Vasudev Menon

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Education

North Carolina State University — Raleigh, NC

B.S. in Computer Science and B.S. in Mathematics | Cum. GPA: 4.0/4.0 — *Expected Spring 2026*

- Coursework: Deep Learning, Artificial Intelligence, Data Science, Linear Algebra, Data Structures and Algorithms, Operating Systems, Combinatorics, Real Analysis, Differential Equations, Discrete Mathematics
- Honors and Awards: Phi Beta Kappa, Dean's List All Semesters

Eötvös Lorand University — Budapest, Hungary

Budapest Semesters in Mathematics (BSM) — *Fall 2025*

- Coursework: Deep Learning, Graph Theory, Advanced Combinatorics (Hypergraph Theory)

Experience

Fidelity Investments — Durham, NC

Software/Machine Learning Intern – Summer 2025 — *June 2025 – August 2025*

- Built an LLM app converting pension plan docs into Java code using prompt engineering and templated prompt pipelines
- Enhanced and tested model reliability via prompt refinement and maintained contextual continuity
- Used Neo4j to model plan rules as a searchable knowledge graph, enabling bulk code generation

Fidelity Investments — Durham, NC

Software Engineer Intern – Summer 2024 — *June 2024 – August 2024*

- Engineered an enterprise assessment system used by 4,000+ company leads to evaluate application reliability
- Implemented a dashboard integrated with Power Platform API
- Built and deployed Backstage developer portal plugins in Node.js and TypeScript, enhancing internal tooling
- Utilized Docker for DevDocs integration to provide documentation for users

North Carolina State University — Raleigh, NC

NSF-Funded Deep Learning Research Intern — *May 2023 – August 2023*

- Automated deep learning experiments via shell scripting and R, analyzing batch normalization across GPU clusters
- Trained/evaluated neural nets with statistical analysis and metric visualizations (precision, recall, time)
- Contributed to NSF-funded research through experiment design and literature synthesis

Rice University — Remote

Data Science Intern (NSF Project) — *June 2021 – Feb. 2022*

- Conducted research on an NSF-funded project to analyze and extrapolate COVID-19 sequence data using R
- Utilized numerous state-of-the-art statistical algorithms to examine DNA sequence data
- Analyzed 100,000+ COVID-19 strains using statistical models, uncovering key genomic differences
- Presented research at the Junior Science and Humanities Symposium

Projects

Mechanistic Interpretability of Transformers on Simple Games | *PyTorch, NumPy, HuggingFace*

- Conducted interpretability research comparing hardcoded vs learned transformer models on controlled game tasks
- Designed novel experimental framework for enabling direct comparison of hand-engineered and gradient-learned solutions
- Analyzed transformer internals from a mathematical perspective contributing to understanding of how neural networks learn algorithmic reasoning

Differential Privacy in Federated Learning (FL) on MIMIC-IV | *AI/ML, Python, PyTorch, Flower, Big Data*

- Implemented **Distributed Differential Privacy (DDP)** in FL using Flower to protect sensitive healthcare data
- Simulated heterogeneous clients using racial groupings from the **MIMIC-IV** ICU dataset to reflect real-world skew
- Analyzed trade-offs between privacy budgets, model accuracy, and convergence with Gaussian noise and clipping techniques
- Overcame large-scale (100GB+) data processing challenges with SQL and Power Query
- Collaborated with Dr. Kotevska (ORNL) and Dr. Haider (NCSU); authored and presented findings
- Paper Link: View Paper

Rapster: Full-Stack Music Sharing Platform | *AI/ML, FastAPI, Supabase, Docker, Essentia, Cloudflare R2*

- Developed a full-stack app to upload and analyze audio tracks with ML-powered feature extraction (BPM, key, MFCCs)
- Deployed containerized ML workloads using **Essentia** in a FastAPI backend wrapped with Docker and orchestrated via Docker Compose
- Stored user files in Cloudflare R2 and metadata in Supabase, using signed URLs for secure access control
- Designed interactive frontend in **Next.js + TailwindCSS** with waveform scrubbing and real-time spectrum visualizations
- GitHub: https://github.com/vmenon04/rapster

Technical Skills

Programming: Python, Java, C/C++, R, SQL
AI/ML: PyTorch, TensorFlow, Keras, Scikit-learn, HuggingFace, Federated Learning, Differential Privacy
Systems & Tools: Docker, AWS, Git, CI/CD, Power Platform, Linux, REST APIs
Frameworks: FastAPI, Flask, Django, Flower, Streamlit
Other: Data Visualization (Matplotlib, Pandas), LaTeX