YOONJU SIM

AI-assisted Optimization Researcher

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ABOUT ME

Yoonju Sim is a PhD candidate in Industrial and Systems Engineering at KAIST and a member of the Computational Optimization Methods (COMET) Lab led by Prof. C Kwon. Her research focuses on designing AI-assisted algorithms for solving large-scale discrete optimization problems, particularly vehicle routing, but also broader MILP-based models. She uses techniques such as cutting planes and column generation together with AI, machine learning, and large language models (LLMs). Her goal is to build faster and more adaptive optimization methods by integrating classical OR principles with modern learning-based strategies.

RESEARCH INTERESTS

Domain:
- Transportation and Logistics
- Quantum Computing

Methods:
- Mixed-Integer Programming based Approaches
- Machine Learning
- Large Language Models (LLMs)

Programming: Python, Julia

EDUCATION

2023.08 - Now **Korea Advanced Institue of Science and Technology (KAIST)** — **Daejeon, South Korea**
Combined MS&PhD Candidate in Industrial and Systems Engineering

2019.03 - 2023.08 **Korea University (KU)** — **Seoul, South Korea**
Bachelor of Science in Industrial Management Engineering
GPA: 4.4/4.5

2022.01 - 2022.05 **Arizona State University** — **Arizona, US**
Exchange student in Industrial Engineering

RESEARCH EXPERIENCE

2023.08 - Now **Computational Optimization Methods (COMET) Lab, KAIST** — **Daejeon, South Korea**
Advisor: Prof. C Kwon
- Implementing large-scale optimization methods in Python
- Investigating machine learning accelerated heuristics for vehicle routing problems
- Executing projects to solve real-world business challenges

WORK EXPERIENCE

2023.01 - 2022.07 **Presales Intern @ SAP Korea** — **Procurement Business Team**
Study spend management software, so-called 'Ariba' and assist in client meeting

2022.07 - 2022.12 **Presales Intern @ SAP Korea** — **Technology Team**
Study SAP Business Technology Platform and Low-code/No-code tools

UNDER REVIEW

- **Sim, Y.**, and **Kim, H.** et al. *Test-Time Search for Neural Graph Coarsening Procedures for the CVRP*. arXiv preprint (arXiv:2510.00958). **Submitted to Transportation Science, Special Issue — under review.**

WORKING PAPERS

- **Sim, Y.** and **F. Berto** et al. *QuantumEvo: LLM-based Hyper-Heuristic Algorithm for Reversible Circuit Synthesis*. **In progress**.
- **Sim, Y.** et al. *Learning to Improve Lagrangian Relaxation and Column Generation Lower Bounds for Packing Problems*. **In progress**.

PROJECT

2025.02 - 2025.09 **Research on AI-accelerated Production Planning** **Samsung Electronics**
Developed an AI-accelerated Lagrangian relaxation model for CLSP, achieving near-optimal solutions and supporting fast 3-month production planning.

2023.09 - 2023.12 **Project on modeling UAM Simulation** **GS E&C**
Designed and implemented a Python-based simulation to analyze UAM vertiport capacity, optimizing gate/FATO configurations using queueing and event-based modeling.

2023.01 - 2023.01 **Research on a supplier performance management system** **IME Department, Korea University**
Conduct a research on a supplier performance management system with respect to management consulting. Korea university, City of Vancouver, and UBC engaged Leader of a team of 6 students

2022.09 - 2022.12 **Project about RUL prediction and Anomaly Detection** **IME Department, Korea University**
Conduct a project to predict the residual life of equipment using unsupervised learning on sensor data. Win the first prize in the competition hosted by the IME Department, Korea University.

2021.06 - 2021.07 **Project on Smart Campus - deploy a service named 'Subject Phd'** **Korea University**
Develop a website that assists students with course registration. Utilize text mining on syllabus data to make recommendation algorithm and elevate search algorithm. Win the first prize in the competition hosted by Korea University. Leader of a team of 4 students

ACTIVITIES

2023.01 - 2023.12 **Industrial Engineering Study Club in KU, WeTIE** **Vice President**
Serve as a vice president of the club with approximately 50 members and Organize sessions of introducing industrial engineering to the freshmen

CONFERENCE PRESENTATIONS

2025.10.22 **Test-Time Search for Neural Graph Coarsening Procedures for the CVRP** **INFORMS Annual Meeting**
Oral Presentation

2024.10.28 **Charaterizing and Learning the Lagrangian Multipliers for the Bin Packing Problem** **INFORMS Annual Meeting**
Oral Presentation

HONORS AND AWARDS

2025.11.18 **Poster Competition for Industrial/Social Problem Solving** **Excellence Award**
Department of Industrial and Systems Engineering, KAIST

Last updated: December 20, 2025