

# Upkar Singh

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## Education

### University of Saskatchewan

Bachelor of Science in Computer Engineering

Sep 2021 – Apr 2026

Saskatoon, SK

## Experience

### Research Analyst (Quantum Computing)

Dec 2025 – Present

*Vaccine and Infectious Disease Organization (VIDO)*

Saskatoon, SK

- Built a configuration-driven Python pipeline converting continuous protein-activity time series into validated binary states and Boolean signaling-network models, with reproducible outputs backed by 226 automated tests.
- Implemented six continuous-to-binary encoding methods and validated BASC-A against an external R implementation and exhaustive search, uncovering a fallback mislabeled as a fitted threshold.
- Benchmarked the encodings on identical treatment trajectories, showing method choice shifted inferred dynamics from 1 to 10 states and 0 to 34 switching events, and that condition-specific fitting recovered 71% more switches under cellular stress at the cost of cross-condition comparability.
- Encoded a four-variable kinase network as a Boolean SAT problem and ran Grover's search on a 9-qubit Rigetti Novera processor, benchmarking hardware against noiseless simulation and extending the model to VQE and QAOA.

### Summer Student

Jun 2025 – Sep 2025

*Saskatchewan Human Rights Commission (SHRC), Ministry of Justice*

Saskatoon, SK

- Audited 120+ active case files in the ProLaw records management system for accuracy and consistency, resolving inconsistent or incomplete entries to maintain reliable records for ongoing cases.
- Served as front-line escalation point for 100+ public inquiries, applying procedural rules to non-standard cases, and prepared Excel stakeholder reports tracking five outreach initiatives.

### Vice-President, Student Affairs

May 2024 – Apr 2025

*University of Saskatchewan Students' Union (USSU)*

Saskatoon, SK

- Elected to represent 20,000+ undergraduates in a full-time executive term, serving as primary liaison to the Provost's office, Deputy Provost, and university administration, and representing the union in meetings with provincial ministers.
- Chaired the Sustainability Fund Committee, evaluating 10+ funding proposals against a six-figure budget and issuing recommendations jointly with the Department of Sustainability.

## Projects

### Portfolio Tail-Risk Engine

Sep 2026 – Present

*Python, NumPy, Pandas, SciPy, Monte Carlo Simulation, Statistical Inference*

- Engineered a reproducible Python engine forecasting one-day VaR and Expected Shortfall for a monthly rebalanced 11-asset portfolio, comparing Rolling Gaussian, EWMA and Filtered Historical Simulation over 3,519 out-of-sample days with 100,000 Monte Carlo scenarios per forecast.
- Built no-look-ahead evaluation with Kupiec and Christoffersen backtests, quantile and FZ0 scoring, and Holm-adjusted Diebold-Mariano tests (Newey-West HAC), tracking SHA-256-checksummed snapshots with 650 automated tests.
- Found that adaptive models significantly beat the Gaussian benchmark in 6 of 12 Holm-adjusted comparisons and that all models under-forecast 99% tail risk in Feb–Apr 2020, with exception rates of 6.5% to 19.4% against a 1% target.

### FinRAG – Financial Research over SEC 10-K Filings

Jul 2026 – Aug 2026

*Python, ChromaDB, BM25, Sentence Transformers, Streamlit, Groq API (gpt-oss)*

- Built an evidence-first research system over five FY2022 SEC 10-K filings, pairing narrative and financial-statement evidence with page-level citations and formula-backed calculations that block unsupported model arithmetic.
- Designed and evaluated multiple retrieval approaches on FinanceBench questions, improving gold-page Hit@5 from 37.9% to 62.1% and achieving 96.6% candidate recall.

### Portable ASL–English Translation Device

Sep 2025 – Apr 2026

*Python, TensorFlow Lite, scikit-learn, Linux, Git*

- Deployed an end-to-end ML inference pipeline on a battery-powered Raspberry Pi with a cross-functional team, converting models to TensorFlow Lite to fit memory and compute limits with 4 hours of offline operation per charge.
- Trained gesture-recognition models from scratch on a large unstructured image dataset, reaching 76% held-out test accuracy across a 250-word vocabulary through preprocessing, augmentation and feature extraction.

## Technical Skills

**Languages:** Python, SQL, Java, C++, C, JavaScript, Verilog HDL, MATLAB

**Machine Learning & AI:** TensorFlow, PyTorch, scikit-learn, feature engineering, model validation, benchmarking

**LLMs & Retrieval:** RAG, ChromaDB, Sentence Transformers (BGE), BM25, hybrid retrieval, Groq API

**Data & Analysis:** Pandas, NumPy, SciPy, Matplotlib, Seaborn, time-series analysis, sensitivity analysis

**Quantitative Finance:** VaR, Expected Shortfall, Monte Carlo simulation, backtesting, HAC inference, multiple testing

**Quantum Computing:** PyQuil, Qiskit, Grover's search, VQE, QAOA

**Engineering:** Git, Docker, Linux, pytest, CI, data validation, Streamlit