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: 4.0/4.0** **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

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

- 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
- Facilitate one-on-one mentorship and detailed evaluations of assignments to foster students' technical growth

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 a structured and systematic methodology for validating retrieval-augmented generation models for NLP applications, ensuring high accuracy, reliability, and consistency from

Central Hudson Gas and Electric Corp, Software Intern | Poughkeepsie, NY **June 2022 – Aug 2022**

- Managed the development of 4 SAP HANA ABAP applications that improved system integration by streamlining module communication and refined data management procedures to enable real-time analytics and decision-making
- Designed **CDS views** to streamline analytics, achieving a 30% boost in system performance compared to base model
- Conducted end-to-end testing of database enhancements, ensuring compliance with organizational requirements and information security protocols while closely collaborating with the cybersecurity department for risk assessment

OPEN-SOURCE CONTRIBUTIONS & PROJECT EXPERIENCE

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

- Led a 7-member team as **captain** to a **top-26 global finish** in MITRE's eCTF competition, focused on embedded system security and Captured 46+ flags by reverse-engineering and exploiting vulnerabilities in other universities
- Designed and implemented **AES-128-CFB encryption with Boolean masking and S-box** on the **MAX78000FTHR**, securing TV frame and subscription communications
- Built a **real-time decoder (100+ FPS)** with **side-channel defenses, randomized delays, and secure key handling** for robust security, also developed **anti-replay mechanisms** with cryptographic timestamp verification
- Wrote and debugged code in C & Python to crack cryptographic logic and retrieve flags, earning 49.1% of the total flags

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 – Nov 2024**

- Developed a custom memory manager in C for kernel-space modules, boosting system performance by 15% through optimized allocation, deallocation, fragmentation handling, and real-time memory usage tracking
- Implemented **bitmap-based tracking** and **function interposition** to enhance memory efficiency and reduce leak
- Crafted a test suite with logging, error handling, and validation, improving reliability and boosting throughput by 20%

TECHNICAL SKILLS

- **Programming Languages**: C++, C, Python, R, Java, SAP/ABAP, Linux, MySQL, Test-Driven Development
- **Libraries & Frameworks**: PyTorch, Scikit-Learn, TensorFlow, Transformers, Docker, Single-page applications (SPAs)
- **Technologies**: Machine Learning, Deep Learning, **NoSQL**, Cloud Computing
- **Tools and Platforms**: SAS, MATLAB, Unix, Data Integration, Version Control
- **Relevant Coursework**: Operating Systems, Computer Architecture, System Programming, Machine Learning/ AI

ACHIEVEMENTS and CERTIFICATES

- **Runner-up – QubitX Hacks [Project Link]** **April 2024**
- **1st Place Winner – Best TechHack (HACKBU 2024) [Project Link]** **Feb 2024**
- **Software Engineering Virtual Experience (JPMorgan Chase & Co.)** **July 2023**
- **Cybersecurity Virtual Experience Program (JPMorgan Chase & Co.)** **June 2023**