

# Satvik Gupta

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## EDUCATION

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### Nanyang Technological University, Singapore

Master of Science in Smart Manufacturing; GPA: 4.17/5.00

Dissertation titled "Superquadrics-based Planning for Dual-Arm Robotic Manipulation of Boxes"

Singapore

Dec 2024 (expected)

### Thapar Institute of Engineering & Technology, Patiala

Bachelor of Engineering (B.E.) in Mechanical Engineering; GPA: 8.36/10.00

India

2019 - 2023

## RESEARCH EXPERIENCE

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### Robotics Research Centre, NTU

Advisor: [Prof. Domenico Campolo](#)

NTU, Singapore

Aug 2023 - Present

#### ◦ Superquadrics-based Planning for Dual-arm Robotic Manipulation of Boxes:

- Conducting research focused on development of a novel approach for dual-arm manipulation using superquadrics.
- Using MATLAB & Drake as primary tool for modeling, planning, & control of trajectory in a simulated environment
- Using Dynamic Movement Primitives(DMPs) to generate smooth & adaptable trajectories for manipulation tasks.

### Research Intern, Advanced Robotics Centre, NUS

Advisor: [Prof. Marcelo H. ANG Jr.](#)

NUS, Singapore

Jan 2022 - Jun 2022

#### ◦ Omnidirectional Autonomous Mobile Robot (OAMR):

- Developed a 4 mecanum-wheeled autonomous mobile robot, powered by NVIDIA Jetson Xavier developer kit.
- Completed electro-mechanical setup of all components including sensor such as LiDAR, motor encoder, IMU, etc.
- Created & implemented packages for different SLAM algorithms including HectorSLAM & Google Cartographer.
- Developed custom ROS navigation stack for full autonomous capabilities of the robot.

#### ◦ Smart Eye-Kiosk for Community (SEK-C):

- Worked on the design & development of fully automated eye kiosk for diagnosis of causes of reversible blindness.
- Developed computer vision algorithms for auto-detection of human eye & auto-alignment of the camera with the eye.
- Explored & implemented the liquid lens technology on Edmund Optics camera using Raspberry Pi controller board for auto-focusing & auto-capturing of the retinal image.

### TIET-TelAviv University Centre for Food Security(T<sup>2</sup>CEFS)

Advisor: [Prof. Ajay Batish](#)

TIET, India

Aug 2022 - May 2023

#### ◦ Autonomous Agriculture Weed Removal Robot (A2WR2):

- Developed a fully autonomous ROS-powered robot rover for precise weed detection in vegetable row crops.
- Designed & in-house fabricated a differential drive-based mobile robot with delta manipulator for agricultural fields.
- Developed ROS-based packages for sensor fusion & teleop control for initial testing purposes in the field, used various sensors for autonomy including LIDARs, Intel RealSense Depth camera, etc.

### Research Assistant, Systems & Control Lab

Advisor: [Prof. T.K. Bera](#)

TIET, India

Jul 2022 - Jun 2023

#### ◦ 6DOF Mobile Robotic Manipulator for Concrete 3D Printing:

- Engineered an autonomous mobile manipulator with mecanum wheels and a 6-DOF arm for 3D concrete printing, overseeing design, fabrication, and control.
- Utilized SolidWorks for design, Arduino for control logic, & selected DC and stepper motors to meet precise operational requirements.

## Summer Intern, Larsen & Toubro Ltd.

Heavy Engineering Division, L&T

Hazira, Gujarat

July 2021 - Sep 2021

- Designed an automatic strip cutting mechanism for installation on strip cladding head in the Electro Slag Strip Cladding Welding (ESSC) Process.
- Worked & researched with the team setting up India's first IoT based welding stations at L&T, Hazira Facility.
- CAD modelled & designed various machine parts for the ongoing welding station setups.

## TECHNICAL SKILLS

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- **Platforms & Frameworks:** MATLAB, ROS/ROS 2, Gazebo, RVIZ, Drake Sim, Linux, L<sup>A</sup>T<sub>E</sub>X.
- **Languages & Libraries:** Python, C/C++, OpenCV, Arduino IDE.
- **Hardware:** NVIDIA Jetson Xavier AGX/Nano, Intel Realsense Depth Camera, Raspberry Pi, LiDAR, Arduino, Encoders, DC/Servo/Stepper motors, Motor controllers.
- **CAD & Tools:** Solidworks (Certified Associate), PTC Creo, Onshape, AutoCAD, TinkerCAD, Autodesk EAGLE.

## PROJECTS

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### Participating in F1 Tenth Competition, ICRA 2024, Japan | ROS2, Python Jan 2024 - Present

- Working in a team of 5 to build fully autonomous fastest racing car which is 1:10 the size of actual F1 car.
- Leading the development of various global and local planning algorithms to find the min. lap time, min. curvature, and shortest path.

### PocDoc Portable Device | Solidworks, Raspberry Pi, Python May 2022 - Aug 2022

- Designed & fabricated a setup using acrylic sheets & FDM based 3D printing techniques for out-of-hospital eye screening integrated with PocDoc application.
- Raspberry Pi-powered device to perform 6-different types of eye tests using keyboard or a Xbox gaming controller.
- Successful development of the prototype & in the clinical trial stage; under the guidance of [Dr. Rupesh Agrawal, Tan Tock Seng Hospital, Singapore](#).

### Analysis of Mechanical Properties of FDM printed parts | 3D printing, ML Aug 2021 - Present

- 3D printed different dog-bone test specimens using (PLA) material by varying input parameters.
- Deploying Machine Learning models on the input & output parameters to predict mechanical properties of the parts.
- Manuscript under preparation, advised by [Dr. Vishal Gupta](#).

### Nurse Assist Mobile Robot | ROS, Solidworks, Raspberry Pi, Python Aug 2021 - Jul 2022

- Responsible for CAD design & fabrication of chassis & other parts of the differential drive robot using various manufacturing processes & 3D printing methods.
- Path planning using ROS-based framework; used Hokoyu LIDAR & odom data from motor encoders.

### 3D Printing Mobile Robot | Solidworks, Arduino, Motion Control Aug 2020 - Dec 2021

- Designed & fabricated mobile robot for 3D printing of infinite-length parts.
- Developed Arduino-based GRBL control for printing parts using ABS/PLA material.
- Printing parts in different layer stacking sequences to test properties of the parts so printed.

## ACHIEVEMENTS

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- Competition Finalist & project awarded seed grant funding at **Medical Education Grand Innovation Challenge '22 (MEGIC)**, held in **NUS, Singapore**.
  - Awarded travel grant of INR1,00,000 from Army Public School, New Delhi to represent India at the **International RoboCup Junior'16** held in **Leipzig, Germany**.
  - Represented North Zone (India) in Rescue Line League at **Indian RoboCup Junior'17**, held in **Bangalore, India**
  - **1st Runner Up** & bagged the Award for Best Creativity & Innovation at **Indian RoboCup Junior'17**.
  - **Winner, Indian RoboCup Junior'16**, All India Nationals in Rescue Line League held in New Delhi, India.
  - **Winner**, Boat racing competition, **RoboKnights'15** (DPS RKP, Delhi).
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