

Jeongjoon Gwon: Background & Research Summary

2027 Fall Ph.D. Applicant

Education

- B.S. Candidate, Industrial & Systems Engineering (double major in Computer Science), KAIST
 - GPA 3.54/4.3 (cumulative), 3.69/4.3 (ISE major)
 - *Including 18 months of mandatory military service (KATUSA, attached to the U.S. Eighth Army)*
- Exchange student, University of Washington (Winter–Spring 2026) — GPA 3.96/4.0, Dean's List



Awards & Scholarships

- Presidential Science Scholarship, Korea Student Aid Foundation
 - *Awarded to the top 120 STEM students nationwide; Full tuition and stipend (\$17,500)*
- Korea–U.S. Advanced Industry Youth Exchange Scholarship (\$9,000)
- Undergraduate Research Grant, KAIST Advanced Manufacturing Challenge (\$6,200)

Research Interests: Urban parcel logistics under scarce curb space and uncertain demand — loading-zone allocation, curb rules and pricing, curb-aware last-mile routing — using stochastic, robust, and learning-augmented optimization.

Research Experience

- **Urban Freight Lab, University of Washington** (Prof. Anne Goodchild)
 - open loading-zone dataset [R1]; freight strategy database for Seattle DOT [R4]
- **Manufacturing Systems & Scheduling Lab, KAIST** (Prof. Hyun-Jung Kim)
 - LLM-guided GA for project scheduling; B.S. thesis [R2]
- **Management Science & Operations Lab, KAIST** (Prof. Woonam Hwang)
 - supply-chain risk and ESG compliance (EU CSDDD analysis)
- **DAIM Lab, KAIST** (Prof. Young Jae Jang) — EV factory simulation with General Motors [R3]

Contacts: jgwon7436@kaist.ac.kr | gwonjeongjoon@gmail.com

R1. A Harmonized Geospatial Dataset of Commercial Vehicle Loading Zones in 11 U.S. Cities (Urban Freight Lab, 2026–)

Motivation

- No two U.S. cities publish loading-zone data the same way; of 13 cities with documented programs, 5 publish nothing from which a zone can be located
- The curb is the scarcest infrastructure in parcel delivery, yet the data to model its allocation did not exist in usable form

What I did

- Evaluated each city's public sources; determined which allow zone-level reconstruction; added three cities beyond the original review
- Rebuilt city scripts into one reproducible R pipeline (per-city scripts → harmonization → validation)
- Designed the reconstruction method for cities with no loading-zone layer (Portland: parking slots + curb lines + signs)

Result

- **13,148 loading zones across 11 cities**, each with a harmonized type, the city's original label, and posted rules (days, hours, maximum stay, users, payment)
- Portland reconstruction vs. proprietary INRIX layer: **90%** of our zones within 10 m of an INRIX zone, **85%** of INRIX zones within 10 m of ours
- First-author data descriptor in preparation for *Scientific Data*; data package with raw sources, code, and processed data



The 11 cities and records per city (left); loading zones in downtown Seattle by type (right).
Figure from the manuscript in preparation.

R2. Resource-Constrained Project Scheduling Optimization via LLM-Guided Genetic Algorithms (B.S. Thesis, 2025)

Motivation

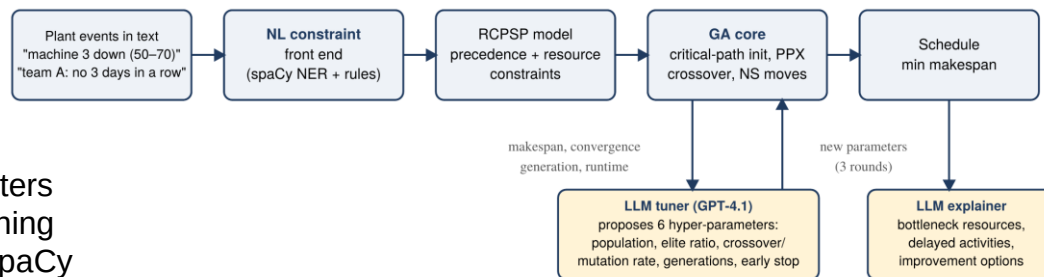
- GAs solve the RCPSP well but need an expert to tune hyper-parameters and to translate a site's constraints into the model

Design

- GA with critical-path-seeded initialization, precedence-preserving crossover, and neighborhood-search moves
- LLM in two roles — tuning six GA hyper-parameters over three rounds from run statistics, and explaining the resulting schedule — behind a rule-based (spaCy + regex) front end that turns plant events into constraints
- Problem drawn from a Samsung E&A project-scheduling case; validated on PSPLIB

Result

- 15 PSPLIB j120 instances: average makespan 0.7% lower than the base GA (up to 1.5%), paired t-test $p < 0.05$, ~18% added runtime



Rule-based front end for constraints; the LLM tunes the GA and explains the schedule

	Base GA	LLM-guided GA
Avg. makespan, 15 PSPLIB j120	148.6	147.8 (−0.7%, max −1.5%)
Paired t-test	—	$p < 0.05$
Runtime	—	+18% (~48 s)
Tuning-only experiment (10 inst.)	—	−1.2% (0.5–2.2%), +25% overhead

R3. Simulation-Based Layout Evaluation for EV Factories, with General Motors (DAIM Lab, 2021–22)

Motivation

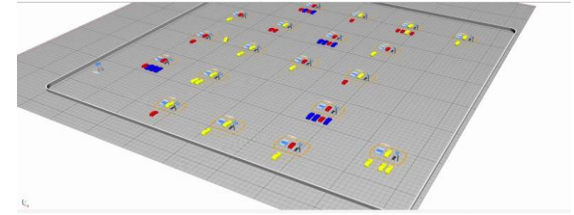
- GM was moving EV plants toward AGV-based matrix assembly, where workstation layout becomes the decisive design variable — with no tool to evaluate it

Design

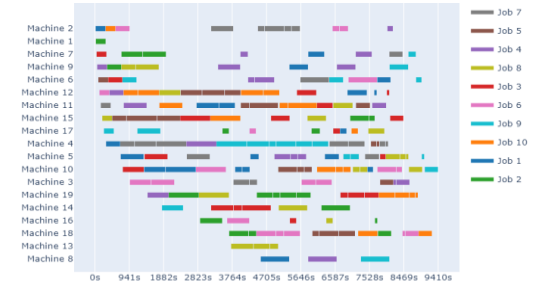
- Agent-based DES (Siemens Plant Simulation) of a 19-workstation AGV matrix-assembly area with 4,320 alternative process plans from GM data; a Python controller (COM API) runs any candidate layout and records makespan and utilization
- Rule-based control (routing, FCFS dispatching, deadlock avoidance) and a DQN agent (PyTorch, via COM) that selects among dispatching heuristics from the simulation state; co-developed a MILP (FJSP with process-plan flexibility and transport times) with GM R&D

Result

- Station utilization under the rule-based policy ranged from 3% to 78% in a 10-car run — the imbalance that motivated learning the dispatching choice; presented at GM headquarters, Detroit



Agent-based simulation of the matrix-assembly workstation area with AGVs.



Workstation schedule (Gantt) produced from a simulation run

R4. Low-Pollution Neighborhoods: Freight Strategy Database for Seattle DOT (Urban Freight Lab, 2026)

Compiled 84 freight pollution-reduction strategies from the literature and city pilots into a structured database (13 categories, ~28 attributes incl. emission effect, measurement method, mile stage, vehicle class, and sector applicability) and assessed their fit for four Seattle neighborhoods as the basis for the project's recommendations.