Vivek Raj

vraj1@binghamton.edu | 631-353-8483 | github.com/rajv79 | linkedin.com/in/vivek-raj07 | Portfolio | **US CITIZEN**

EDUCATION

Binghamton University | Thomas J. Watson College of Engineering and Applied Science, NY
Master of Science in Computer Science, **Artificial Intelligence (AI) Track GPA: 3.94/4.0** **Jan 2024 – May 2025**

Binghamton University | Thomas J. Watson College of Engineering and Applied Science, NY
Bachelor of Science in Computer Science **GPA: 3.8/4.0 (Dean's List)** **Aug 2021 – Dec 2023**

PROFESSIONAL EXPERIENCE

iA (Innovation Associates), Software Developer Engineer I | Binghamton, NY **Aug 2025 – Present**

- Enhancing and modernizing NEXIA Retail Software, a scalable pharmacy fulfillment and retail management system supporting enterprise operations for the Defense Health Agency (DHA) and other large-scale clients
- Delivered 50+ bug fixes and feature enhancements in a VB.NET application during bi-weekly Agile sprints, improving platform performance and reliability through close collaboration with cross-functional teams
- Built and designed multiple internal automation tools for QA teams and software engineers to streamline debugging, testing, and feature validation workflows, reducing manual effort by 15–20% across development cycles
- Collaborated with build and cross-functional teams to deliver stable monthly builds, actively participating in code reviews, debugging sessions, and requirements analysis to improve code quality and release efficiency

Binghamton University, Teaching Assistant (CS) | Binghamton, NY **Aug 2024 – May 2025**

- Mentored 100+ students in **Computer Security** and **Design and Algorithms**, covering **cryptography**, **network security**, **data integrity**, and algorithm analysis for strings, trees, graphs, and networks

Research Assistant (Prompt Engineering) | Binghamton University, NY **Feb 2024 – May 2024**

- Created **AI model testing workflows** by designing comprehensive test cases for machine learning outputs in BERT
- Analyzed and optimized prompt engineering techniques, improving AI response efficiency by up to 40% across diverse tasks
- Collaborated on developing and executing a structured validation methodology for retrieval-augmented generation (RAG) models in NLP, improving accuracy by 15% and enhancing reliability and consistency across benchmarks

OPEN-SOURCE CONTRIBUTIONS & PROJECT EXPERIENCE

MITRE Embedded Capture the Flag | MITRE **Jan 2025 – April 2025**

- Led a 10-member team as **captain** to a **top-26 global finish** in MITRE's eCTF competition, focused on embedded system security, and captured **49.1%** of total flags by reverse-engineering and exploiting vulnerabilities in other universities code
- Implemented AES-128-CFB encryption with masking and S-box on the **MAX78000FTHR**, securing communications through **parallelized execution** and performance optimization under **limited onboard memory**
- Built a **100+ FPS real-time decoder** with **randomized delays, secure key handling, & anti-replay protections**; Using **AI-assisted C/Python automation** to reverse cryptographic logic & bypass protocol-level defenses

Apple FoundationDB – Logging Framework & Transaction API Contributor | Git **Jan 2025 – Feb 2025**

- Enhanced Apple FoundationDB's logging framework with configurable log level initialization, improving debugging efficiency by 10% across platforms, optimized transaction API test cases for cross-platform compatibility
- Contributor to **PR #11879**, improving foundational logging mechanisms and database transaction reliability

Custom Memory Management | Git **Oct 2024 – Jan 2025**

- Developed a **custom memory allocator** in **C/C++** for **user-space modules**, enabling dynamic memory allocation similar to `malloc()` while minimizing **internal fragmentation** and **metadata overhead**
- Implemented **batch-based allocation** with **fixed-size blocks**, **bitmap-based free block tracking**, and **first-fit allocation policy**, achieving **15% performance improvement** and significantly reducing **allocation overhead**.
- Leveraged **function interposition**, optional **sbrk()-based heap management**, and **alignment-aware block sizing** (8/16-byte boundaries) to enhance **memory efficiency** in **embedded** and **real-time OS environments**
- Designed and executed a **robust test suite** with **logging, error handling, and validation**, improving **allocator reliability**, boosting **throughput by 20%**, and demonstrating knowledge of **production allocator techniques** such as **segregated lists**

TECHNICAL SKILLS

- **Programming Languages:** C, C++, Python, Java, C#, VB.NET, SQL, Linux scripting
- **Embedded Systems & Frameworks:** FreeRTOS, POSIX, CMSIS, Embedded Linux
- **Machine Learning & AI:** TensorFlow, Scikit-Learn, Transformers, MediaPipe, PaddleOCR, YOLO, Reinforcement
- **Technologies & Domains:** Real-Time OS, Embedded Systems, Cloud DevOps (Azure DevOps)
- **Tools & Platforms:** Visual Studio, GCC/GDB, Make/CMake, Nsight, Valgrind, Unix/Linux, Git, Docker