








# Jesse WARD-BOND

## Sustainability | Machine Learning

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 Toronto, Ontario, Canada  
 Volleyball, Trivia, Fantasy/Sci-fi, Extremely Spicy Food

## SKILLS

**Programming** Machine Learning (e.g. PyTorch, PyG), Optimization (e.g. Gurobipy), Geospatial Analysis (e.g. geopandas, shapely), Front-end (e.g. react.js), Back-end (e.g. DRF, node.js), Other languages (Rust, C, Java)

**Software/Tools** Gurobi, PyTorch, COMSOL, Git, Jupyter, Anaconda, R Suite, Arduino, UniSym

**Languages** English (fluent), Mandarin (int.), French (beg.), Korean (beg.)

## EDUCATION

2023 - Present **PhD in Mechanical and Industrial Engineering**  
*University of Toronto*  
Co-supervised by Dr. Elias Khalil and Dr. Shoshanna Saxe. Using machine learning to identify and optimize urban layouts, with the ultimate goal of reducing the embodied GHG emissions of necessary infrastructure. Courses include: Infrastructure Sustainability, Strategies for Net Zero, Data Mining, Machine Learning on Sequences and Graphs. (GPA 4.0/4.0).

2021 - 2023 **MASc in Mechanical and Industrial Engineering**  
*University of Toronto*  
Co-supervised by Dr. Timothy Chan and Dr. Edmond Young. Developed a machine learning model to optimize the design of Inertial Microfluidic Devices. See thesis *Geometry-Free Prediction of Inertial Lift Forces in Microchannels*. Courses included: Machine Learning for Optimization, Linear/Integer Programming, Organ-On-A-Chip Engineering. (GPA 4.0/4.0)

2012-2018 **BASc Chemical Engineering & BSc Honours Biochemistry**  
*University of Ottawa*  
A six-year (with co-op), 62-course, double major covering the both the Chemical Engineering and Biochemistry curriculums. Courses included: Calculus I-III, Linear Algebra, ODEs, Numerical Methods, Physics, Transport Phenomena, Java, C, VBA, etc. Magna Cum Laude (GPA 8.8/10)

## PROFESSIONAL EXPERIENCE

**Present** | **Founder - Qurious Trivia**  
**August 2023** | *Toronto, Canada*

- ▶ Created a company that hosts public, private, and corporate Trivia nights
- ▶ Hosting regular free community events in local public parks
- ▶ Managing and marketing many pub-trivia nights at local restaurants

Public Speaking Marketing Event planning

**Present** | **ESC203/CME259 Teaching Assistant - University of Toronto**  
**September 2021** | *Toronto, Canada*

- ▶ Lead weekly 2-hour discussion-based seminars of 20+ engineering students
- ▶ Designed activities and facilitated discussions to explore how engineering relates to the climate crisis, the distribution of wealth/resources, and information security
- ▶ Created lesson plans and presentations from course material
- ▶ Graded essays and technical writing.

Leading Seminars Quercus Preparing activities Marking

May 2021  
October 2018 | **Application Engineer - Spartan Controls**  
*Vancouver, Canada*

- Responsible for CAD 1.5 million per year in sales of process-control equipment
- Developed and maintained relationships with key customer accounts to drive business
- 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.

Fisher Valve Sizing | Engineering Sales | R | VBA | SAP | P&IDs

March 2018  
December 2017 | **Research Assistant, Surface Plasmon Photonics - Berini Lab - University of Ottawa**  
*Ottawa, Canada*

- Designed and implemented experimental protocols to solve a critical problem in SPR biosensors
- Performed digital image analysis of Fluorescence microscopy results with ImageJ, and analyzed/reported results with R.
- See publication section, "Non-specific adsorption..."

Fluorescence Microscopy | ImageJ | R | Python

May 2017  
August 2017 | **Research Assistant, Organic Photocatalysis - Jiang Lab - Tianjin University**  
*Tianjin, China*

- Studied Mandarin Chinese to help communicate complex topics across a language barrier
- Rapidly familiarized myself with the fabrication and electronic properties of organic semiconductors for photocatalysis
- See publication section, "g-C<sub>3</sub>N<sub>4</sub>@α-Fe<sub>2</sub>O<sub>3</sub>..."

FTIR | XRD | XPS | SEM

May 2017  
September 2016 | **Research Lead, Solid-Associated Oil-Sand Proteins - Altosaar Lab - University of Ottawa**  
*Ottawa, Canada*

- Developed and lead a project investigating proteins trapped in oil sands in order to develop novel bio-remediation and tertiary recovery techniques
- Pitched my project to international investors and a panel of judges

Lit. Reviews | HPLC-MS | BCA Assays | Poster presentations


May 2016  
January 2016 | **R&D Employee - Wells Bio**  
*Seoul, South Korea*

- Developed rapid diagnostic tests for Zika, Dengue, etc.
- Organized and hosted a weekly language exchange

qPCR | SDS-PAGE | Lateral Flow Immunoassays

## PROJECTS


**DETECTING WILDLIFE TRAFFICKING NETWORKS IN BANKING DATA** 2024

 [github.com/jwardbond/2023-imi-bigdata](https://github.com/jwardbond/2023-imi-bigdata)

A package developed for Scotiabank during the 2023-2024 IMI BIGDataAIHUB Case Competition. This software uses a new Pagerank algorithm variant and a Flask GUI to help bank AML teams detect wildlife trafficking networks in their data.

Python | Flask | Huggingface | Replicate

**SATSEG** 2023

 [github.com/jwardbond/satseg](https://github.com/jwardbond/satseg)

Used pretrained vision transformers (DINO) and graph convolutional networks to generate semantic segmentations of satellite images in an unsupervised fashion.

PyTorch | PyG | GCN | ViT | Transformers

## SOLAR GLASS MFA

2023

 [github.com/jwardbond/solar\\_glass\\_mfa](https://github.com/jwardbond/solar_glass_mfa)

A material flow analysis of glass in solar panels within Canada under different demand scenarios.

Python MFA

## CELL-SEP-LIFT-FORCE

2021-2023

 [github.com/jwardbond/cell-sep-lift-force](https://github.com/jwardbond/cell-sep-lift-force)

A machine learning model trained to predict lift forces in inertial microfluidic devices. See thesis *Geometry-Free Prediction of Inertial Lift Forces in Microchannels*.

Python Pytorch

## METRO-MAPS

2022

 [github.com/jwardbond/metro-maps](https://github.com/jwardbond/metro-maps)

Developed python-based implementation of the algorithm presented in Nollenburg & Wolff's *Drawing and Labelling High-Quality Metro Maps by Mixed-Integer Programming*. Implemented graph occlusion constraints using callbacks to drastically reduce solution time.

Python Gurobi Mixed-Integer Programming node.js

## SPORTS SCHEDULING RLGNN

2021

 [github.com/jamalcl19/SportsSchedulingRLGNN](https://github.com/jamalcl19/SportsSchedulingRLGNN)

Developed a reinforcement learning model + graph neural network model to solve double-round-robin tournament scheduling problems. Tuned hyperparameters, and compared results to a *de novo* heuristic algorithm.

Python PyTorch

## PUBLICATIONS & MAJOR WORKS

Ward-Bond, J. (2023). *Geometry-Free Prediction of Inertial Lift Forces in Microchannels* (Master's Thesis, University of Toronto)

Rashid, S., Ward-Bond, J., Krupin, O., & Berini, P. (2021). Non-specific adsorption of protein to microfluidic materials. *Colloids and Surfaces B: Biointerfaces*, 208, 112138.

Wu, Y., Ward-Bond, J., Li, D., Zhang, S., Shi, J., & Jiang, Z. (2018). g-C<sub>3</sub>N<sub>4</sub>@ $\alpha$ -Fe<sub>2</sub>O<sub>3</sub>/C Photocatalysts: Synergistically Intensified Charge Generation and Charge Transfer for NADH Regeneration. *ACS Catalysis*, 8(7), 5664-5674.

Ward-Bond, J., & Altosaar, I. (2018). *Solid-Associated Proteins in the Athabasca Oil Sands* (Undergraduate Thesis, University of Ottawa)

Ward-Bond, J., Colin, J., Yelle, N. 2015. Anesthetic Hypodermic Needle Cover – Patent Application No. 14975267 – Lapsed. USPTO

## AWARDS

- 2024 **1st Place (\$15 000)** - IMI BIGDataAIHUB Case Competition - University of Toronto & Scotiabank
- 2023 **Ontario Graduate Scholarship** - University of Toronto
- 2022 **Canadian Graduate Scholarship - Master's (NSERC)** - University of Toronto
- 2021 **Vector Scholarship in Artificial Intelligence** - Vector Institute
- 2021 **Queen Elizabeth II Scholarship** - University of Toronto
- 2012-2018 **Dean's List** - University of Ottawa
- 2012-2018 **Admissions Scholarship** - University of Ottawa
- 2018 **Finalist** - Professional Engineers Ontario Water Purifier Competition
- 2018 **Most Innovative** - University of Ottawa Senior Engineering Design Competition
- 2017 **1st Place** - University of Ottawa Startup Weekend
- 2017 **Best Poster Presentation** - University of Ottawa Biochemistry Poster Competition



## AFFILIATIONS AND VOLUNTEERING

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- 2024-Present **r/toronto AMA coordinator** Responsible for coordinating all aspects of "Ask Me Anything" events on the r/toronto subreddit: reaching out to potential interviewees, scheduling, and developing documentation.
- 2023-Present **O'Connor Pollinator Project Founder** Created 5 pollinator gardens on an unused plot in East York. Currently managing the gardens and coordinating a couple other volunteers.
- 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 Ficton/Nonfiction Book Clubs**
- 2021-Present **University of Toronto Academic Trivia Club**
- 2024 **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.
- 2010-2020 **Volleyball coach**  
Taught indoor and beach volleyball to both children and adults for several different organizations. Experience levels ranged from absolute beginner to advanced.