PRAVEEN NATARAJAN

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EDUCATION

University of Illinois Urbana-Champaign **Expected: May 2026**
Bachelor of Science in Computer Engineering **GPA: 3.76**
Relevant Coursework: Data Structures, Autonomous Vehicles, Digital Systems, Computer Systems & Programming, Engineering Probability, Computational Linear Algebra, Calculus 1-3, Differential Equations

RELEVANT EXPERIENCE

Autonomous and Unmanned Vehicle Systems Laboratory **January 2023 – Present**
Autonomy Researcher Urbana, IL

- Enhanced a D-star navigation algorithm for robotic path planning by integrating incremental re-planning with real-time LiDAR and sensor data, improving obstacle avoidance and goal-directed navigation
- Modeled the incremental re-planning D-Star code in MATLAB/Simulink to quantify the performance improvements of the proposed navigation algorithm and translated simulations to C++ with Gazebo/ROS
- Spearheaded collaboration with graduate students to test, validate, and process 1800+ frames of real-world vehicle navigation data into a JSON file using Python to train artificial intelligence lane detection algorithm

Air & Space Forces Association **June 2020 – May 2022**
Cybersecurity Competitor San Diego, CA

- Placed #1 nationally in Linux/Windows System Administration and cybersecurity competitions that utilized Bash scripting, Group Policy, network administration, and forensic analysis
- Competed in 15+ Capture the Flag (CTF) competitions and used Red Team/Blue Team exercises that trained security concepts like decryption, web exploitation, Unix, vulnerability hardening, and system knowledge
- Created Bash scripts that secure Linux machines by automating hardening processes, including user permissions, password policies, port scanning, firewall configuration, software updates, and application security

PROJECT EXPERIENCE

F1TENTH Autonomous Vehicle System | *Python, OpenCV, ROS, Gazebo* **March 2024 – Present**

- Implemented lane-following algorithm for the F1Tenth Autonomous vehicle using computer vision and perspective transformations for lane feature extraction, achieving a 95% accuracy in real time navigation along a track
- Refined track pathing with a PID controller, boosting agility and safety by dynamically adjusting velocity and steering angle
- Enabled LiDAR-based obstacle avoidance by analyzing PointCloud data and stopping the vehicle at a safe braking distance

Autonomous Polaris GEM Vehicle | *Python, OpenCV, ROS, Gazebo* [Link] **January 2024 – March 2024**

- Developed lane detection algorithm in Python and OpenCV for self-driving Polaris GEM car by integrating gradient/color thresholding, perspective transformation, and polynomial fitting with ROS for real world and simulated scenarios
- Created lateral and longitudinal fine-tuned vehicle controllers for the GEM vehicle, integrating vehicle models and control theory to navigate a real track in under 130 seconds, achieving 100% accuracy in waypoint navigation
- Engineered a high-precision Monte Carlo Localization (MCL) system in Python within a ROS and Gazebo simulated environment, leveraging advanced techniques in probabilistic robotics, sensor fusion, and particle filter optimization

Bit-Serial Computer | *Altera Quartus, SystemVerilog, Vivado* [Link] **January 2024 – February 2024**

- Engineered a computer module capable of performing 8 bitwise operations using digital logic chips and breadboards
- Created 4 core computer components (register, computing, routing, and control units) with muxes, counters, and registers
- Drafted detailed schematics in Altera Quartus and ran waveform simulations to optimize efficiency and validate circuit
- Implemented and optimized processor functionality for AMD's Spartan-7 FPGA, leveraging SystemVerilog with Vivado

Raspberry Pi People Counter | *Python, OpenCV* [Link] **January 2023 – May 2023**

- Designed cost-effective people detection algorithm using OpenCV and Haar-Cascades for quick object tracking
- Incorporated highly accurate directional movement analysis to distinguish between entering and exiting people
- Developed monitoring interface featuring video display, control settings, and data-driven insights on occupancy

HONORS AND AWARDS

- **National Cyber Scholarship -** Winner of $2500 Capture the Flag programming and cybersecurity competition
- **Tau Beta Pi -** Awarded to top 10% of graduating class by GPA - Company Outreach Committee
- **James Scholar -** For Excellence in Academic and Extracurricular Involvement

SKILLS

- **Hardware:** SystemVerilog, Verilog, Intel Altera Quartus, Vivado Design, Gazebo Simulator, Fusion360, PTC Creo, Onshape
- **General:** Python, C, C++, MATLAB, Bash scripting, Linux/Unix, HTML/CSS/JavaScript, OpenCV, ROS, Git, Github