

# Vishnu Mandala

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## EDUCATION

### University of Maryland, College Park, MD

Jan 2023 – Dec 2024

*Master of Engineering in Robotics*

GPA: 3.91/4.0

Coursework: Perception and Planning for Robots, Robot Modeling and Controls, AI and Deep Learning, Manufacturing Robotic Systems

### Mahatma Gandhi Institute of Technology, India

Jul 2018 – Jul 2022

*Bachelor of Technology in Mechatronics*

GPA: 7.84/10

Coursework: Kinematics and Dynamics, Robotics and Automation, CAD/CAM, Microprocessors and Microcontrollers, MEMS

## SKILLS

**Languages:** Python, C++, C, CUDA, Bash

**Robotics & Control:** ROS1/ROS2 (MoveIt, RViz, Gazebo, URDF), SLAM, PID, Kalman Filtering, System Modeling, CARLA

**AI & ML:** PyTorch, TensorFlow, YOLO, Reinforcement/Transfer Learning, CNN/RNN, Supervised/Unsupervised Learning

**CAD & Simulation:** SolidWorks, MATLAB/Simulink, ANSYS, Autodesk Inventor, Creo, AutoCAD

**Tools & Platforms:** Git, Linux, Docker, CI/CD, Jupyter Notebook, CMake, Raspberry Pi, Arduino IDE, Windows

**Sensor & Embedded Systems:** LIDAR, Depth Cameras, RGB-D Sensors, IMU, Encoders, Ultrasonic Sensors, PCB Design

## EXPERIENCE

### Graduate Teaching Assistant

Aug 2023 – Dec 2024

*Department of Mechanical Engineering, University of Maryland*

College Park, MD

- Delivered hands-on instruction in SolidWorks and Autodesk Inventor to over 600 students, improving design accuracy by 25% through advanced CAD lectures, targeted feedback, and collaboration with faculty on grading and assessments

## PROJECTS

### Agile Robotics for Industrial Automation Competition (ARIAC) | ROS2, C++, YOLOv8, Gazebo, RViz, UR10e, AGV

- Managed a 5-member team to develop a NIST-compliant control system for UR10e robots and AGVs in a warehouse, improving kitting and assembly efficiency by 20% through strategic task prioritization
- Developed a YOLOv8-based system for part detection and localization with 98% accuracy, enabling precise conveyor tracking and adaptive handling of faults like missing or defective parts
- Constructed a fault-tolerant ROS2 architecture with real-time monitoring and dynamic tool-changing, enhancing reliability by 15%

### Mobile Manipulator Robot Design & Control | ROS2, MATLAB, SolidWorks, UR10, LIDAR, URDF, Kinematics, Dynamics

- Engineered a 6-DOF mobile manipulator (UR10 arm + differential drive) with an optimized chassis and steerable L-joints, boosting load stability by 20% through ROS2 navigation with LIDAR fusion and achieving a 20ms control latency in Gazebo
- Achieved 98% pick-and-place accuracy ( $\pm 1$  mm) and 30% greater stability using DH parameters and Jacobian-based trajectory planning

### RC-NFQ Algorithm for Autonomous Navigation | PyTorch, Keras, CNN, DQN, Path Planning, Reinforcement Learning

- Engineered an enhanced RC-NFQ algorithm with dropout-regularized CNNs in PyTorch, reducing collision rates by 15% and training latency by 30%, ensuring robust performance in dynamic traffic and surpassing NFQ/DQN baselines

### Improved Bi-directional RRT\* for Robot Path Planning | TurtleBot3, Gazebo, APF, Motion Planning, Sensor Fusion

- Augmented Bi-Directional RRT\* with Artificial Potential Field (APF), reducing path length by 25% and computation time by 30%
- Minimized path inflection points by 50% via APF-based tree growth, sensor fusion, and Dynamic Window Approach, improving real-time path efficiency by 20% in dynamic environments; tested in Gazebo and physical TurtleBot3 Burger

### Obstacle Recognition and Autonomous Navigation System | SLAM, YOLOv8, OpenCV, Raspberry Pi, Embedded Control

- Led a 5-person team to develop an autonomous differential drive robot with real-time pick-and-place, achieving 92% detection accuracy and a 15% YOLOv8 training time reduction using mosaic augmentation and tailored datasets
- Improved navigation precision by 30% with multi-sensor fusion and landmark-based SLAM for real-time trajectory adjustment
- Designed a multi-threaded Raspberry Pi system for concurrent sensor processing and motor control, ensuring stable 10 FPS obstacle recognition and 25% faster task execution through optimized path planning

### Automated Vertical Glass Cleaning Robot | SolidWorks, ANSYS, Arduino, PID, PCB Design, Machining, C++

- Designed a 2-DOF robot with a pulley/leadscrew mechanism and machined glass holder, boosting alignment stability by 20% and achieving 95% vacuum adhesion across inclinations through ANSYS-based force analysis
- Programmed a PID-based zigzag cleaning algorithm on Arduino with infrared and boundary sensors, enhancing cleaning coverage 25%

## ACTIVITIES

### Vehicle Prototype Developer

FMAE BAJA 2021

*QUADTEK RACING, Mahatma Gandhi Institute of Technology*

Hyderabad, India

- Designed an off-road prototype vehicle in SolidWorks and ANSYS, reinforcing safety and durability through stress analysis, load distribution, and performance testing, ensuring compliance with FMAE and SAE BAJA standards.

## CERTIFICATIONS

**Master Statistics & Machine Learning: Intuition, Math, Code** - Udemy

Oct 2024

**A Deep Understanding of Deep Learning** - Udemy

Oct 2024