Vatsal Malkari

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EDUCATION

Rutgers University, New Brunswick — Expected Dec 2026
- *Master of Science in Data Science*
- **GPA**: 3.50
- **Coursework**: Probability & inference, Regression & time series analysis, Data Structures & algorithms

Rutgers University, New Brunswick — Sep 2022 – May 2025
- *Bachelor of Science in Computer Science & Data Science*
- **GPA**: 3.46
- **Coursework**: Algorithms, Systems Programming, Computer Architecture, Introduction to Data Science, Deep Learning, Database Management, Regression Methods, Applied Statistical Learning, Discrete Mathematics, Principles of Information and Data Management.

EXPERIENCE

NJCCIC — Jan 2025 – May 2025

Extern via Rutgers MBS Externship Exchange

- Built an unsupervised anomaly detection model (autoencoder) on Google BigQuery, improving threat detection accuracy by 22.4% through feature and hyperparameter tuning.
- Designed a scalable analytics pipeline in BigQuery to process 2M+ weekly login events, identifying the top 1% highest risk accounts using behavioral signals.
- Accelerated large-scale security analytics using PCA and vectorized workflows, automating threat classification and reducing analysis time for state security analysts.

PROJECTS

Custom C++ Deep Learning Engine (From Scratch) — Sep 2025 – Jan 2026

- Built a neural network framework from scratch, implementing Autograd, Backpropagation, and CNN layers without external ML libraries.
- Optimized tensor operations for memory efficiency, achieving 45% validation accuracy on FER-2013 dataset.
- Created a real time inference pipeline integrating C++ models with Python/OpenCV, enabling live webcam emotion detection with <100 ms latency.

Optimized PTM Probability Engine — Bristol Myers Squibb Challenge — Oct 2025 – Dec 2025

- Designed a high-performance Python tool to model protein modification probabilities, handling 100+ sites efficiently.
- Reduced algorithmic complexity from $O(2^n)$ to $O(n \log n)$ using memoization and convolution techniques, achieving a 41x runtime speedup.
- Deployed tool as a standalone executable with LRU caching to minimize memory footprint.

Python-Like Interpreter in C (Systems Engineering project) — Aug 2025 – Nov 2025

- Implemented a lightweight interpreter in C supporting expressions, control flow (if, else), and data structures (dictionary, list, string, map, stack, queue).
- Developed a tokenizer, recursive-descent expression evaluator, and execution engine, validated with 40+ test programs.
- Improved performance using manual memory management and $O(1)$ hash-map lookups in dictionary implementation.

Lightweight C Task Scheduler — Mar 2025 – Jun 2025

- Engineered a thread-safe job scheduler in C using a min-heap for priority queueing and a hash table for $O(1)$ task lookup.
- Reduced CPU busy-waiting with condition variables, significantly improving efficiency.
- Stress tested reliability with 2,000+ concurrent tasks and implemented detailed logging for debugging and diagnosing race conditions.

AOT and FMAB anime RAG QA System (ChromaDB + Transformers) — Nov 2024 – Jan 2025

- Built a scalable Retrieval-Augmented Generation system using ChromaDB and SentenceTransformers for semantic search over anime data.
- Integrated Google Gemini API for Q&A and deployed a FastAPI backend with a Gradio frontend, achieving < 1s response times for live queries.

SKILLS

- **Languages**: Python, C++, C, Java, SQL, JavaScript
- **Machine Learning**: PyTorch, TensorFlow, Transformers (Hugging Face), OpenCV, Scikit-Learn, Pandas, NumPy
- **Backend**: FastAPI, Flask, Spring Boot, Docker, PostgreSQL, ChromaDB, Git, CI/CD, Django
- **Systems Engineering**: Multithreading (pthreads), Concurrency, Memory Management, OS Scheduling, Linux/Unix
- **Concepts**: Object-Oriented Programming (OOP), Data Structures & Algorithms, REST APIs, System Design, JWT Auth

LEADERSHIP

Alpha Phi Omega Co-Ed Service Fraternity
Webmaster, Brotherhood Engagement Committee, Alumni Chair
- Managed chapter website (Squarespace) and coordinated outreach events to boost alumni and brotherhood engagement.

AWARDS

- **Dean's List - Rutgers University:** Spring 2023, Spring 2025