

SUVRAT JAIN

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EDUCATION

Georgia Institute of Technology, Atlanta, GA

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| - Bachelor of Science in Mechanical Engineering/Concentration in Robotics, GPA – 3.8 | 2020 – 2025 |
| - Master of Science in Mechanical Engineering/Concentration in Robotics | 2025 – 2026 |

EXPERIENCE

Safe Robotics Lab – Research Assistant (*Project Eyeball*)

July 2025 – Present

- Making an asymmetric stereo camera setup utilizing cameras of different focal lengths. This would simulate asymmetric foveation as performed by human eyeballs and would allow us to get accurate depth information for a region of interest.
- Implementing a vergence control depth estimation method for two 2-DOF gimbals that can move relative to each other.

Amazon Robotics – Hardware Engineer

Jan 2023 – July 2023

- Designed and optimized sensor frame enclosures and assemblies using SolidWorks sheet metal design, focusing on manufacturability, ease of assembly, and structural integrity. Conducted FEA for design verification.
- Developed low-cost passive vibration damping mounts to eliminate 100% of vibrations causing premature camera failure under low frequency vibrations (0-100 Hz). Each failure necessitated 15-20 minutes of downtime.
- Designed a repair platform that supports up to 300 lbs while weighing under 30 lbs. Achieved this by designing it to be formed from steel, providing strain hardening. This reduced the repair time from 45 minutes to 15 minutes.
- Conducted cable quality testing, reducing costs and cable replacement time by optimizing the use of cable interconnects.
- Collaborated with cross-functional teams and made engineering drawings for manufacturing and assembly processes.

Amazon Robotics – Robotics Project Engineer

Jan 2022 – June 2022

- Led package automation (SmartPac) and kickout improvement projects. Identified label printer issues by analyzing error logs, kickout rates, and machine downtime, ultimately recommending a software fix.
- Assessed fulfillment center operations, quantifying impact of downtime on throughput, manual repair times, and lost revenue, with solutions saving \$500K+ annually and improving efficiency.
- Managed timelines, guided teams, and created presentations and training materials for implementation.

Georgia Tech Manufacturing Institute – Research Student (*Nanoscale Manufacturing*)

May 2021 – Dec 2021

- Used piezo-electric motors to build a slicing and motion control system that can take images and control motors.
- Made a microscale mechanical ruling system capable of creating precise diffraction gratings (20µm thickness).

PROJECTS

Compact Hybrid Powerplant for Micromobility Vehicles – Senior Design

- **Mechanical Design & Analysis:** Engineered a 29 lb compact transmission integrating a 50 cc Honda GX50 and 4 kW BLDC motor via a custom cone-clutch and HTD timing-belt drive.
- Delivers peak torque of 34 Nm and a top speed of 36-mph (for a typical bicycle).
- Performed detailed stress and fatigue analysis to ensure 90% reliability at 750 hrs of operation.
- Extends range of a typical e-bike from 25 miles to 71 miles.
- **Controls:** Implemented STM32 MCU with UART protocol to a VESC motor controller to control RPM/current.
- Developed interrupt-driven RPM acquisition from Hall sensors and PWM clutch/throttle actuation, enabling seamless transitions between electric, engine, and regenerative modes.

Crane Trajectory Competition

- Controlled a bridge crane with a hook (single pendulum) to navigate a complex trajectory and pick up a payload (double pendulum) and drop it on a bullseye. Did it in 33s with least residual/transient vibrations by utilizing Specified Insensitivity shaping. Received first place.

Model Free Control of a Crane

- Made a model-free controller using automatic SPSA optimization for feedback gains for a nonlinear bridge crane system.

4x4 IR Controlled Car

- Made a 4x4 IR controlled car to show a proof of concept of traction control. System automatically detected slip at wheels and braked when necessary. Utilized servo, stepper motors, encoders, ultrasonic sensor, temperature sensor, compass.

Self-Balancing Robot

- Designed a two-wheeled self-balancing robot integrating Arduino, IMU sensor, and encoders.
- Implemented two PID-based controllers for pitch and velocity control such that robot can move while balanced.

Robotics Competition

- Collaborated with students to make a robot to place objects on an arena under 30s with a \$100 budget. Designed a linkage arm to complete a task under 1s. Used Arduino/C++ to control pneumatics, solenoids, DC motors, lead screws, and rails.

COURSES AND SKILLS

- **Tools:** SolidWorks, FEA, Drawings, DFM, DFA, GD&T, MATLAB, ROS & Simulink, STM32 MCU, Arduino, ESP32, I²C, UART, CAN, RS-232/485, external and timer interrupts, analog to digital, PWM.
- **Controls (ME 4452, ME 4012, ME 3017, ME 6404, ME 6401)**
 - Input shaping, LQR, Lyapunov stability, root-locus, frequency response, Nyquist, PID tuning, ZPETC, RLS, MRC.
- **Vibrations (ME 6442 – Graduate Level)**
 - Linear vibrations, forced and free motion of MDOF systems, damping, dynamic stability.
- **Robotics & Dynamics (ME 4451, ME 6441)**
 - Kinematics of rigid bodies, Reverse Displacement & Forward Displacement Analysis, Differential motion