Aadarsh Narayan

Phone: 832-998-7324 | **Email:** aadarsh271.k.narayan@utexas.edu | **Portfolio:** www.cs.utexas.edu/~aadarshn
Location: Austin, TX 78712

Education

The University of Texas at Austin
Bachelors of Science in **Computer Science, Turing Scholars Honors Program** — *Expected June 2025*
Bachelors of Science in **Mathematics** — *Expected June 2025*
Masters of Science in **Computer Science** — *Expected June 2026*

- **GPA**: 3.985 / 4.0
- **Relevant Coursework**:
    - Data Structures, Computer Architecture, Operating Systems, Algorithms, Machine Learning (I, *focus on statistical methods and data collection* & II, *focus on mathematical theory behind neural nets, gradient descent, CNNs, Transformers, Diffusion models, etc*), Autonomous Driving, Quantum Information Science, Physical Simulation, Programming Languages, Generative AI, Graph Theory and Combinatorics, Quantum Mechanics
    - Multivariable Calculus, Discrete Mathematics, Probability, Linear Algebra, Differential Equations, Mathematical Statistics, Number Theory, Algebraic Structures, Real Analysis

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Skills

Programming Languages: C++, C, Python, Rust, Java, JavaScript, React Native, OpenGL, R, Coq
ML Model Familiarity: Various MLPs, CNNs, Transformers, GANs, Rectified Flow
Frameworks & Tools: PyTorch + DPP, Scikit-Learn, Pandas, Numpy, Git, Docker
Skills: Systems Design, Arch Emulation (Verilog, ARM, x86), Data Collection, Model Training, Research, Team Management, Communication, Web Design

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Experience

Autonomous Mobile Robotics Laboratory (AMRL) — *Austin, TX*
Undergraduate Researcher — *Jan 2024 – Aug 2024*

- Conducted research in **Model Predictive Path Integral (MPPI)** control for 2.5D environments with focus on aerial vehicular trajectories.
- Collected large datasets for model training using both model-size vehicles and automated simulations, focusing on improving trajectory predictions

- Wrote ROS Nodes to operate and interface with test vehicles, worked with VICON motion tracker to capture data, and used Gazebo for simulations. Extensive use of python and bash scripts to automate processing, environment generation, and evaluations
- Developed and trained forward kinodynamic models with various architectures, including MLP and CNN components, to enable integration of aerial trajectories into path planning.

Freshman Research Initiative – Energy Analytics — *Austin, TX*
Research Assistant — *Aug 2021 – May 2022*

- Collaborated with and led a 6-member team, working through Google Colab. Leveraged ERCOT provided big data, cleaning and imputation techniques, and machine learning techniques like SARIMA, VAR, and Facebook Prophe**t** for energy demand forecasting in the Texas power grid. Useful to real-world applications such as pricing, planning, and investment in energy production
- Built models to analyze energy-efficient buildings, identifying the characteristics associated with efficient consumption in order to aid the construction of more efficient developments

Major Projects

- **Autonomous F1Tenth Car**: Developed local navigation with dynamic path scoring and global navigation using RRTs. Integrated particle filter-based localization and high-speed drifting capabilities. Involved the application and integration of multiple complex algorithms, scientific testing of scoring approaches, and performance optimization to ensure real time robustness.
- **Shakespeare-GPT**: Fine-tuned GPT-2 with Shakespeare's works using **LoRA** (Low-Rank Adaptation), implementing in PyTorch to explore GPT-2 internals.
- **Path Tracer with Caustic Effects**: Created a photon mapping-based path tracer, enabling realistic light refraction and caustics.
- **PopcornOS**: Managed a 60-member team to develop an OS, contributed to virtual memory and graphic display subsystems, ported complex user programs like Doom
- **Pipelined Multicycle Processor in Verilog**: Processor in Verilog capable of accurately emulating 8 ARM instructions complete with fetch, decode, read, write, execute instruction pipeline
- **Programming Language Interpreter/Compiler**: Built a Python-like interpreter with scoped functions and variables, written in C.

Achievements & Honors

- **University Honors**, University of Texas at Austin — 2021-2023
- **Turing Scholars Honors Program**, University of Texas at Austin
- **National Merit Scholarship Award Winner**, 2021
- **High School Valedictorian**, Class Rank: 1/713
- **AP Scholar with Distinction**