# Nijash Sooriyakumaran

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## Summary

Graduate researcher in high-dimensional sequential decision making, Bayesian optimization, and machine learning, with dual master's training in financial mathematics and engineering (4.0 / 3.9 GPA). Builds models for portfolio construction and risk analytics in production-grade Python and C++, with focus on turning rigorous theory into working, tested systems.

## Education

**Master of Applied Science, Bioengineering (MASc)** Sep 2024 – Sep 2026E

*University of Toronto · CGPA 4.0 / 4.0 · IBBME Fellowship · TA, Risk Analytics (Rotman MMA)*

- **Thesis:** Uncertainty-aware optimization in high-dimensional systems; mixing deep learning and Bayesian acquisition.
- Built and parallelized novel algorithm for HPC clusters, leveraging multi-CPU execution; achieved **17×** and **6×** speedup.

**Master of Financial Mathematics (MFM)** Sep 2023 – Aug 2024

*McMaster University · CGPA 3.9 / 4.0 · Mathematics Graduate Scholarship*

- **Industrial Thesis:** Classification of High-Risk Wire Transfers; Latent Embedding Spaces and Bayesian Topic Modeling.
- **Select Coursework:** Stochastic Calculus, Portfolio Theory & Optimization, Deep Learning, Risk & Financial Markets.

**Bachelor of Electrical Engineering (B. Eng)** Sep 2018 – Apr 2023

*McMaster University*

- **Thesis:** Computational efficiency of the Weiss-Weinstein lower bound for nonlinear filtering (with R. Tharmarasa).
- **Select Coursework:** Advanced Probability Theory, Partial Differential Equations, Digital Signal Processing.

## Research & Working Papers

**OFAT for High-Dimensional Optimization under Noise** Working paper with J. Audet (University of Toronto)

- Proposed fully stochastic one-factor-at-a-time optimization as an interpretable baseline for benchmarking ML algorithms under noisy responses; Monte Carlo power analysis to assess statistically reliable factor-effect recovery.

**Conference: Sooriyakumaran, Audet & Feng (Omics4CMeat 2025)**

- "Developing Algorithms for Serum-Free Cell Culture Media Discovery." Applied deep learning and bandit methods to high-dimensional sequential experimental design for biological optimization workflows, reducing time to discovery.

## Experience

**AML Risk Intern, Royal Bank of Canada** May 2024 – Sep 2024

*Toronto, ON*

- Built a variational-autoencoder based sensitivity analysis to assess AML concentration risk across 200+ holdings.
- Developed an NLP model to flag high-risk and illegal transaction patterns; **improved high-risk detection by 30%**.

**Software Developer Intern, Ciena Corporation** Sep 2021 – Apr 2022

*Ottawa, ON*

- Wrote Python bindings for ~100 C++ libraries; built and debugged unit-tests validating Segment Routing protocols.

## Selected Projects

**Dynamic Portfolio Allocation with Deep Gaussian Processes** 2026

- Built Deep Gaussian Process for t+1 log-return prediction on 3-month high-frequency crypto data across 27 assets.
- Engineered funding-rate signals for leverage imbalance, variance-based sizing, regime adaptivity, and 5 bps cost.
- **+81% annualized Sharpe** and **50% lower max drawdown** vs. an XGBoost benchmark in walk-forward back test.

**Multi-Factor HJM Interest-Rate Simulator (C++)** 2026

- Multi-factor Heath-Jarrow-Morton forward-rate simulator with PCA factor construction; **~30× speedup** over Python.
- Monte Carlo simulation using Eigen computed key-rate durations and curve sensitivities under interest-rate shocks.

**Variational Autoencoder for Implied-Volatility Surfaces** 2023

- VAE learning representations of IV surfaces across strikes and maturities, modelling via moneyness and maturity.

## Skills & Interests

**Languages & Tools:** Python, C++, MATLAB, R, SQL, Bash, Git, Linux, Excel, PowerPoint, Bloomberg Terminal.
**ML / Numerical:** PyTorch, Ax, BoTorch, scikit-learn, XGBoost, Optuna, Selenium, Eigen, NumPy/SciPy, Pandas.
**Methods:** Bayesian optimization, Monte Carlo, Gaussian processes, deep learning, Kalman/HMM filtering, NLP.
**Interests:** Violin (Teacher's Grade), Chess, Sudoku, Hackathons, Reading, Golf (amateur), Cooking, Hiking.