

Faraz Khoshbakhtian

EDUCATION

Ph.D., Industrial engineering, University of Toronto, Expected defense in 2025 (Current GPA: 4.0)

Thesis: Graph representation learning for a generalized and scalable solutions to the critical node detection problem, with applications to pandemic vaccination strategies

Supervisor: Dionne M. Aleman, Ph.D.

H.B.Sc., University of Toronto, 2020 (Cumulative GPA 3.7)

Concentrations: Computer Science, Statistics, and Philosophy

Areas of expertise

Graph neural networks; reinforcement learning; deep neural networks and training dynamics; distributed computing and big data analysis; operations research; combinatorial optimization; analysis and interpretability for machine learning; recommendation engines; test-driven development.

Professional experience

• **Applied science internship, Mastercard, 2023-Present**

A Mitacs Accelerate project; developing state-of-the-art network representation learning algorithms for universal node embeddings. Project focuses on development of novel self-supervised and reinforcement learning algorithms for generalized learning on graphs.

• **Data scientist and software developer, Ctrl Designer, 2017-Present**

Applied machine learning techniques such as reinforcement learning in software development to optimize and automate industrial processes.

• **Data scientist, RBC, Summer 2021**

Designed, implemented, and validated climate analytics tools using interpretable machine learning and statistics. Extensively used Hadoop and Spark to handle big data, train models, and interpret them.


• **Developer and curriculum writer, Code at the Edge, 2018-2019**

• **Department assistant, Department of Philosophy, University of Toronto, Summer 2018**

• **Research assistant, Scholars in Residence, University of Toronto, Summer 2017**

Intensive research project on China's cultural revolution and its effects on the marginalized population supervised by Dr. Yiching Wu.

Technical skills

Python, , Java, C++, Julia; large-scale agent-based simulation modelling; AWS; SageMaker; PyG and DGL; PyTorch and TensorFlow; GitHub Actions; Weights & Biases; MLflow; LangChain; Graph neural networks; Transformer architecture; Gurobi; database management systems; computer science and machine learning theory; neural network applications and interpretability; statistical learning; cloud computing; distributed computing.

Publications

Published

- [1] Khan, S. S., Khoshbakhtian, F., and Ashraf, A. B. (2021). Anomaly detection approach to identify early cases in a pandemic using chest X-rays. *Proceedings of the Canadian Conference on Artificial Intelligence*. 2021. doi: [10.21428/594757db.fab](https://doi.org/10.21428/594757db.fab)

In-progress

- [2] Khoshbakhtian, F., Validi, H., Ventresca, M., Aleman, D. M. Distance-based critical node detection for effective vaccine policies. *submitted to Operations Research Letters*.
- [3] Khoshbakhtian, F., Lagman, A., Aleman, D. M., Giffen, R., and Rahman, P. Prediction of severe COVID-19 infection at the time of testing: A machine learning approach. *targeted for Canadian Medical Association Journal*.
- [4] Navabzadeh, F., Khoshbakhtian, F., Aleman, D. M., Giffen, R., and Rahman, P. Machine learning to predict clinical outcomes of psoriasis patients. *targeted for Canadian Medical Association Journal*.

Pre-prints

- [1] Khoshbakhtian, F., Lagman, A., Aleman, D. M., Giffen, R., and Rahman, P. (2021). Prediction of severe COVID-19 infection at the time of testing: A machine learning approach. medRxiv. doi: [10.1101/2021.10.15.21264970v1](https://doi.org/10.1101/2021.10.15.21264970v1).

Conference and workshop presentations

(**bold** for the presenter)

- [1] **Khoshbakhtian, F.**, Validi, H., Ventresca, M., Aleman, D. M. Distance-based critical node detection for effective vaccine policies. INFORMS Annual Meeting. Phoenix, US. October 2023 (*scheduled*).
- [2] **Khoshbakhtian, F.**, Validi, H., Ventresca, M., Aleman, D. M. Distance-based critical node detection for effective vaccine policies. INFORMS Healthcare. Toronto, Canada. July 2023.
- [3] **Khoshbakhtian, F.**, Validi, H., Ventresca, M., Aleman, D. M. Distance-based critical node detection for effective vaccine policies. CORS / Optimization Days. Montreal, Canada. May 2023.
- [4] Khoshbakhtian, F., Validi, H., Ventresca, M., **Aleman, D. M.** Distance-based critical node detection for effective vaccine policies. Panoptic: view on global optimization. Florida, US. March 2023.
- [5] **Khoshbakhtian, F.**, Lagman, A., Aleman, D. M., Giffen, R., and Rahman, P. Prediction of severe COVID-19 infection at the time of testing: A machine learning approach. *CORS/INFORMS International Conference*. Vancouver, Canada. June 2022.
- [6] **Pirmorad, E.**, Khoshbakhtian, F., Mansouri, F., and Farahmand, A. M. Deep reinforcement learning for online control of stochastic partial differential equations. Spotlight presentation at *The Symbiosis of Deep Learning and Differential Equations*. virtual. Dec 2021.
- [7] **Khoshbaktian, F.** Machine learning for early detection of severe COVID infection. *University of Toronto Engineering Research Conference (UTERC)*. virtual, Canada. July 2021.
- [8] **Navabzadeh, F.**, Khoshbakhtian, F., Aleman, D. M., Giffen, R., and Rahman, P. Machine learning to predict clinical outcomes of psoriasis patients (*invited presentation*). INFORMS Healthcare Conference. virtual, Canada. July 2021

Teaching experience

• Head teaching assistant, University of Toronto, 2018-present

- Courses: Big Data Science (MIE1628); Data Modelling (MIE253); Fundamentals of Object-Oriented Programming (MIE250); Fundamentals of Computer Programming (APS106); Introduction to Philosophy (PHL101)
- Responsibilities: Managing teams of TAs, preparing tutorial material, holding office hours, designing and marking assignments and exams.

Leadership and service

- **Co-Founder, Executive Member**, University of Toronto Students for a Free Iran, 2022-Present
- **Co-Director, Marketing Team**, ILead:Grad, University of Toronto Faculty of Applied Science & Engineering, 2020-2021
- **Co-Lead, Design Team**, Cyrus International Film Festival of Toronto, 2016-2018
- **Workshop Facilitator, Research Officer**, InDepth Conference at the Munk School of Global Affairs, 2016-2017

Awards

- Ontario graduate scholarship (OGS) (15,000) (2023-2024)
- MITACS Accelerate award (toward applied science internship at Mastercard) (15,000) (2023)
- Emerging and Pandemic Infections Consortium (EPIC) doctoral award (\$10,000) (2023)
- 6T6 Industrial Engineering 50th Anniversary Award in Healthcare Engineering (\$3,000) (2022)
- Faculty of Applied Science & Engineering Graduate Student Endowment Award (\$3,000) (2020)
- Woodsworth College Brookfield's Leadership Scholarship (\$6,000) (2018)
- Jackman Humanities Scholars in Residence Scholarship (\$1,500) (2017)
- Sam & Mary Restivo Family Admission Scholarship (\$1,200) (2015)