Jacob Chmura

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EDUCATION

♦ University of Toronto

2017-2022

Honours B.Sc. w/High Distinction

CGPA: 3.94

· Double Degree: Computer Science Specialist & Mathematics Major

SELECTED CS COURSES: COMPUTER VISION(100%), PROBABILISTIC LEARNING(95%), NLP(96%), DEEP LEARNING(91%)

SELECTED MATH COURSES: DIFFERENTIAL GEOMETRY (97%), MEASURE THEORY (95%), ANALYSIS (91%)

Research

Optimal division of the genome into regions with cancer specific differences in mutation rates Young A, Chmura J, Park Y, Morris Q, Atwal G. Pac Symp Biocomput. 2020;25:274-285. PubMed PMID:

⋄ Exploration for sparse MDP's: Maximizing information in learned latent spaces Chmura J, Burhani H, Shi X. ICML 2023 (under review)

PATENTS

♦ Multi-Objective Reinforcement Learning Agent with Gradient Modulation

Azam M, Chmura J, Huang H, Yu Z. U.S. Patent Application No. XXXX.

♦ System and Method for Multi-Objective Reinforcement Learning in Trading Azam M, Chmura J, Huang H, Yu Z. U.S. Patent Application No. XXXX.

Professional

## EXPERIENCE $\diamond$ RBC Capital Markets, AI Lab

2022-Present

AI Engineer

- · Invented a measure of market impact grounded in optimal transport theory that attributes information leakage on exchanges using Wasserstein distances.
- · Formulated an end-to-end optimization adjusting our order routing policy based on divergence between agent state and market conditions. Deployed to production in CA & US, trading over \$200MM.
- · Wrote a multi-threaded KDB tool that programmatically generates queries to market data gateways, unifying how datasets are generated, stored, and shared.
- · Worked on a low-latency, high-throughput service providing aggregated market features for inference.

## ♦ RBC Capital Markets, AI Lab

AI Engineer, Intern

2020-2021

- · Worked on a novel multi-objective extension to proximal policy optimization that combines hindsight relabelling, gradient projections and alternative bellman operators. Applied to a new RL trading agent, this enabled few-shot adaptation to client-specific trading objectives at inference time.
- · Engineered features and designed reward functions based on optimal execution econometrics research. Performed rigorous simulation, testing and analytics preparing model for production.
- · Created a RL reading group, presented literature to broader teams on a bi-weekly basis.

## ♦ Vector Institute for Artificial Intelligence

2019-2020

Machine Learning Researcher

- · Published an information theory driven dynamic programming algorithm for associating regional mutation density with cancer type by discovering patterns in chromatin state.
- · Investigated deep ensembles and gradient-based feature importance to better classify rare cancers.
- · Implemented a Kronecker-factored approximate second-order optimizer, and monte-carlo dropout to a cancer classifier.

♦ Bibbit August 2018

Full Stack Engineer

· Designed website for reading and publishing, recommendation system for personalized feed.

♦ Fio Corp.

Software Engineer, Intern

August 2017

· Performed verification and validation of edge-based vision system for disease classification.

SCHOLARSHIPS

& AWARDS

♦ 4x Deans List Scholar for Academic Excellence

2018-2022

University of Toronto ♦ 3x Recipient of Louis Savlov Scholarship for Sciences

2018-2020

University of Toronto

♦ Ted Mossman Scholarship for Mathematics

University of Toronto

2017

SELECTED

Projects

## ♦ Project X 2020: Undegraduate AI Research Competition

Research Team, University of Toronto AI. Organized open source resources, summarized published research in infectious disease problem category.

- ♦ Position Based Fluid Simulation
- ♦ Morse Theory, Sard's Theorem, and Applications