

# Sevin Mohammadi

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<u>EXPERTISE</u>	<b>Data Science   Probabilistic Machine Learning   Bayesian Learning   Predictive Analytics   Reinforcement Learning</b>		
<u>EDUCATION</u>	<b>Columbia University, NY, GPA: 4.06/4.00</b> (Jan '20 to Dec '24) <b>Ph.D. in Engineering</b> <i>Thesis:</i> Geospatial Probabilistic Machine Learning for Analyzing Vehicular Mobility Patterns in Urban Road Networks: Focus on Travel Duration, Trajectories, and Decision-Making Applications <b>University of Tennessee Knoxville, TN, GPA: 3.9/4.0</b> (Aug '17 to Dec '19) <b>M.S. in Engineering</b> <i>Project:</i> "Study of Driving Volatility in Connected and Cooperative Vehicle Systems" funded by NSF.		
<u>SKILLS</u>	<b>Programming:</b> Python, SQL, R   <b>Data Science Libraries:</b> NumPy, Pandas, GeoPandas, Scikit-learn, NetworkX, TensorFlow, Pytorch, PyMC3   <b>Others:</b> Git, Shell		
<u>COURSEWORK</u>	Data Analysis & Modeling   Statistical Inference   Bayesian Machine Learning   Machine Learning   Deep Learning   Causal Inference for Data Science   Uncertainty & Risk   Signal Processing & Noise   Reinforcement Learning   Infrastructure Systems Optimization   Transportation Analytics & Logistics   Big Data in Transportation		
<u>EXPERIENCE</u>	<b>Center for Smart Streetscapes, Researcher &amp; Student Leadership Council</b> (Aug '23 to present) <b>Geospatial Sequential Data Science &amp; Deep Learning</b> <ul style="list-style-type: none"><li>Engineered a Transformer-based surrogate model with a Sequence-to-Sequence architecture, inspired by LLMs, to match noisy GPS trajectories to digital road maps.</li><li>Achieved an accuracy of 75%, exceeding the performance of state-of-the-art rule-based models and the BiGRU encoder-decoder RNN model.</li></ul> <b>Institution Representative</b> <ul style="list-style-type: none"><li>Promoted Center for Smart Streetscapes by organizing events &amp; communicating its mission to public.</li></ul> <b>Smart Cities Research Center, Researcher</b> (Jan '20 to Aug '23) <b>Predictive Analytics, Policy Design &amp; Simulation</b> <ul style="list-style-type: none"><li>Developed probabilistic data analytics for improving ambulance response in NYC.</li><li>The model is now up and running with FDNY, reducing ambulance response times up to 133 seconds.</li><li>Developed interpretable predictive model for learning spatial and temporal properties of ambulance and taxi travel times using Hierarchical Bayesian learning.</li><li>Developed model outperformed NGBoost, Random Forest and lightGBM.</li><li>Designed a heuristic ambulance dispatching policy, evaluated with discrete event simulation.</li><li>Developed predictive model for ambulance travel time using Bayesian Neural Networks.</li><li>Proved myopicness of greedy policy with reinforcement learning in particular Q-learning agent.</li><li>The designed heuristic obtained superior performance over classic greedy policy.</li></ul> <b>Center for Transportation Research, Researcher</b> (Aug '18 to Dec '19) <b>Data Analytics and Statistical Modeling</b> <ul style="list-style-type: none"><li>Discovered empirical evidence of social interactions among drivers affecting microscopic driving behavior through the analysis of 151 million rows of time series data.</li><li>Identified correlations of environmental factors with such behavior using a random parameter binary logit model.</li></ul>		

JOURNAL  
PUBLICATIONS

- [1] **S. Mohammadi**, A. Smyth, "Surrogate Modeling of Trajectory Map-matching in Urban Road Networks using Transformer Seq2seq Model," IEEE Intelligent Transportation Systems, *revision submitted*, 2024.
- [2] **S. Mohammadi**, A. Olivier, A. Smyth, "Dynamic penalty-based dispatching decision-making for improved EMS response in urban environments: a heuristic approach," *under review* at Sustainable Cities and Society, 2024.
- [3] **S. Mohammadi**, A. Olivier, A. Smyth, "Probabilistic Prediction of Trip Travel Time and its variability using Hierarchical Bayesian Learning," Journal of Risk and Uncertainty in Engineering Systems, 2023.
- [4] A. Olivier, **S. Mohammadi**, A. Smyth, "Bayesian Neural Networks with Physics-Aware Regularization For Travel Time Modeling from Imbalanced Data," Computer-Aided Civil Infrastructure Engineering, 2023.
- [5] A. Olivier, M. Adams, **S. Mohammadi**, A. Smyth, "Data Analytics for Improved Closest Hospital Suggestion for EMS Operations in NYC," Sustainable Cities and Society, 2022.
- [6] E. L. de Larrea, H. Lam, E. Sanabria, J. Sethuraman, **S. Mohammadi**, A. Olivier, A. Smyth et al., "Simulating NYC Hospital Load Balancing During COVID-19," IEEE: Winter Simulation Conference, 2021.
- [7] E. Sanabria, H. Lam, E. L. de Larrea, J. Sethuraman, **S. Mohammadi**, A. Olivier, A. Smyth et al., "Short-term Adaptive Emergency Call Volume Prediction," IEEE: Winter Simulation Conference, 2021.
- [8] **S. Mohammadi**, R. Arvin, et al., "The Role of Drivers' Social Interactions in their Driving Behavior: Empirical Evidence and Implication for Traffic Flow," Transportation Research Part F: Traffic Psychology & Behavior, 2021.
- [9] A. Khattak, I. Mahdinia, **S. Mohammadi**, A. Mohammadnazar, B. Wali, "Big Data Generated by Connected and Automated Vehicles for Safety Monitoring, Assessment and Improvement," arXiv: Computers and Society, 2019.

PRESENTATIONS

- [1] "Dynamic Penalty-based Dispatching for Optimal EMS Response Times: A Heuristic Approach," INFORMS Annual Meeting, Washington, Seattle, 2024.
- [2] "Enhancing Smart City Mobility on Urban Road Networks with Neural Network-Based Map-Matching of GPS Trajectory Data," Columbia University Data Science Day, New York City, 2023.
- [3] "Optimizing Ambulances Hospital Transports in New York City," Columbia University Data Science Day, New York City, 2021.
- [4] "Social Influence on Driver Decisions Using Modeling and Gossip Algorithms," Transportation Research Board Annual Meeting, Washington, DC, 2019.

AWARDS

- INFORMS Doing Good with Good O.R. Student Paper Competition **Finalist**, 2021
- Selected for the Morgan Stanley Quantitative Finance Women's Ph.D. Mentorship Program, 2022
- Recipient of the New York Women in Transportation Leonard Braun Memorial Scholarship (\$5000), 2022
- Machine Learning & Digital Twins, Science, Engineering & Technology Conference NSF fellowship, 2021
- Columbia University Academic Award for Full Tuition and Research Assistantship, 2020
- NASEM Transportation Research Board Meeting Travel Award, (\$1000) 2019
- University of Tennessee Knoxville Academic Award for Full Tuition and Research Assistantship, 2017

MENTORSHIP

- Mentor of MY Streetscape 2023 Summer School for high school students:
  - Eunice Yanes, will be majoring in Engineering Physics at Fordham University
  - Christopher Grullon, currently a freshman at Columbia University EngineeringProject title: Designing Safe Urban Traffic Intersections for Cyclists.
- Mentor of Columbia University 2023 Summer Undergraduate Research Experience Fellow:
  - Marylyn Carrillo, currently a senior student at the University of California, Los AngelesProject title: **Manhattan in Motion: Visualizing Delivery Vehicle Crash Density for Safer Urban Mobility.**

OUTREACH,  
VOLUNTEERING  
& SERVICES

- Student Leadership Council for the Center for Smart Streetscapes, year 2023-24
- Girls' Science Day Volunteer at Columbia University, Spring 2023
- Vice President of Women's Transportation Seminar at UTK, Fall 2019
- Social Director of the Institute of Transportation Engineers at UTK, Spring 2019