# NIRMAL A J L A

(Antonyselvaraj Jhon Leonard Arputha) +1 763-358-9183 | na497@cornell.edu | Linkedin - Nirmal A J L A

Mechanical Engineer | Robotics and Automation | Expertise in Haptics, IOT Systems, Sensor Modeling and Product Design

## EDUCATION

**Cornell University** *Ithaca | Aug 2024 ~ May 2025*

*M.Eng in Mechanical and Aerospace Engineering (MAE) | GPA : 3.721*

Coursework: Robotics, Automation, Sensor Modelling and simulations,Advanced Product Design and Haptics, IOT Systems

**College of Engineering Guindy (CEG)** *Chennai | Aug 2019 – May 2023*

*B.E Mechanical Engineering | GPA : 3.903*

Patent for String Drive Wheelchair

## SKILLS

**Technical :** SolidWorks, CATIA, AutoCAD, Fusion 360, Inventor, Ansys, Aveva E3D, BricsCAD, Rapid Prototyping, 3D Printing, Design for Manufacturing, Blender (Renders), GD&T, CFD, NX, Onshape, Microcontroller Programming
**Programming :** C++, Python, Matlab, C#, Kotlin, Front-End(HTML, CSS, JS), Android Dev, Flutter, SQL
**Interpersonal:** Communication, collaboration, leadership & initiative, problem-solving & critical thinking, adaptability & resilience, work ethic & accountability.

## PROFESSIONAL EXPERIENCE

**AMTDC, IIT Madras** *Feb 2022 – June 2022*

*Research and Design Intern*

- Developed an automated pallet changer for the FANUC Robodrill, reducing workpiece changeover time by 40% and increasing throughput.
- Contributed to mechanical design and CAD modeling of the changer mechanism, focusing on modularity and ease of integration with existing CNC systems.
- Performed feasibility and kinematic analysis to validate system efficiency, reliability, and manufacturability under industrial constraints.

**Technip Energies** *Aug 2023 – Aug 2024*

*Piping Design Engineer*

- Designed optimized layouts for hydrocarbon refineries and chemical plants, modeling 300+ pipelines in AutoCAD and ensuring full compliance with ASME and other industry codes.
- Routed process piping systems with a focus on safety, accessibility, thermal stress management, and efficient material usage.
- Oversaw on-site construction for 3 months at the Indian Oil Corporation plant in Paradip, Odisha, delivering 100% spool installations on time under strict deadlines

## TECHNICAL PROJECTS

**SAVIpress: Acupressure-Inspired Footrest Massage Device** *Sep 2024 ~ May 2025*

- Engineered a haptic footrest with pressure nodes for relaxation and improved circulation.
- Conducted finite element analysis (FEA) for stress and deformation testing under various loads.
- Led branding, mechanical design, and prototype development for usability testing.

**Smart Wheelchair with String Drive Mechanism** *Mar 2022 – Sep 2022*

- Redesigned the drive mechanism using a string-based system for improved mobility.
- Conducted ergonomic and force analysis to optimize effort reduction for users.
- Developed a mechanical prototype with enhanced maneuverability.

**Agricultural Smart Bot (Capstone Project)** Dec 2022 ~ May 2023

- Designed and fabricated an autonomous robot capable of plowing, seeding, and irrigation.
- Integrated sensor-based automation for precision farming tasks.
- Conducted mechanical design validation and field testing.

**Autonomous Mobile Robot – Sensor Fusion, Mapping & Control** *Jan 2025 ~ May 2025*

- Programmed and tested real-time localization, mapping, and motion planning algorithms on the iRobot Create platform, using MATLAB.
- Developed lab solutions for sensor integration, SLAM, and autonomous navigation; final competition project demonstrated obstacle avoidance and path execution in a dynamic environment.

**Haptic Device for Fishing Arcade Game** *Sep 2024 – Dec 2024*

- Designed a dual Hapkit-based force feedback system to simulate realistic fishing sensations.
- Implemented bilateral control with position and force scaling for an immersive arcade experience.

**LiDAR-Based Sensor Modeling and Navigation** *Sep 2024 – Dec 2024*

- Designed a sensor model for autonomous navigation, detecting obstacles and mapping environments.
- Implemented real-time filtering and noise reduction for accurate target identification.
- Achieved 82% scanning coverage with optimized movement planning for rapid response applications.

**Autonomous Selfie Drone Controller** Sep 2024 – Dec 2024

- Developed a PySMT and Z3-based autonomous controller for takeoff, hover, and landing.
- Designed real-time trajectory optimization to handle wind disturbances and user proximity constraints.
- Integrated dynamic force calculations and stability adjustments for precision control.

**High-Precision Bluetooth Scroll Wheel** *Jan 2025 ~ May 2025*

- Designed a compact, ergonomic scroll wheel using a hollow-shaft BLDC motor, AS5600 magnetic encoder, and nRF52840 microcontroller for high-resolution wireless HID input.
- Integrated a circular capacitive touchpad and Li-Po battery in a modular, 3D-printed form factor; project is heading toward a provisional patent for its innovative design and seamless user experience.

**Modular 3D-Printed Camera Cage for Nikon Z50II** *Jan 2025 ~ May 2025*

- Engineered a fully 3D-printed camera cage with integrated Arca-Swiss base, side vertical shooting plate, cold shoe mounts, and top handle, enabling enhanced ergonomics, modularity, and accessory mounting.
- Achieved full screen articulation and unobstructed access to battery and SD card doors; designed for strength, minimal weight, and printability, demonstrating strong CAD and product development skills.

**Motorized Camera Slider with Closed-Loop Control** *Jan 2025 ~ May 2025*

- Designed and prototyped a belt-driven camera slider using a NEMA 17 stepper motor, magnetic encoder, and ESP32 microcontroller for closed-loop motion control.
- Built on 2020 V-slot extrusions with a custom carriage, the system supports Bluetooth control for remote operation and precise positioning.

**Aerodynamic Analysis of a Three-Wheeler** *Sep 2021 – Jan 2022*

- Conducted CFD simulations to optimize vehicle aerodynamics. Proposed design modifications to reduce drag and improve efficiency.

**STEM IoT Education Training Platform** *Jan 2025 ~ May 2025*

- Designed scalable IoT training modules and coding tutorials for high school educators in rural Geneva, NY.
- Developed user-friendly sensor demos and Arduino/TTN content to support long-term classroom integration.

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# CREATIVE & LEADERSHIP EXPERIENCE

**Freelance Graphic Designer & Filmmaker** *2018 – 2023*

- Delivered branding and promotional content for clients; specialized in motion graphics, video editing, and storytelling.
- Portfolio: Website | YouTube

**Student Video Producer – Cornell Student & Campus Life** *Sep 2023 ~ May 2025*

- Produces videos for Cornell's official platforms; involved in scripting, shooting, and editing campus life stories.
- Featured Work: *Food of the Original People*

**Student Director – CEG Tech Forum** *Aug 2021 – Aug 2023*

**Design Head – NSS Unit 7** *Aug 2020 – Aug 2022*