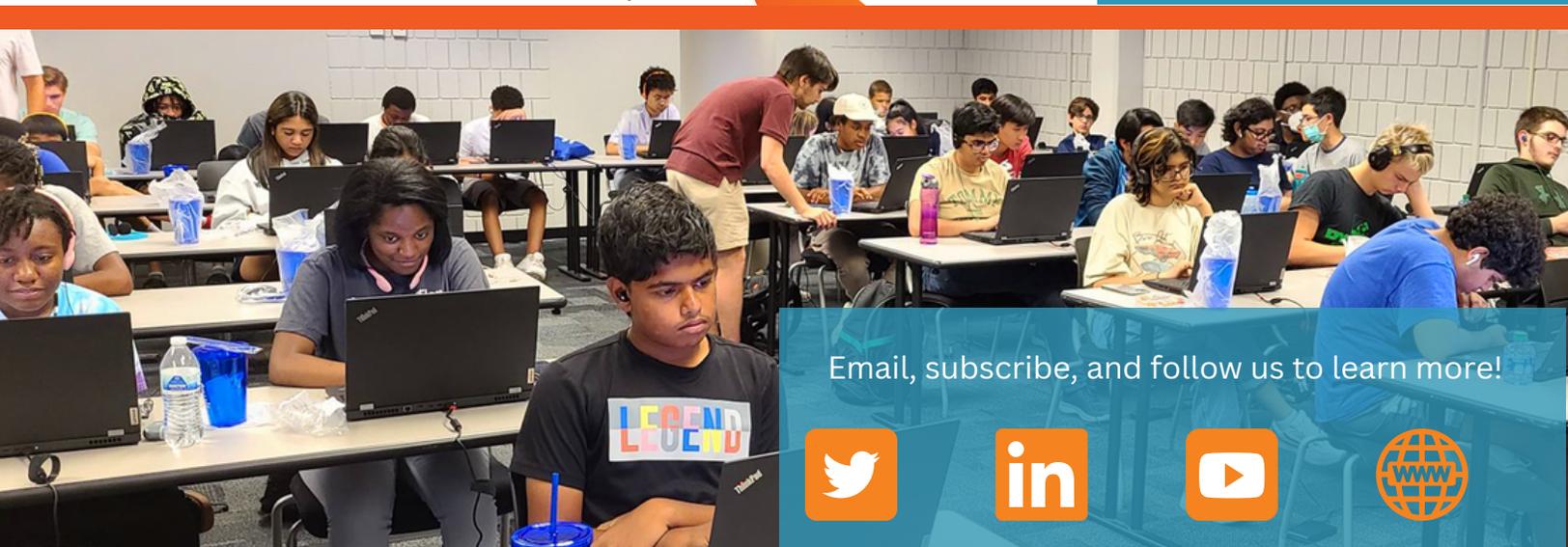
AI4OPT is funded by the [National Science Foundation](#).



CONNECT WITH US!

We aim to broaden community contribution through the development of an AI and mathematical optimization-based system to address societal challenges in energy, logistics and supply chains, resilience, and sustainability and circuit design and control.

Subscribe and follow us to learn more about our projects, research, and community events. If you are interested in media relations or AI4OPT's research, education, and partnership initiatives email and call us by clicking [here](#).



Email, subscribe, and follow us to learn more!

