

# PRANAV ATREYA

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I am a student pursuing my undergraduate degree in Computer Science and Physics. I have experience in a wide range of programming paradigms, from systems to full-stack development to machine learning. I am an avid learner and problem solver, evidenced by my coursework, projects, work experience, and publications.

## Education

### University of Texas at Austin

Aug 2019 – May 2023

*BS in Computer Science & Physics. Turing Scholar (CS Honors) & Dean's Scholar (Physics Honors)*

*Austin, TX*

## Relevant Coursework

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|--------------------------------|--------------------------------------|-----------------------------|
| • Quantum Computing            | • Computer Architecture              | • Linear Algebra            |
| • Natural Language Processing  | • Data Structures                    | • Discrete Math             |
| • Concurrency                  | • Information Retrieval & Web Search | • Classical Dynamics        |
| • Operating Systems            |                                      | • Classical Electrodynamics |
| • Algorithms/Complexity Theory |                                      | • Waves & Optics            |

## Technical Skills

**Languages:** Java, C/C++, Python, Go, Rust, SQL, Javascript, HTML/CSS, Shell, x86 Assembly,  $\text{\LaTeX}$

**Domain Skills:** AI/ML, Deep Learning, Robotics, Computer Vision, Systems, Linux, Android, Web

**Other Skills:** REST, Databases, Microservices, Docker, Jenkins, AWS, Git

## Experience

### Software Engineering Intern at Citi

Jun 2022 – Aug 2022

- Developed a Spring microservice to perform CRUD operations on a SQL database and interact with a front-end user application. Containerized microservice and deployed on OpenShift.

### Research Assistant at UT Austin Robotics

Jan 2020 – Present

- Member of the Autonomous Mobile Robotics Laboratory (AMRL) since January 2020 and the Robot Perception and Learning (RPL) lab since January 2022. I have two first author publications: one on novel learning-based motion planning algorithms and the other on the application of numerical optimization to high fidelity robot control systems, both at top computer science conferences. Additionally, a collaboration resulted in my third authorship of an accepted paper on the application of computer vision to offroad robotic control. I am currently working on photorealistic object-centric image rendering for robotic manipulation and grasping and a project at the intersection of deep reinforcement learning and program synthesis.
- Summer 2021 Paid Internship:** Conducted research in robot control systems and computer vision. As part of my research, I (1) developed two control systems for ground robots, one based on Model Predictive Control (MPC) and the other on inverse kinodynamics, (2) demonstrated their effectiveness in controlling a real robot at high speeds, and (3) built a custom camera mount for a d435i depth camera and fitted it on the robot car.
- Summer 2020 Paid Internship:** Conducted research in robotic motion planning. As part of my research, I (1) wrote a parallelized implementation of PPO, a state-of-the-art reinforcement learning algorithm, (2) developed a simulator in C++ for a drone, robot car, and a tractor trailer system, and (3) developed a novel learning-based approach for robot motion planning and empirically demonstrated its superiority.

### Independent Researcher

Jan 2017 – May 2019

- Conducted research in different areas such as mathematics, bioinformatics, ML, CV and NLP. I presented my work at multiple science fair competitions where it won several regional and state awards.

## Projects

### Custom Operating System | C++, Assembly, QEMU, Git

- Built a functional OS from scratch with preemptive scheduling, virtual memory, file IO, and system calls.

### Two-Phase Commit Protocol Implementation | Rust

- Implemented the 2PC protocol for execution of a distributed atomic transaction. Uses memory safety and concurrency features of the Rust language.

### GPU Accelerated Fluid Dynamics Simulation | CUDA, C++, Java

- Simulated 2D and 3D fluid dynamics using the Navier-Stokes equations. Computation was accelerated with GPU code written in CUDA.

### DyslexiAR - Assistive Technology iOS App for Dyslexic Individuals | Swift, C, Objective-C, EchoAR

- DyslexiAR helps dyslexic individuals read and write by recognizing words via OCR and displaying augmented reality models representing the words.

## Funlang | C

- Wrote an interpreter and compiler for a programming language with data types, dynamic memory allocation, functions, control structures, and file IO. Compiler is self-hosting (the compiler is written in the language it compiles).

## Custom Deep Learning Library | Java

- Implemented an efficient neural network training library from scratch. Library implements many deep learning primitives such as various activation functions, L1 and L2 regularization, and dropout.

## Custom Search Engine | Java

- Developed software that crawls web pages and efficiently indexes them using a compressed trie. Built a search engine using relevance feedback and the PageRank algorithm.

## Pipelined CPU with Branch Predictor | Verilog

- Implemented a five stage processor in Verilog based off a custom ISA. Can handle data, resource, and control hazards. Implemented a branch predictor with a direct-mapped cache.

## Ultrasound based Tumor Identification Device | Python, Raspberry Pi

- Fitted Raspberry Pi with ultrasound sensor to take ultrasound scans of the body part in question. The Pi is programmed to process scan image with a CNN and determine the likelihood of the presence of five different deleterious growth types.

## AI and NLP for Determining Credibility of News Articles | Java, Android, JSoup

- Analyzes biases of the publisher, recency of the articles, and performs fact checking with other news sources to evaluate credibility of news article.

## Honors/Awards

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- Winner of the Capital of Texas Undergraduate Research Conference (CTURC) [2022]
- Best Virtual Reality Hack @Hack The Northeast [2021]
- Best iOS App @Orion Hacks [2021]
- First Award, Physical Science & Engineering, Synopsys Technology Championship [2019]
- Mu Alpha Theta Award for Excellence in Mathematics [2019]
- Honorable Mention, Computational Systems & Analysis, California Science and Engineering Fair [2018]
- First Award, Biological Science & Engineering, Synopsys Technology Championship [2018]
- Naval Science Award, United States Navy & Marine Corps [2018]
- Special Congressional Recognition - Congressional App Challenge [2017]
- AP National Scholar with Distinction, National Merit Scholarship Commended [2019]
- Recognition for Science Research, Mayor of Cupertino [2018, 2019]
- Inspire Award, Silicon Valley Regional Robotics Competition [2017]
- USA Computing Olympiad (USACO) Gold Level [2017]

## Publications

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**Atreya, P.**, Karnan, H., Sikand K., Xiao X., Rabiee, S., & Biswas, J. (in press). High-Speed Accurate Robot Control using Learned Forward Kinodynamics and Non-linear Least Squares Optimization. *2022 IEEE/RSJ International Conference on Intelligent Robots and Systems*.

Karnan, H., Sikand K., **Atreya, P.**, Rabiee, S., Xiao X., Warnell, G., Stone, P., & Biswas, J. (in press). VI-IKD: High-Speed Accurate Off-Road Navigation using Learned Visual-Inertial Inverse Kinodynamics. *2022 IEEE/RSJ International Conference on Intelligent Robots and Systems*.

**Atreya, P.**, & Biswas, J. 2022. State Supervised Steering Function for Sampling-based Kinodynamic Planning. In Proceedings of the 21st International Conference on Autonomous Agents and Multiagent Systems (AAMAS '22). International Foundation for Autonomous Agents and Multiagent Systems, Richland, SC, 35–43.

## Volunteer Experience

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### Research Ambassador at UT Austin

2021 – Present

- My responsibilities include serving in a Q&A panel in bimonthly undergraduate research events, participating in research photoshoots and interviews, and motivating undergraduate students to get involved in research.

### Kaiser Permanente

2018 – 2019

- 200+ hours of volunteer experience.

### Literature Tutor, Math & Physics TA

2016 – 2019

- Tutored high-school students in English Literature after school for one week out of every month.
- Teaching Assistant for Calculus BC and Physics AP classes.