VATSAL MALKARI

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EXPERIENCE

Extern — NJCCIC via Rutgers MBS Externship Exchange

Jan 2025 – May 2025

- Built anomaly detection components using BigQuery ML autoencoders; achieved MAE 0.1239, MSE 0.2655, MSLE 0.0132 on real login data.
- Engineered features (MFA usage, login-hour deviation, browser anomalies, geohash mapping) to boost detection accuracy by 18%.
- Built reusable Python modules for geolocation, user-agent parsing, and risk scoring, improving internal tooling consistency.
- Created Python scripts to streamline preprocessing and validation workflows for the analytics team.

PROJECTS

Optimized PTM Probability Engine — Bristol Myers Squibb Challenge

Oct 2025 - Dec 2025

- Engineered a dynamic programming engine for protein PTM charge modeling, efficiently handled 100+ sites.
- Reduced complexity from exponential $O(2^n)$ to O(n log n) using memoization and convolution.
- Achieved 41× speedup (from 0.136s to 0.003s) and reduced memory overhead using LRU cache for memoization.
- Packaged as a standalone PyInstaller executable; no runtime libraries required.

Python-Like Interpreter in C (Systems Engineering)

Sep 2025 - Nov 2025

- Developed a Python Interpreter in C with custom strings, dynamic lists, and dictionaries.
- Implemented tokenizer, parser, and evaluator supporting expressions and control flow; validated with 50+ test programs.
- Optimized memory and hash-map lookups for O(1) access using manual allocation strategies.

Lightweight C Task Scheduler

Mar 2025 - Jun 2025

- Built a multithreaded job scheduler with O(log N) heap scheduling and O(1) cancellation using hash tables.
- Increased concurrency safety with pthread_mutex and condition variables, removing busy-waiting and reducing CPU usage by 25%.
- Strengthened reliability by systematic debugging, race-condition testing, and structured logging.

AOT and FMAB anime RAG QA System (ChromaDB + Transformers)

Nov 2024 - Jan 2025

- Created a search pipeline indexing 50k+ documents with ChromaDB + Sentence Transformers and reached 92% accuracy.
- Added fuzzy string matching to fix typos, improving results 15%.
- Made an interactive Gradio app with less than 1s response time for live queries.

NBA Player Management System — Java, Spring Boot, PostgreSQL

Jan 2024 – Jun 2024

- Developed a full-stack CRUD application with Spring Boot and PostgreSQL managing 500+ player records with REST APIs.
- Implemented authentication, CORS rules, and structured API endpoints, reducing unauthorized access attempts 30% in test scenarios.

EDUCATION

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

- **Rutgers University**, New Brunswick, NJ
  Bachelor of Science in Computer Science & Data Science
  Graduated: May 2025
  Coursework: Algorithms, Systems Programming, Computer Architecture, Introduction to Data Science, Deep Learning, Data management for Data Science

SKILLS

- **Languages:** Python, SQL, C, Java, JavaScript, C++
- **Backend & Tools:** Django, Djoser, Spring Boot, Flask, FastAPI, Git, Docker, CI/CD, REST APIs
- **Databases:** PostgreSQL, BigQuery, ChromaDB
- **Libraries:** Pandas, NumPy, Matplotlib, OpenCV, TensorFlow, PyTorch
- **Systems:** Multithreading (pthread), Concurrency, OS-level Scheduling, Linux/Unix
- **Concepts:** System Design, Debugging, Testing, Authentication, Authorization

Leadership

Alpha Phi Omega Co-Ed Service Fraternity
Webmaster, Brotherhood Engagement Committee, Alumni Chair

- Managed website and coordinated alumni outreach and events