

Jeffrey Watchorn Ph.D.

STAFF RESEARCH SCIENTIST · MACHINE LEARNING, DRUG DELIVERY, FORMULATIONS, AUTOMATION

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Technical Skills

- Programming:** Python (Pandas, Scikit-learn, TensorFlow, Keras, Pytorch, RDKit, Ax, Micropython), Jupyter, Git, MATLAB, SAS, R, C, SQL
- Laboratory:** Design of Experiment, ANOVA, NMR, UV-Vis, FTIR, SEM/TEM, PALS/DLS/Zeta Potential, Mass Spec, HPLC, XRD, Lyophilization
- Teaching:** Nanomedicine and Formulation Sciences, Polymer Chemistry, Environmental Chemistry
- Communication:** Technical writing (Journals, Patents) and presentation (Stakeholders, Public), French proficiency (B2), emotionally intelligent leader

Relevant Work Experience

Acceleration Consortium

Toronto, Canada

STAFF RESEARCH SCIENTIST

Jan. 2024 - Present

- As the first Research Scientist, I designed, created and managed an autonomous, AI-powered laboratory for drug formulations discovery.
- Developed and implemented bayesian optimization pipelines to recommend experiments (BoTorch/Ax) based on molecular features (RDKit), remotely execute these experiments (MQTT/Openrons), and record the data (MongoDB). The resulting data was modelled with several predictive model architectures (LightGBM, XGBoost, NN, etc.)
- Created custom labware (multistripes, liquid dispensers, machine vision apparatuses) including engineering design, CAD, electronics design (LT-Spice), microcontroller hardware programming (Micropython) and rapid prototyping (3d Printing, Machining).

Statistics Canada

Ottawa, Canada

DATA ANALYST (CONTRACT)

May. 2017 - Sept. 2017

- Developed pipelines for accessing and analyzing Statistics Canada databases used for national indicators (such as consumer price index).
- Implemented machine learning tools, including KMeans clustering, for both exploratory data analysis and to dynamically assign product category labels to sample consumer shopping carts.

Department of National Defence

Ottawa, Canada

DATA ANALYST (CO-OP)

Jan. 2015 - May. 2015

- Designed and applied multi-objective optimization to solve NP-hard assignment problems in support of resource allocation for the Canadian Armed Forces, Navy, and Air Force.
- Wrote a custom GUI to package these tools for general use throughout the department, ultimately reducing training time and operating expenses at no additional capital cost.

Education

Doctor of Philosophy in Chemical Engineering

Toronto, Ontario, Canada

UNIVERSITY OF TORONTO, FRANK GU LAB

Sept. 2018 - Sept. 2023

- Machine learning enabled discovery for next-generation biomaterials.** Originated DISCO NMR to map materials-protein interactions with atomic precision. I used this data to develop a machine learning framework to power a self-driving materials discovery platform.
- Nanoparticle drug delivery systems development.** Synthesized, isolated and characterized novel polymer and amphiphile materials. Used these materials to create various nanoparticle materials (micelles, liposomes, solid NPs) to encapsulate and release drugs.

Bachelor of Applied Science in Nanotechnology Engineering

Waterloo, Ontario, Canada

UNIVERSITY OF WATERLOO, HONOURS, CO-OPERATIVE PROGRAM, WITH DISTINCTION

Sept. 2012 - May. 2017

- Relevant Courses:** Linear Algebra with Numerical Applications, Engineering Computation, Nanomedicine & Nanobiotechnology

Selected Publications

Stuart, S.*; Watchorn, J.*; Gu, F. X. *An Interpretable Machine Learning Framework for Modelling Macromolecular Interaction Mechanisms with Nuclear Magnetic Resonance*. RSC Digital Discovery (2023). Cover Article. (LINK)

Stuart, S.; Watchorn, J.; Gu, F. X. *Sizing up feature descriptors for macromolecular machine learning with polymeric biomaterials*. npj Computational Materials, 2023, 9, 102. (LINK)

Watchorn, J.; Stuart, S.; Burns, D. C.; Gu, F. X. *Mechanistic influence of polymer species, molecular weight, and functionalization on mucin-polymer binding interactions*. ACS Appl. Polym. Mater. 2022, 4, 10, 7537–7546. (LINK)

Watchorn, J.; Burns, D.; Stuart, S.; Gu, F. X. *Investigating the Molecular Mechanism of Protein-Polymer Binding with Direct Saturation Compensated Nuclear Magnetic Resonance*. Biomacromolecules 2022, 23 (1), 67–76. Cover Article. (LINK)

Honors & Awards

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| 2023 | University of Toronto Chair's Discovery Award , Award - Research Excellence | Toronto, Canada |
| 2019, 2021, 2022 | Queen Elizabeth II Graduate Scholarship in Science and Technology , Scholarship - Provincial | Toronto, Canada |
| 2020, 2021 | Mclean Foundation Graduate Scholarships In Science And Technology , Scholarship - Institutional | Toronto, Canada |