

# PRAVEEN NATARAJAN

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## EDUCATION

### University of Illinois Urbana-Champaign

Expected: May 2025

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 navigation algorithm

### Illini RoboSub

December 2022 – Present

Software Engineer

Urbana, IL

- Led the computer vision team of 10 in developing object tracking algorithms with simulated Zed X camera and Gazebo
- Created mission planning strategies for 4 key tasks, enhancing decision-making in real-time simulation scenarios
- Developed SLAM algorithms to map environment markers and robot positions using ROS2 and camera data

### Air & Space Forces Association

June 2020 – May 2022

CyberPatriot 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

### Autonomous Polaris GEM Vehicle | Python, OpenCV, ROS, Gazebo

January 2024 – Present

- Developed AI 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

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

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

- Languages:** Python, C/C++, HTML/CSS/JavaScript, Bash, MATLAB, SystemVerilog, LC3 Assembly, Linux/Unix
- Simulation:** Altera Quartus, Vivado, Cisco Packet Tracer, Gazebo, Fusion360, PTC Creo, Onshape
- Developer Tools:** Github, Valgrind, VS Code, PyCharm, IntelliJ, Jupyter Notebook
- Libraries:** OpenCV (Computer Vision), ROS (Robot Operating System), PyTorch, Numpy