




# RAHUL ROY

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## EDUCATION

### Northwestern University

M.S. in Robotics   GPA 3.85

Evanston, IL

Expected December '24

### Manipal Institute of Technology

B.Tech. in Mechatronics Engineering - Minor in Robotics and Automation   GPA 3.75

Manipal, India

June '18- July '22

#### Relevant Coursework

ROS (Robot Operating System)/ROS 2, Robotic Manipulation, Mechatronics, Microprocessor System Design, SLAM for Robotics.

## PROJECTS

### Autonomous Quadruped Search and Retrieve | *Current* | C++, Python, ROS 2

Jan '24 - Present

- Developing algorithms to enable a Unitree Go1 robot to search for a person given a picture in C++, Python and ROS 2.
- Creating a custom exploration algorithm to map the environment.
- Using the Nav2 stack and RTAB mapping (3D SLAM) to localize and autonomously navigate the quadruped.
- Using Visual Odometry, loop closure and computer vision to accurately map the region.
- Training an image recognition model YOLOv8 to detect people and using face detection algorithms to match facial features.

### Simultaneous Localization and Mapping from Scratch (EKF SLAM) | *Current* | C++, ROS 2

Jan '24 - Present

- Programming an EKF SLAM (2D SLAM) pipeline using ROS 2 and C++ for the Turtlebot3.
- Creating a kinematics and odometry control library in C++ for differential drive robots.

### Vision-based Autonomous Control of a 7 DOF Robot Arm | *Group Project* | Python, ROS 2

Dec '23

- Programmed a 7 DOF Franka Arm in Python and ROS 2 to autonomously detect and knock down colored bowling pins.
- Trained YOLOv8 machine learning model for classification and detection of the colored bowling pins, displayed as markers in Rviz2.
- Developed a Python API for the ROS 2 MoveIt package to control the robot's movements.

### Motion Controlled Differential Drive Car with Infrared (IR) Gripper | *Group Project* | C

Dec '23

- Coded a microcontroller in C to control a differential drive car with an autonomously operated IR gripper.
- Transmitted Euler angles via Radio communication to direct the car's movement based on tilt and inclination.
- Integrated IR Grid-EYE sensor for object detection, triggering servo-controlled gripper manipulation within the car's range.

### Automated Grasping: Pincher X100 4-DOF Robot Arm Grasps a Purple Pen | *Python, ROS 2*

Sept '23

- Programmed a Pincher X100 4-DOF robot arm to grasp a purple-colored pen.
- Utilized Intel RealSense D435i and OpenCV for object localization and HSV color space with depth mapping for orientation.
- Enabled Trossen PincherX 100 robot arm manipulation and object grasping using camera-detected coordinates.

## PROFESSIONAL EXPERIENCE

### Centre for Artificial Intelligence and Robotics, Defence Research and Development Organisation

India

*Project Intern*

Jan '22 - June '22

- Set up IMU and Velodyne LIDAR for the Husky A200 robot using C++ and Python in ROS 2.
- Achieved autonomous navigation using SLAM Toolbox (2D SLAM), Cartographer, and Nav2 (ROS 2 Foxy) in C++.
- Performed a comparative study of the TEB and DWA motion planners for the proposed robot.

### Central Research Laboratory, BEL

India

*Intern*

July '21 - Aug '21

- Implemented algorithms in MATLAB related to Robotic Navigation including Trilateration, Triangulation, and GPS.
- Manipulated UDP packets in MATLAB to send from one system to another.

## SKILLS

- **Software:** Python, C++, C, Git, Linux, Unit Testing, Bash, MATLAB
- **Robotics:** *Software:* ROS 2/ROS, Nav2, Computer Vision, Machine Learning, MoveIt 2, Gazebo, SLAM, Coppeliasim, YOLOv8, Path Planning, Sensor Fusion, RTAB Map, Visual Odometry,  
*Hardware:* Microcontroller (nRF52833, PIC32), Unitree Go1, Nvidia Jetson, Franka Emika Panda
- **Manufacturing:** Circuit design, 3D Printing, CAD (SolidWorks, Onshape)