

Eunhan Ka

PHD STUDENT · LYLES SCHOOL OF CIVIL ENGINEERING, PURDUE UNIVERSITY

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Education

Purdue University

United States

DOCTOR OF PHILOSOPHY (PHD), LYLES SCHOOL OF CIVIL ENGINEERING

Aug. 2020 - present

- Topic Keywords: Network Traffic Dynamics, Connected and Autonomous Vehicles, Machine Learning, Network Science
- Advisor: Dr. Satish V. Ukkusuri

Seoul National University

South Korea

MASTER OF SCIENCE (MS), DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

Feb. 2018

- Thesis: A Simulation Study of Demand Responsive Transport for the Disabled to Minimize User Waiting Time
- Advisor: Dr. Chungwon Lee

Seoul National University

South Korea

BACHELOR OF SCIENCE (BS), DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

Feb. 2016

Research Experience

Research Assistant

Aug. 2020 - Present

PURDUE UNIVERSITY

- Develop a novel framework for modeling traffic dynamics with physics-informed deep learning in large-scale urban areas and predict the traffic impact of connected and autonomous vehicles (CAVs) in cyber-physical systems
- Formulate an optimization framework to schedule autonomous trucks considering platooning and speed optimization
- Predict origin-destination (OD) matrices by using mobile location data (**Sponsor: INDOT**)
- Analyze the traffic impact of movable barrier (Alex Fraser Bridge) in Vancouver by leveraging the mobile location data (**Sponsor: Lindsay Corporation**)

Researcher

Mar. 2018 - Aug. 2020

SEOUL NATIONAL UNIVERSITY

- Led a study on designing a cluster-based route of multi-capacity vehicles of demand-responsive transport services for the disabled
- Developed optimal operation strategies of Mobility-as-a-Service (MaaS) for the mobility impaired (**Sponsor: National Research Foundation of Korea, South Korea**)
- Modelled lane change behaviors on freeways and gap acceptance behaviors at roundabouts in real driving situations and virtual reality (**Sponsor: Ministry of Land, Infrastructure and Transport, South Korea**)
- Collaborated and coordinated with faculty members, businessmen, researchers, and graduate students at University of Seoul, Radius Corporation, Korea Land & Housing Institute

Research Assistant

Mar. 2016 - Feb. 2018

SEOUL NATIONAL UNIVERSITY

- Designed a real-time relocation strategy for one-way car-sharing and developed an event-based simulation for one-way car-sharing services (**Sponsor: National Research Foundation of Korea**)
- Led a study on improving demand-responsive transport services for the disabled with shared mobility in Seoul (**Sponsor: T-Money Welfare Foundation, South Korea**)
- Developed an evaluation method to evaluate drivers' behaviors with surrogate safety measures (**Sponsor: Ministry of Land, Infrastructure and Transport, South Korea**)
- Collaborated and coordinated with faculty members, businessmen, and researchers at the Korea Transport Institute, Korea Transportation Safety Authority, and InnoSim

Publications

IN REVIEW

2. **Ka, E.**, Xue, J., Leclercq, L., and Ukkusuri, S. V. (TBD). PIML-GBM: A Physics-Informed Machine Learning for Estimating Traffic State with a Generalized Bathtub Model in Large-scale Urban Networks. *Transportation Science*. .
1. Xue, J., **Ka, E.**, and Ukkusuri, S. V. (TBD). Network Macroscopic Fundamental Diagram-Informed Graph Learning for Traffic State Imputation. *ISTTT25: 25th International Symposium on Transportation and Traffic Theory*, Ann Arbor, Michigan, United States. .

REFEREED JOURNAL PUBLICATIONS

3. **Ka, E.**, Sharma, S., and Ukkusuri, S. V. (2022). Leveraging Location-Based Data for Assessing Network-Level Traffic Impact of Lane Management: A Case Study of Alex Fraser Bridge. *Journal of Transportation Engineering, Part A: Systems*, 148(12), 04022105. **[2022 Editor's Choice Collections]**. <https://doi.org/10.1061/JTEPBS.0000760>
2. **Ka, E.**, Kim, D. G., Hong, J., and Lee, C. (2020). Implementing surrogate safety measures in driving simulator and evaluating the safety effects of simulator-based training on risky driving behaviors. *Journal of advanced transportation*, 2020. . <https://doi.org/10.1155/2020/7525721>
1. Lee, D., Hwang, S., **Ka, E.**, and Lee, C. (2018). Evaluation of the rain effects on gap acceptance behavior at roundabouts by a logit model. *Journal of Advanced Transportation*, 2018. . <https://doi.org/10.1155/2018/2726732>

REFEREED CONFERENCE PROCEEDINGS

9. **Ka, E.**, Ka, D., Jung, Y., and Lee, C. (2020). A Cluster-Based Route Design of Multi-Capacity Vehicle in Large-Scale Demand Responsive Transport Service for the Disabled. *99th Annual Meeting of the Transportation Research Board*, Washington DC, United States. .
8. **Ka, E.**, Hong, D., Na, Y., and Lee, C. (2018). Analysis of Status in DRT Service for the Disabled in Seoul and Comparison Domestic and Foreign Cases. *International Conference for Road Engineers*, Jeju, South Korea. .
7. Hong, D., **Ka, E.**, Ha, S., and Lee, C. (2018). Selection of Appropriate Hyperparameter for Waiting Time Prediction Model for Demand Responsive Transport for the Disabled in Seoul Using Long Short-Term Memory (LSTM) Network. *78th Korean Society of Transportation Conference*, Wonju, South Korea. **[Outstanding Paper Award]**.
6. **Ka, E.**, Ha, S., Hong, J., and Lee, C. (2017). Application of Deep Learning for Demand Forecasting of Call Taxi for the Handicapped in Seoul. *77th Korean Society of Transportation Conference*, Seoul, South Korea. .
5. **Ka, E.**, Kim, S., Hong, J., and Lee, C. (2017). A Preliminary Study of Comparison with Lane Changing Model Parameters in Merging Area between Normal and Raining Conditions. *12th International Conference of Eastern Asia's Society for Transportation Studies (EASTS)*, Ho Chi Minh, Vietnam. .
4. **Ka, E.**, Woo, D., and Lee, C. (2016). The Importance of Demand Prediction for Vehicle Relocation Strategy Development in One-way Car-sharing System. *3rd International Conference on Computational Science and Engineering*, Ho Chi Minh, Vietnam. .
3. **Ka, E.**, Kim, S., Woo, D., and Lee, C. (2016). An Estimation of Critical Gap for Gap Acceptance Model Applied to Lane Change of Surrounding Vehicles in Driving Simulator. *2016 Fall Korea Institute of ITS Conference*, Jeju, South Korea. .
2. **Ka, E.**, Lee, S., Lee, J., and Lee, C. (2016). Comparison of Survival Model of Traffic Flow Deterioration due to Traffic Accident according to VDS Aggregation Level. *75th Korean Society of Transportation Conference*, Busan, South Korea. .
1. Lee, S., Lee, H., Lee, J., **Ka, E.**, and Lee, C. (2016). Analysis of Traffic Flow Impacts of Highway Traffic Accidents Using Survival Analysis. *74th Korean Society of Transportation Conference*, Jeju, South Korea. **[Outstanding Paper Award]**.

Awards, Fellowships, & Grants

Outstanding Paper Award

Mar. 10, 2018

78th Conference of Korean Society of Transportation, Korean Society of Transportation

Lecture & Research Scholarship

\$ 4,500

Sep. 2016 - Feb. 2017

Department of Civil and Environmental Engineering, Seoul National University

Brain Korea 21 Plus Scholarship

\$ 2,400

Mar. 2016 - Aug. 2016

National Research Foundation of Korea

Need-based Scholarship

\$ 500

Mar. 01, 2016

Department of Civil and Environmental Engineering, Seoul National University

Outstanding Paper Award

Feb. 19, 2016

74th Conference of Korean Society of Transportation, Korean Society of Transportation

Alumni Association Scholarship

\$ 3,000

Oct. 25, 2015

Alumni Association of Department of Civil Engineering, Seoul National University

Bronze Award

\$ 400

June 17, 2013

6th Science and Technology Writing Excellent Research Paper Presentation Competition,
College of Engineering, Seoul National University

Teaching & Mentoring Experience

Teaching Assistant

Jan. 2021 - Present

LYLES SCHOOL OF CIVIL ENGINEERING, PURDUE UNIVERSITY

- CE 597 - Network Models for Connected Autonomous Vehicles (Spring 2022, Fall 2021)
- CE 597 - Smart Logistics (Fall 2021, Graduate)
- CE 597 - Data Science for Smart Cities - CE597 (Spring 2021, Graduate), [link]

Lecturer

Nov. 2019

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING, SEOUL NATIONAL UNIVERSITY

- Introduction to Civil and Environmental Engineering (Transportation Engineering)

Mentor

Aug. 2017, Feb. 2018

COLLEGE OF ENGINEERING, SEOUL NATIONAL UNIVERSITY

- Youth Engineering Frontier Camp

Teaching Assistant

Sep. 2016 - Dec. 2017

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING, SEOUL NATIONAL UNIVERSITY

- Sustainable Transportation Systems (Fall 2017, Undergraduate)
- Advanced Transportation Operation (Spring 2017, Graduate)
- Leadership for Civil Engineers (Spring 2017, Undergraduate)
- Introduction to Transportation Engineering (Fall 2016, Undergraduate)

Professional Activities

REFeree SERVICE

- Journal Referee:
Journal of Transportation Engineering, Part A: Systems
- Conference Referee:
Transportation Research Board; ISTTT25 (Co-reviewer)

Extracurricular Activities

Leader

Mar. 2016 - Feb. 2017 &

Mar. 2009 - Feb. 2011

Campus Ministry in Seoul, South Korea, Youth With A Mission (YWAM)

Leader of a Voluntary Team

Jan. 2012

Project for Improvement of Drinking Water in Tanzania, Serving Friends International
(Non-governmental organization)

Sergeant

Feb. 2014 - Nov. 2015

MND Service Support Corps, Republic of Korea Army (ROKA)

Skills

PROGRAMMING

Python (w/ TensorFlow, PyTorch, Keras, PySpark, and GeoPandas): Machine learning and deep learning models based on TensorFlow, Pytorch, and Keras; Massive data (e.g., mobile phone location data) preprocessing for trip data extraction based on PySpark and GeoPandas

R: Time-series analysis; Data preprocessing; Data clustering; Data visualization; Discrete choice modeling; and Statistical analysis

Java (w/ CPLEX): Agent-based simulation (demand responsive transport services); Event-based simulation (one-way car-sharing services); Optimization models using the API of CPLEX

SOFTWARE

MATLAB, CPLEX, SPSS, NLOGIT, TransCAD, VISSIM, LaTeX, Windows, Linux (Ubuntu), and Mac OS