# Jay Bhautikkumar Prajapati

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- Robotics Engineer with 2+ years of in Machine Learning, Computer Vision, Robotics and Automation.
- Specializes in CAD, Autonomous Navigation, Path Planning, and Software Development for robotic systems.

## Education

**University of Maryland, College Park, USA | Master of Engineering in Robotics (GPA: 3.7/4)** Aug 2022 – May 2024

**Gujarat Technological University, India | B.Tech. in Mechanical Engineering (GPA: 7.88/10)** Aug 2018 – May 2022

Related Coursework: Robot Design, Controls, Deep Learning, Industrial Automation, Smart Manufacturing, Embedded Systems and IoT

## Experience

**Graduate Teaching Assistant** | Computer Vision, Software Development, Deep Learning Aug 2023 – May 2024

University of Maryland College Park, MD, USA

- Mentored 95+ graduate students in essential Computer Vision concepts, including homography, calibration, stereo vision, optical flow, and SLAM.
- Instructed graduate students in advanced C++, OOP, version control and software design patterns, enhancing their programming proficiency.
- Led comprehensive training on ROS2, ROS1-ROS2 bridge, unit testing, and CI/CD, equipping students with critical software development skills.

**Robotics Intern** | Robotics, IoT, 3D Printing, Rapid Manufacturing and Prototyping, Autonomous Navigation Jan 2020 – Jan 2022

Robotics Lab, BVM Engineering College Anand, Gujarat, India

- 3D scanned an 11ft statue, achieving a 98% accurate CAD model, and cut production costs by 50% of 3D printed miniatures using FDM technology.

Quadruped Robot (Demo)

- Engineered a Quadruped Robot to perform biomimicry of canines with dynamic locomotion abilities: walking, turning, trotting, and slope climbing.
- Optimized multithreaded control of 12 servo motors using an ATmega 2560 microcontroller, achieving 90% accurate gait patterns compared to SolidWorks simulations. Patented the design and utility, securing first position at GUJCOST Robofest – State Level Championship.

Comparison of 2D Mapping Algorithms

- Constructed a robot using Raspberry Pi, LiDAR sensor, and Raspberry Pi Camera for 2D mapping and GPS enabled autonomous navigation.
- Mapped a 20,000 sqft hostel floor to comprehensively evaluate 2D mapping algorithms, including HectorSLAM, Cartographer, and Gmapping.

## Projects

**Software module for a Multi-Robot System** (GitHub)

- Developed a software module implementing Agile Iterative Process to simulate a multi-robot system utilizing C++, ROS2, and Google Test Framework. Integrated Continuous Integration/Continuous Deployment (CI/CD) to ensure software deployment.
- Simulated 25+ robots achieving precise geometric alignment with 99% accuracy, achieving 89% code coverage.

**AudioVision Assist: Enabling accessibility through deep learning** (GitHub, Demo)

- Trained a deep learning model using Inception V3 CNN encoder for feature extraction, processing live video feeds to generate and vocally express descriptive captions, achieving 92% accuracy for real-time accessibility for visually impaired individuals.
- Enhanced model confidence by implementing Block Static Expansion and multi-headed attention vectors for generating feature vectors, significantly improving the accuracy and reliability of real-time descriptions for visually impaired users.

**Dynamic Path Planning for autonomous robot** (GitHub)

- Applied A* and Dijkstra algorithms to plan paths for a TurtleBot3 burger, both in simulation and hardware implementation.
- Implemented the RRT* algorithm in Python for robot path planning, incorporating dynamic obstacle avoidance through real-time replanning. Executed motion planning for robot manipulators using OMPL.

**Autonomous Pick and Place Robot** (Demo)

- Built a mobile robot with autonomous navigation and obstacle detection, integrating IMU, Raspberry Pi, Arduino, Pi Camera, and ultrasonic sensors for real-time object recognition and obstacle avoidance.
- Utilized PID control for precise localization based on encoder data and programmed the robot for efficient pick and place operations, achieving an 80% success rate with color-coded blocks. Soldered a custom PCB for electronics setup and power distribution.

**Semantic Segmentation**

- Achieved 80% accuracy by employing RNN based ResNet50 and Pointrend architectures for semantic segmentation of food items.
- Employed transfer learning techniques to segment frames in real-time video feed, enhancing precision in food item identification.

## Skills

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| **Programming:** | Python, C/C++, MATLAB, SQL (MySQL), Docker, Data Structures, Algorithms, Unit Testing, PLC Ladder Logic |
| **Software Tools:** | ROS/ROS2, Rviz, Gazebo, MoveIt, NAV2, Solidworks, PTC Creo, Fusion 360, MS Office |
| **Library and Tools:** | Git, PyTorch/TensorFlow, Keras, Cuda, SKLearn, OpenCV, NumPy, Pandas, Doxygen, LaTeX, MS Office, Linux, Lucid |
| **Soft Skills:** | Leadership, Teamwork, Strategic Planning, Communication, Public Speaking, Critical Thinking, Teamwork |

## Patents and Publications

- **IoT based wastewater spillage detection system**, IOP Conference Series: Journal of Physics (Link)
- **QUADRUPED CANINE ROBOT**, Application No.202221001158, The Patent Office Journal No. 11-2022 (March 2022)