

RYAN BRIJ-RAJ

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EDUCATION

New York University

New York, NY

B.A. in Computer Science & Data Science, Minor in Mathematics

Expected May 2028

- **Coursework:** Data Structures & Algorithms, Principles of Data Science I & II, Linear Algebra, Discrete Mathematics, Probability & Statistics, Computer Programming
- **Activities:** Data Science Club, Mathematics Society, Motorsports Society, Chess Society

EXPERIENCE

learnSTEM

Remote

Research Intern

June 2023 – August 2023

- Conducted advanced combinatorics research under a UPenn PhD candidate, investigating Ramsey numbers, the Hales-Jewett theorem, and the Lovász Local Lemma; authored a research paper applying probabilistic methods to formally derive Van der Waerden's theorem.

Whole Foods Market

New York, NY

Cashier

June 2025 – August 2025

- Processed high-volume transactions via POS systems and collaborated cross-functionally with team members to sustain operational efficiency during peak hours, earning employee of the month.

PROJECTS

Secure E-Wallet & Transaction Ledger | *Java, Spring Boot, Spring Security, PostgreSQL, Flyway*

June 2026

- Built a financial backend with JWT authentication and AES-256-GCM encryption for PII at rest, using BCrypt hashing and HMAC blind-indexing to meet audit-compliance standards.
- Engineered an idempotent, deadlock-safe transaction engine with pessimistic locking and unique idempotency keys to guarantee exactly-once fund transfers; versioned schema via Flyway with an immutable audit ledger.

Local RAG Chatbot | *Python, FAISS, Sentence-Transformers, Ollama*

June 2026

- Built a fully local Retrieval-Augmented Generation pipeline (no external APIs) using FAISS vector search and sentence-transformer embeddings, paired with local LLM inference via Ollama for grounded document Q&A.

Chess Engine (Taciturn) | *Python, PyTorch, Monte Carlo Tree Search*

May 2025

- Built an AlphaZero-inspired self-learning chess engine with a dual-headed ResNet (12.6M parameters) trained entirely via self-play; implemented MCTS with PUCT selection, Dirichlet noise, and temperature scheduling for exploration.
- Engineered a full training pipeline with a 500K-sample replay buffer, iterative model promotion (55batched inference via CUDA 11.8; encoded states as (119, 8, 8) tensors across 8 history frames

Portfolio Optimization Tool (POTR) | *Python, NumPy, Pandas, SciPy, Plotly, React, Flask, Docker*

June 2024

- Built a full-stack quantitative finance app implementing Modern Portfolio Theory; engineered a Monte Carlo simulation engine (3,000+ portfolios) with NumPy/Pandas and SciPy SLSQP convex optimization to compute Maximum Sharpe Ratio and Minimum Variance portfolios, CVaR, and maximum drawdown from real-time market data

PUBLICATIONS

Collision Theory of Complete Multipartite Graphs | *Independent Research*

July 2026

- Investigated edge-count multiplicities in maximal k -colorable graphs by introducing a collision-theoretic framework linking extremal graph theory with lattice geometry and algebraic number theory.
- Produced a 17-page research paper containing original theoretical results, proofs, asymptotic analysis, and computational verification of conjectures and structural properties.

The Edge Spectrum of Maximal k -Colorable Graphs | *Independent Research*

May 2026

- Authored a research paper in extremal graph theory proving exact saturation and abundance bounds for the edge spectrum of complete k -partite graphs.

Linear Algebra Essentials: A Self-Teaching Guide (Amazon)

July 2026

- Authored a textbook introducing core linear algebra concepts, including vector spaces, linear transformations, eigenvalues, and orthogonality through step-by-step explanations and practice problems.

Discrete Mathematics and Combinatorics (Amazon)

March 2026

- Authored a textbook covering graph theory, combinatorics, and proof techniques bridging undergraduate and graduate-level mathematics.

TECHNICAL SKILLS

Languages: Python, Java, C/C++, TypeScript, JavaScript, SQL, HTML/CSS, LaTeX

Frameworks: Spring Boot, React, Next.js, Flask, Node.js, TensorFlow, Keras, Angular, Spring Boot, FAISS

AI/ML: Reinforcement Learning, MCTS, RAG, LLM Integration, NumPy, SciPy, PyTorch

Tools: Git, Docker, PostgreSQL, MongoDB, REST APIs, Linux, AWS, GCP, Vercel

Certifications: Google Developer Program (2026), NVIDIA 6G Developer Program (2026), NYU CS4CS (2023), Harvard CS50 (2022)