Heeseung Shon, Ph.D.

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RESEARCH INTERESTS

- Autonomous condition monitoring-based transportation asset management systems
- Optimization of transportation systems planning and operation
- Transportation big data analysis
- Advanced air mobility systems
- Graph diffusion convolutional network and multi-agent reinforcement learning

EDUCATION

- Korea Advanced Institute of Science and Technology (KAIST), Daejeon, Korea
  - Ph.D. in the Graduate School of Mobility, 2023
  - Dissertation title: Optimal road asset management system considering condition inspection policies and information value
- Korea University, Seoul, Korea
  - M.S. in Civil and Environmental Engineering, 2019
  - Thesis title: New section based congestion index for applications in enhancing missing value imputation and predicting travel time
  - B.S. in Civil and Environmental Engineering, 2017

ACADEMIC EXPERIENCE

- UIC, Illinois, United States
  - Postdoctoral Researcher, 2024-2025
  - Visting Scholar, 2023-2024
- KAIST, Daejeon, Korea
  - Postdoctoral Researcher, 2023
  - Researcher, 2019-2020

HONORS AND AWARDS

- Best paper award, The 86th Conference of Korean Society of Transportation, 2022
- Best paper award, Conference of Korean Society of Civil Engineering, 2021
- Best paper award, The 83rd Conference of Korean Society of Transportation, 2020
- President award, Korean Society of Transportation, 2017

PEER-REVIEWED JOURNAL PUBLICATIONS

Transportation Asset Management Systems

- **Shon, H**. and Lee, J., 2021. Integrating multi-scale inspection, maintenance, rehabilitation, and reconstruction decisions into system-level pavement management systems. *Transportation Research Part C: Emerging Technologies*, 131, p.103328.
- **Shon, H**., Cho, C., Byon, Y. and Lee, J., 2022. Autonomous condition monitoring-based pavement management system (ACM-PMS). *Automation in Construction,* 138, p.104222.
- Jeong, M., **Shon, H.**, Kim, J., Jung, Y. and Lee, J., 2023. Analysis of traffic load reduction effects of overloading enforcement system from a traffic assignment perspective, *International Journal of Highway Engineering*, 25(6), pp.309-315.

Advanced Air Mobility Systems

- **Shon, H.**, Kim, S., and Lee, J., 2024. Optimal planning of urban air mobility systems accounting for ground access trips. *International Journal of Sustainable Transportation*, 18(4), pp.356-378.
- **Shon, H.** and Lee, J., 2025. An optimization framework for urban air mobility (UAM) planning and operations. *Journal of Air Transport Management,* 124, p.102720.
- Perez, D., **Shon, H**., Zou, B. and Kuhn, K., 2025. Advanced air mobility for commuting? An exploration of economic, energy, and evironmental feasibility. *Transport Economics and Management,* 3, pp.135-152.

Transportation Planning and Operations

- Choi, Y.Y., **Shon, H**., Byon, Y.J., Kim, D.K. and Kang, S., 2019. Enhanced application of principal component analysis in machine learning for imputation of missing traffic data. *Applied Sciences*, 9(10), p.2149.
- Lee, J., **Shon, H**., Papakonstantinou, I. and Son, S., 2021. Optimal fleet, battery, and charging infrastructure planning for reliable electric bus operations. *Transportation Research Part D: Transport and Environment*, 100, p.103066.

PAPERS UNDER REVIEW

- **Shon, H**., Kim, S., Yoon, Y. and Lee, J. Incorporating Traffic Flow Transmission Impacts into Dynamic Graph Diffusion Convolutional Network for Traffic Speed Prediction. *Under review.*
- Jeong, M., **Shon, H.**, Kim, J., Jung, Y. and Lee, J. Developing Link Travel Time Functions for Highway Merging and Diverging Segments with Mixed Truck Traffic. *Under review*.
- **Shon, H**., Zou, B.* Modeling Early-Stage Advanced Air Mobility with Integrated Air-Ground Services for Commuting. *Under review*.

CONFERENCE PROCEEDINGS

- **Shon, H**. and Lee, J. 2022. Optimal Urban Air Mobility (UAM) Planning and Operations. *Transportation Research Board (TRB) 102nd Annual Meeting*. Accepted for presentation.
- **Shon, H**., Kim, S. and Lee, J., 2022. Incorporating Traffic Flow Transmission Impacts into Spatio-Temporal Graph Diffusion Convolutional Network for Traffic Speed Prediction. *Transportation Research Board (TRB) 102nd Annual Meeting*. Accepted for presentation.
- Selmoune, A., **Shon, H**., Han, J., Kim, J. and Lee, J., 2022. Heterogeneity in Bus Choice Behavior by Time of Day: Empirical Evidance from Smart Card Big Data. *Transportation Research Board (TRB) 102nd Annual Meeting.* Accepted for presentation.
- **Shon, H**., Cho, C., Byon, Y. and Lee, J. *, 2022. Initial Concept of Autonomously Monitored Pavement Management Systems and Its Potential Benefits. *Transportation Research Board 101st Annual Meeting.* Accepted for presentation.
- **Shon, H**. and Lee, J. *, 2021. Information Value in Pavement Management Systems with Surface Condition Information Collected by Autonomous Vehicles. *The 14th International Conference of Eastern Asia Society for Transportation Studies (EASTS).*
- **Shon, H**. and Lee, J. *, 2021. Joint optimization of multi-scale decisions in budget allocation, inspection frequency, and maintenance policies for transportation infrastructure systems. *Transportation Research Board 100th Annual Meeting.* Accepted for presentation.
- Oh, Y., **Shon, H**., Jeong, H., Bae, HG. and Kang, S. *, 2018. Analysis on taxi operation using digital tachograph and meter data in Korea. *18th International Conference Road Safety on Five Continents (RS5C 2018)*.

LANGUAGES

- English (Proficient)
- Korean (Native)

SKILLS

Advanced Python, Matlab, R, and Microsoft office

Moderate C++, VISSIM, EMME, and LaTex

MILITARY SERVICE

- Sergeant, The Republic of Korea's Army, Korea.

TEACHING EXPERIENCE

- Korea University, Seoul, Korea
  - Research assistant, Spring 2017
  - Teaching assistant, Fall 2017

SELECTED RESEARCH & APPLIED PROJECTS

- **Preliminary Study for a Road Construction Project**, ***Korea Development Institute***
  - Built **EMME**-based multimodal network scenarios and performed traffic assignment to quantify **travel-time savings, safety, and emissions** as inputs to cost-benefit analysis. *(Methods/Tools: EMME, Python, demand-supply scenarios)*

- **Taxi Operation Information Management System,** ***Neighbor System***
  - Analyzed large-scale **digital tachograph (DTG) taxi data** to identify **demand hotspots** and **prototyped detectors** for **regulatory violations/unauthorized operations**. *(Methods/Tools: Statistics, Python, GIS)*

- **Road Asset Management System (RAMS) Strategy for the Dominican Republic,** ***The Export-Import Bank of Korea***
  - Designed a **country-tailored RAMS framework** (master plan, data collection and pavement-condition indices, organizational roles, prioritization/repair decision rules, system architecture), and produced a **phased implementation roadmap**.

- **Big-Data- and Optimization-Driven Sustainable Transport Infrastructure Asset Management,** ***National Research Foundation of Korea***
  - Designed **multi-objective life-cycle maintenance optimization** and **a connected-vehicle-based condition-monitoring pipeline** *(Results: two papers in top-tier journals- Transportation Research Part C; Automation in Construction.)*

- **Urban Mobility Network Analysis & Forecasting with Attention Mechanisms and Graph Neural Networks,** ***National Research Foundation of Korea***
  - Built a **graph-based neural model** with attention and diffusion to learn **taxi-flow spatial correlations** and **forecast speeds from DTG data**, with map matching and a recurrent encoder. *(Methods/Tools: graph diffusion convoultional networks, recurrent neural network, DTG data, Python)*

- **Jeju Innovation City Smart-Mobility Living Lab,** ***Jeju Free International City Development Center***
  - Developed a prototype where **roadside video infrastructure** detects difficult perception cases and **sends hazard alerts to autonomous vehicles**; implemented end-to-end code from camera ingestion to alerting. *(Methods/Tools: autonomous vehicles, convolutional neural networks, Python, video analytics)*