jacob-chmura.github.io
jacob.chmura@mail.mcgill.ca
(647) 967-9382

Jacob Chmura

ML engineer with 4 years experience building performant end-to-end systems and delivering impactful research

Education

- **M.Sc. Computer Science** - McGill University — *2024 - Present*
  Advisors: Prof. Nicolas Le Roux and Prof. Reihaneh Rabbany
- **Honours B.Sc. Computer Science & Mathematics** - University of Toronto — *2017 - 2022*
  Selected Courses: Computer Vision(100%), Probabilistic Learning(95%), NLP(96%), Deep Learning(91%), Differential Geometry(97%), Measure Theory(95%), Topology(93%), Analysis(91%) — cgpa: 3.96

Selected Work Experience

- **Mila, Quebec AI Institute** — *2024 - Present*
  ML Researcher | Complex Data Lab
- **Royal Bank of Canada, Algorithmic Research** — *2022 - 2024*
  ML Engineer | Reinforcement Learning Platform for Trading, Aiden

  · Led research, architecture, and development of a smart order router optimizing exchange selection from real-time market features. Deployed multi-region, trading over 2B shares and saving 650k annually in exchange fees.

  · Worked on a distributed feature store with ZMQ that publishes aggregated market features as a service. Streamed real-time price prediction signals with Cython accelerated code for the Aiden platform.

  · Addressed difficulty evaluating market impact by developing a new metric grounded in optimal transport theory. Measures distributional shifts in the limit order book and is robust to non-stationary market conditions.

  · Developed a Python library that manages the lifecycle of supervised learning tasks and designed APIs that integrate Apache Parquet and Pytorch with time series KDB data. Standardised model evaluation and versioning.

  · Led reinforcement learning research in compression-based auxiliary tasks that improve sample efficiency.
- **Royal Bank of Canada, Algorithmic Research** — *2020 - 2021*
  ML Engineer, Intern | Reinforcement Learning Platform for Trading, Aiden

  · Led research and development of a decentralized multi-task policy gradient method that learns a unified policy across various trading objectives. Enabled online adaptation to client preferences, a significant leap in RL trading.

  · Prepared models for production by automating simulation under different market regimes and reward designs.

  · Created a reinforcement learning reading group. Designed the curriculum and presented literature bi-weekly.
- **Vector Institute for Artificial Intelligence** — *2020 - 2021*
  ML Researcher | Quaid Morris Lab

  · Published an information-theoretic dynamic programming algorithm in C that reduces mutations needed to differentiate cancer by 20%. Found genome segmentation that maximize mutual information with cancer type.

  · Addressed lack of interpretability in a pre-trained tumour classifier by implementing DeepLIFT feature importance. Discovered spatial patterns in importance that reflected biological characters in mutation topology.

  · Built Python framework comparing predictive uncertainty estimators. Reduced trust barriers in clinical applications by reducing over-confident and rare misclassifications with ensembles and Monte-Carlo dropout.
- **Fio Corp.** — *Aug 2017*
  Software Engineer, Intern
  · Performed verification and validation of edge-based vision system for disease classification.

Patents & Publications

- Optimal division of the genome into regions with cancer specific differences in mutation
- Information Context Exploration for sparse Markov Decision Processes
- Multi-Objective Reinforcement Learning For Personalized Client Execution
- Multi-Objective Reinforcement Learning with Gradient Modulation

Selected Projects

- **Position Based Fluid Simulation** | C++
- **Deep Learning Cancer Classifier Feature Importance** | *Undergraduate Summer Research Program*

Awards

- **Royal Bank of Canada**
  · RBC Performance Award Winner | 2023
- **University of Toronto**
  · Louis Savlov Scholarship for Sciences | 2017-2020
  · Ted Mossman Scholarship for Mathematics | 2017

Skills

- Languages
  · Python, Cython, C, Q, Java, KDB, Bash, SQL, C++
- Frameworks
  · Pytorch, Numpy, Pandas, Pyrarrow, Mlflow, Seaborn, Matplotlib
  · ZMQ, Protobuf, gRPC, Spark, Kafka, Redis, Cassandra