jacob-chmura.github.io
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Jacob Chmura

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: 31797603.

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

Patents

◇ **System and Method: Multi-Objective RL For Personalized Client Execution**
Azam M, Chmura J, Huang H, Yu Z. CA. Patent Application No. 3195081.

◇ **Multi-Objective RL with Gradient Vaccine**
Azam M, Chmura J, Huang H, Yu Z. CA. Patent Application No. 3198016.

Professional Experience

◇ **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** *2020-2021*
AI Engineer, Intern
· 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.** *August 2017*
Software Engineer, Intern
· 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** *2017*
University of Toronto

Talks

◇ **Learning Feature Importance for a Deep Learning Cancer Classifier** *2019*
Undergraduate Summer Research Program

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**