Reza Safarzadeh

Post Doctoral Associate · Geomatics Engineering

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Education

University of Calgary *Calgary, Canada*

PhD. Geographic Information System *2021 - 2025*

- Advisor: Dr. Xin Wang
- Dissertation: Data-Driven Routing for Autonomous Trucks: Learning from Human Behavior with Context Awareness and Privacy Protection

K. N. Toosi University of Technology *Tehran, Iran*

MSc. Geographic Information System *2014 - 2017*

- Advisor: Dr. Mohammad Karimi
- Dissertation: Multi Objective Optimization of Urban Land Use Planning Using Meta-heuristic Algorithms and Spatial Metrics

Iran University of Science and Technology *Tehran, Iran*

BSc. Geomatics Engineering *2009 - 2013*

- Undergraduate research advisor: Dr. Amir Moradi

Expertise and Skills

Research Expertise

- Data-driven spatial-temporal mobility behavior modeling
- Deep reinforcement learning for trajectory and driver-intention modeling
- Graph-based neural networks for speed prediction and spatial–temporal data
- Multi-agent reinforcement learning for routing / decision-making
- Privacy-preserving federated learning
- Meta-imitation learning for forecasting human-like trajectories and driver behavior modeling

Technical Skills

- **Programming:**
  Python (PyTorch, TensorFlow, PyG, DGL, scikit-learn), C++, JavaScript, HTML/CSS, Leaflet, Mapbox, Flask, Django, Git
- **Reinforcement Learning:**
  Multi-agent RL, IRL, imitation learning, custom RL environments
- **Graph Learning:**
  GNNs, spatial–temporal graph modeling, spectral methods
- **Modeling:**
  Trajectory forecasting, driver behavior analysis, attention modeling, sequence models (GRU/LSTM/Transformer)
- **Data Systems:**
  PostgreSQL/PostGIS, large-scale GPS processing, HPC/GPU pipelines
- **Mathematics:**
  MDPs, stochastic optimization, probabilistic inference, linear algebra
- **GIS & Spatial Tools:**
  ArcGIS Pro, ArcGIS Online, QGIS, ArcGIS Server, ArcGIS Dashboards, GeoServer, Civil 3D, AutoCAD

Publications

Refereed Journal Articles

Safarzadeh, R., and Wang, X., 2025. Transferring Human Route Choice Preferences to Autonomous Vehicles: A Federated Meta-Imitation Learning Framework. Transportation Research Part C: Emerging Technologies. (Under review)

Safarzadeh, R. and Wang, X., 2024. Map matching on low sampling rate trajectories through deep inverse reinforcement learning and multi-intention modeling. International Journal of Geographical Information Science, 38(12), pp.2648-2683.

Kalantari, S. **Safarzadeh, R.**, Wang, Y., Sun, S. and Wang, X., 2023. Trailer allocation and truck routing using bipartite graph assignment and deep reinforcement learning. Transactions in GIS, 27(4), pp.996-1020.

Safarzadeh, R., Karimi, M. and Alaei, S., 2018. Multi objective optimization of urban land use allocation using meta-heuristic algorithms and spatial metrics. Journal of Geomatics Science and Technology, 7(3), pp.189-212.

Refereed Conference Proceedings

Safarzadeh, R., Raei, B., and Wang, X., 2025, August. ChargeNav: End-to-End Fleet Optimization and Energy-Aware Navigation for Electric Trucks. In Proceedings of the 19th International Symposium on Spatial and Temporal Data (SSTD 2025), pp. 247-251. (Received the Best Demo Paper Award)

Safarzadeh, R., Aghazadeh, H. and Wang, X., 2025, August. GAGE-Q: Reinforced genetic algorithm using spatial neighborhood graph embedding for green intermodal transportation. Advances in Cartography and GIScience of the ICA 5, p. 2.

Bao, Y., Drew, S., **Safarzadeh, R.** and Wang, X., 2025, May. Semi-decentralized federated time series prediction with client availability budgets. In IEEE INFOCOM 2025-IEEE Conference on Computer Communications Workshops (INFOCOM WKSHPS), pp. 1-6.

Jakhotiya, S., Sen, A., **Safarzadeh, R.** and Wang, X., 2024, November. Smart Route: A GIS-based solution for mass transit design and optimization. In Proceedings of the 2nd ACM SIGSPATIAL International Workshop on Advances in Urban-AI, pp.15-23.

Safarzadeh, R., Wang, Y., Sun, S. and Wang, X., 2023, August. An interactive map-based system for visually exploring goods movement based on GPS traces. In Proceedings of the 18th International Symposium on Spatial and Temporal Data (SSTD 2023), pp.180-184. (Received the Best Demo Paper Award)

Kim, B.S.S., **Safarzadeh, R.** and Wang, X., 2023, August. Quality assessment of the openstreetmap road network in Calgary, Alberta. In the 31st International Cartographic Conference (ICC 2023), p.124-127.

Safarzadeh, R., Wang, Y., Sun, S. and Wang, X., 2023, October. Spatial and temporal truck travel pattern analysis using a large stream of GPS data. In the Transportation Association of Canada 2023 Conference and Exhibition-Lessons and Leadership (TAC 2023), p.65-70.

Bahrehdar, R., **Safarzadeh, R.**, Kim, B.S.S., Wang, Y., Sun, S. and Wang, X., 2023, October. The impact of extreme weather condition on the transportation system in Calgary. In the Transportation Association of Canada 2023 Conference and Exhibition-Lessons and Leadership (TAC 2023), p.30-34.

Safarzadeh, R., Mozhdehi, A., Kalantari, S., Wang, Y., Sun, S. and Wang, X., 2022, November. Multi-task graph neural network for truck speed prediction under extreme weather conditions. In Proceedings of the 30th International Conference on Advances in Geographic Information Systems (ACM SIGSPATIAL 2022), pp. 1-11.

Safarzadeh, R., Karimi, M. and Alaei, S., 2018, September. Optimization of urban land use allocation using the NSGA-II algorithm and spatial indices. In the 2nd National Conference on Geospatial Information Technology (NCGIT 2018), p.32-45. (Received the Best Paper Publication Award)

Safarzadeh, R. and Karimi, M., 2016, September. Application of multi-objective particle swarm optimization algorithm in site selection for temporary housing after earthquakes in Tehran. In the 2nd International Congress on Earth Science and Urban Development (ESUD 2016), p.1-6.

Presentations

Contributed Presentations

Safarzadeh, R., Wang, Y., Sun, S. and Wang, X., October 2023. Spatial and temporal truck travel pattern analysis using a large stream of GPS data. Oral presentation: Transportation Association of Canada 2023 Conference and Exhibition-Lessons and Leadership (TAC), Ottawa, Canada.

Bahrehdar, R., **Safarzadeh, R.**, Kim, B.S.S., Wang, Y., Sun, S. and Wang, X., October 2023. The impact of extreme weather condition on the transportation system in Calgary. Oral presentation: Transportation Association of Canada 2023 Conference and Exhibition-Lessons and Leadership (TAC), Ottawa, Canada.

Safarzadeh, R., Wang, Y., Sun, S. and Wang, X., August 2023. An interactive map-based system for visually exploring goods movement based on GPS traces. Oral presentation: 18th International Symposium on Spatial and Temporal Data (SSTD), Calgary, Canada.

Safarzadeh, R., Mozhdehi, A., Kalantari, S., Wang, Y., Sun, S. and Wang, X., November 2022. Multi-task graph neural network for truck speed prediction under extreme weather conditions. Oral virtual presentation: 30th International Conference on Advances in Geographic Information Systems (ACM SIGSPATIAL), Seattle, USA.

Safarzadeh, R., Wang, Y., Sun, S. and Wang, X., May 2022. Truck traffic prediction under extreme weather condition. Oral presentation: Canada National Research Center (NRC) AI for Logistics Conference, Ottawa, Canada.

Safarzadeh, R., Karimi, M. and Alaei, S., September 2018. Optimization of urban land use allocation using the NSGA-II algorithm and spatial indices. Oral Presentation: 2nd National Conference on Geospatial Information Technology (NCGIT).

Invited Talks

Winter 2025. GeoAI and Trajectory Mining in Geography, Environment, and GIS. Invited talk: i4Geo workshop series, Department of Geography and Environment, University of Lethbridge. Lethbridge, Canada.

Winter 2024. Trajectory Mining and Computing with Spatial Trajectories. Course Guest Lecturer: Spatial data mining and databases, Department of Geomatics engineering, University of Calgary. Calgary, Canada.

Fall 2022. Spatial-Temporal Truck movement Analysis. Invited talk: AI for logistics (AI4L) summer student workshop, Canada National Research Center (NRC). Ottawa, Canada.

Honors and Awards

2025	**Alberta Innovates Graduate Student Scholarships Award**, Alberta Innovates	*$ 31,000*
2025	**Graduate Co-Instructor Award**, Schulich School of Engineering, University of Calgary	
2024	**Global Open Doctoral Scholarship**, University of Calgary	*$ 10,000*
2024	**Lab2Market Alberta Mitacs Business Strategy Award**, Lab2Market and Mitacs	*$ 15,000*
2024	**Research Impact Excellence Award**, Schulich School of Engineering, University of Calgary	*$ 2,000*
2023	**Evolve to Innovate (e2i) 23-24 Research Award**, Innovate Calgary	*$ 10,000*
2023	**Alberta Machine Intelligence Institute (Amii) Talent Award**, Alberta Machine Intelligence Institute (Amii)	*$ 2,000*
2022	**Esri Student of the Year Award**, Esri Canada Centre of Excellence (ECCE)	*$ 500*

Teaching Experience

Co-Instructor

Design and Implementation of GIS Systems (ENGO 641/451)

University of Calgary
Fall 2024

- Shared teaching responsibilities with another instructor; together we developed all course content for 60 graduate and undergraduate students.
- Delivered interactive lectures, emphasizing practical applications of GIS concepts.
- Designed practical in-class handouts to reinforce key concepts and encourage participation.
- Received a perfect 5/5 in course evaluations, with students praising the interactivity of lectures and the effectiveness of in-class handouts and lab materials.

Programming with Data (ENDG 233)

University of Calgary
Fall 2023

- Shared teaching responsibilities with another instructor; together we developed all course content for more than 150 undergraduate students.
- Delivered interactive lectures, emphasizing active learning and practical applications.
- Developed in-class handouts and practical exercises to reinforce key concepts and encourage participation.

Teaching Assistant

Spatial Databases and Data Mining (ENGO 645/537)

University of Calgary
Winter 2025

- Assisted in delivering lecture materials by providing in-class support and facilitating student engagement.
- Created instructional YouTube videos to support asynchronous learning and accommodate diverse student schedules.
- Developed an interactive course lab website (link) that allowed students to practice exercises and receive instant feedback on their submissions.
- Integrated industry best practices into course materials to ensure relevance and applicability to professional settings.

Geomatics Engineering Design and Communication (ENGO 401)

University of Calgary
Fall 2023

- Assisted in the creation and interpretation of topographic maps, teaching students practical mapping techniques for engineering projects.
- Provided support for cartographic design, helping students produce professional-quality maps aligned with industry standards.

Spatial Databases and Data Mining (ENGO 645) — *University of Calgary, Winter 2023*

- Collaborated with the course instructor to refine the lab material from scratch, ensuring that it met the latest academic and industry standards.
- Designed an interactive course lab website (link) for lab tutorials which allowed students to practice exercises and receive instant feedback on their submissions.

Leadership & Mentoring

Siddhant Jakhotiya, Undergraduate Student, Indian Institute of Technology — *Calgary, Canada, Summer 2024*

- Supervised a project on optimizing public transport networks using spatial–temporal data and optimization algorithms.
- Guided the development of an interactive dashboard for evaluating routing performance; collaboration led to a co-authored paper presented at the ACM SIGSPATIAL Workshop on Urban-AI.

Ravindranath Sawan, Undergraduate Student, G.H. Raisoni College of Engineering — *Calgary, Canada, Summer 2023*

- Mentored a project on deep learning–based traffic prediction, covering data preprocessing, model optimization, and result interpretation within spatial–temporal analysis.

Beom Sae (Shawn) Kim, Undergraduate Student, University of Calgary — *Calgary, Canada, Summer 2022*

- Supervised a project on automated quality assessment of the OpenStreetMap road network compared with official datasets; resulted in a co-authored paper presented at ICC 2023.

Barry Gu, Grade 10 Student, Webber Academy — *Calgary, Canada, Winter 2023*

- Mentored a science-fair project developing a machine learning model for spatial classification; project presented as a poster at the Webber Academy Science Fair.

Professional Experience

University of Calgary — *Calgary, Canada, 2021 - Present*

Research Assistant

- Built ML/DL models for **traffic prediction and route optimization** using Scikit-learn, TensorFlow, and Keras; contributed to a 14% improvement in travel time and 4% reduction in CO_2 emissions.
- Designed and implemented deep learning and **federated learning** models to analyze **sensitive GPS data** while **preserving data privacy** and complying with ethical handling standards.
- Developed **interactive dashboards** with ArcGIS Dashboards and Python for visualizing high-risk zones and route recommendations.
- Designed **AI-based vehicle routing and driver scheduling system**, reducing required vehicles by 24% and distance traveled by 19%.
- Built a **cost-efficient shuttle routing solution** with ML and optimization tools, deployed via a Flask & Mapbox dashboard for live testing.

PARSA Co. (FANAP ICT Group) *Tehran, Iran*
Spatial Data Scientist *2018 - 2021*

- Developed **LSTM-CNN model** in TensorFlow to forecast ATM cash demand, reducing replenishment costs.
- Designed a **GIS-based optimization** tool that improved ATM transaction efficiency by 15% through better placement of ATM locations.
- Led the development of a **GPS-based fleet management system** and Python routing optimization engine to enhance delivery speed and fleet logistics.
- Developed a **real-time route planning** service for replenishment vehicles using meta-heuristic algorithms.

AvayarSanat Co. *Tehran, Iran*
GIS Specialist *2017 - 2018*

- Built **interactive web-based maps** with seamless navigation and multi-layer overlays for geospatial analysis.
- Produced **georeferenced imagery and maps using ESRI** products and conducted digitization for data enrichment.
- Provided research contributions and feedback to enhance team outcomes and project success.

Outreach & Professional Development

Service and Outreach

2024	**Geomatics Graduate Group**, Volunteer Event Committe Member	*University of Calgary*
2023	**Science Fair 2023**, Volunteer Judge	*Webber Academy*
2023	**18th International Symposium on Spatial and Temporal Data**, Volunteer Organizing Team Member	*University of Calgary*
2022	**Graduate Student Association**, Volunteer Award Committee Member	*University of Calgary*

Peer Review

2025	IEEE Transactions on Computational Social Systems
2021-2025	Pacific-Asia Conference on Knowledge Discovery and Data Mining (PAKDD)
2023	ISPRS International Journal of Geo-Information (IJGI)
2021	ACM Transactions on Knowledge Discovery from Data (TKDD)

Professional Memberships

2021-2023	**Esri Canada Centre of Excellence (ECCE) Student Associate**, Esri Canada
2018-2021	**Member of Iran's National Elites Foundation**, Iran's National Elites Foundation
2012-2013	**Vice President Academic**, Geomatics academic committee, Iran University of Science and Technology