

I have a background in operations research and machine learning. I am currently working on geospatial embeddings for housing development.

## ☰ Skills

**Tools:** PyTorch, Lightning, PyG, Spark, Gurobi **Techniques:** NLP (RNN, Transformers), Images (ViT, VAE), Graphs (GCN, GAT), RecSys (NCF), Embeddings (LSH, HNSW), Optimization (IP, LP, MDP) • **DevOps:** Git/GitHub, Docker

## 🎓 Education

### PhD in Industrial Engineering

University of Toronto, 2023 - Present

Using geospatial ML and linear programming to optimize urban housing development. Courses include: Machine Learning on Sequences and Graphs, ML for Optimization, Data Mining and Decision Making. (GPA 4.0/4.0)

### MASc in Industrial Engineering

University of Toronto, 2021 - 2023

Developed a deep learning model to predict forces within Inertial Microfluidic Devices. Thesis available [here](#). Courses included: Machine Learning for Optimization, Linear/Integer Programming. (GPA 4.0/4.0)

### BASc in Chemical Engineering & BSc in Biochemistry (w. Honours)

University of Ottawa, 2012-2018

A dual major. Courses included: Calculus I-III, Linear Algebra, ODEs, Numerical Methods, Java, C. (GPA 8.8/10)

## 🏢 Professional Experience

### Machine Learning for Optimization (MIE424) TA

University of Toronto, Toronto, 2025 - Present

- ▶ Leading students through bi-weekly practical sessions covering the application of "classical" optimization to the development and training of Machine Learning (ML) algorithms.
- ▶ Helping design course material and assignments.

Teaching ML DNN Optimization

### Engineers and Society (ESC203) TA

University of Toronto, Toronto, 2021 - Present

- ▶ Leading weekly 2-hour discussion-based seminars of 20+ engineering students.
- ▶ Designing activities to explore how engineering relates to the climate crisis, the distribution of wealth/resources, and information security.

Teaching Ethics Sustainability

### Applications Engineer

Spartan Controls, Vancouver, 2018 - 2021

- ▶ Responsible for CAD 1.5 million per year in sales of process-control equipment.
- ▶ Hosted instructional seminars for 50+ customers to educate and build product loyalty.
- ▶ Worked in a team to customize products and sales strategies for different customer bases.

Teamwork Sales

## 📁 Selected Projects

### Satseg 🔄 ☰

I investigated how a pretrained vision transformer (DINO) learns to attend semantically relevant areas in satellite images, and then used the ViT embeddings and a graph convolutional network to perform unsupervised segmentation.

PyTorch PyG GCN ViT Transformers

### Urbanopt 🔄

I combined massive geospatial datasets with integer programming to optimize housing development opportunities.

Geospatial Sustainability

## Forecats

I wrote and released some home automation software for generating daily weather-themed pictures of your cats and sending them to e-ink screens. It involved some fun and challenging image processing (optimizing LUTs, dithering, quantizing).

Vison-Language Models Image processing Docker ESP32

## Citizen Gemini

I developed a simplified RAG framework to design a chat bot capable of summarizing legislative transcripts, with the goal of getting people more connected to their local governments. Check out the YouTube video for more details!

Social Sustainability RAG LLM

## Detecting Wildlife Trafficking Networks in Banking Data

I designed a custom Pagerank variant and wrapped it in a Flask API to help anti-money-laundering teams detect wildlife trafficking networks. We won first place at the Scotiabank & IMI BIGDataAIHUB Case Competition.

Sustainability Pagerank Flask Huggingface

## Publications & Major Works

---

Rankin, K. H., Donati, F., Tu, Q., **Ward-Bond, J.**, Reitz, N., Hiser, B., van Lierde, S., Suh, S., Saxe, S., Posen, I. D., Hawes, J. K. (2026). *A call to ensure reproducibility of machine learning applications in industrial ecology*. Under review at Journal of Industrial Ecology.

**Ward-Bond, J.**, Khalil, E. B., Saxe, S. (2026). *Housing Development Optimization: A Generalizable Framework with Case Studies for Toronto, Houston, and Perth*. Under review at NPJ Urban Sustainability.

**Ward-Bond, J.**, Khalil, E. B., Saxe, S. (2026). *UrbanOPT: A Computational Framework for Housing Development Optimization*. ACM BuildSys. In press.

**Ward-Bond, J.**, Mashadian A., Chan, T.C.Y., Young, E. (2025). *Geometry-free prediction of inertial lift forces using deep learning*. Under review. Thesis available here.

## Awards

---

- 2025 **NSERC Graduate Scholarship** University of Toronto
- 2024 **1st Place** IMI BIGDataAIHUB Case Competition – University of Toronto & Scotiabank
- 2023 **Ontario Graduate Scholarship** University of Toronto
- 2022 **Canadian Graduate Scholarship** University of Toronto
- 2021 **Vector Scholarship in Artificial Intelligence** Vector Institute
- 2021 **Queen Elizabeth II Scholarship** University of Toronto

## Affiliations and Volunteering

---

- 2023 – Present **O'Connor Pollinator Project Founder** Created 8 pollinator gardens on an unused plot in East York, and coordinate a (small but mighty) team of volunteers to keep it going.
- 2022 – Present **Progress Toronto** Canvassing in my local ward to collect signatures and raise awareness of current issues in Toronto municipal politics.
- 2021 – Present **University of Toronto Academic Trivia Club**
- 2024 – Present **Clarke Prize Environmental Design Challenge Judge** Judged Hackathon pitches in a competition with over 100 students who were tasked with identifying and solving environmental problems at the University of Toronto.
- 2018 – 2021 **Engineers and Geoscientists BC Outreach** Volunteered to present to classes of children (gr. 6-8) and to lead them in hands-on activities to introduce them to Chemical Engineering.

References and further work history available upon request