jacob-chmura.github.io
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Jacob Chmura

Education

◇ **University of Toronto** *2017-2022*
Honours B.Sc. w/High Distinction *CGPA: 3.96*
· 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%), Topology(93%), 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.

◇ **ICE: Information Context Exploration for Sparse MDP's**
Chmura J, Burhani H, Shi X. (Arxiv ID:2310.06777)

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
· Used off-policy learning and concentration inequalities to develop a new order routing policy.
· Build order routing framework, integrated into RL system and deployed to production trading over $200MM.
· Researched compression-based self-supervised objectives that accelerate learning in sparse reward MDP's.
· Invented a market impact measure grounded in optimal transport theory that attributes information leakage on exchanges using Wasserstein distances.
· Wrote a multi-threaded *KDB* tool that programmatically generates queries to market data gateways, unifying how datasets are generated, shared and validated across assets, models, and teams.
· Worked on a low-latency, high-throughput service providing aggregated market features for inference.

◇ **RBC Capital Markets, AI Lab** *2020-2021*
AI Engineer, Intern
· Developed a novel multi-objective actor-critic extension to PPO that combines hindsight relabelling, gradient projections and vectorized bellman operators enabling few-shot adaptation to client preferences.
· Engineered features and designed reward functions based on optimal execution econometrics research.
· Performed rigorous simulation, testing and statistical evaluation 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-theoretic algorithm that reduces the number of mutations needed to discriminate cancer by finding genome segmentations that maximize mutual information with cancer type.
· Investigated deep ensembles and gradient-based feature importance to better discriminate rare cancers.
· Implemented monte-carlo dropout with a Kronecker-factored optimizer for cancer classification.

◇ **Bibbit**
Full Stack Engineer *August 2018*
· Designed a 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** *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 datasets and summarized published AI research in infectious diseases.

◇ **Position Based Fluid Simulation**

◇ **Morse Theory, Sard's Theorem, and Applications**