Jacob Chmura

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EDUCATION \diamond 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. US Patent No. 18/130776

♦ System and Method: Multi-Objective RL with Gradient Modulation

Azam M, Chmura J, Huang H, Yu Z. US Patent No. 18/139330

Professional

EXPERIENCE \diamond 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 \$500MM.
- · 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.
- \cdot Engineered features and designed reward functions based on optimal execution econometrics research.
- · Performed rigorous simulation, testing and statistical evaluation preparing model for production.
- \cdot 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.
- \cdot 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

 \cdot 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

 $\diamond \ \ 3x \ \ Recipient \ \ of \ \ \textit{Louis Savlov Scholarship for Sciences}$

2018-2020

University of Toronto

⋄ Ted Mossman Scholarship for Mathematics University of Toronto

Undergraduate Summer Research Program

2017

2019

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