

Jay Prajapati

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- Robotics Engineer with 2+ years of experience in Perception, Robot Control, and Machine Learning.
- Specializes in Robot Design, Computer Vision 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 and Modelling, Control Theory, Motion Planning, Perception for Robotics, Deep Learning, Reinforcement Learning

EXPERIENCE

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, achieved a 98% accurate CAD model, and cut production costs by 50% for 3D printed miniatures using FDM technique. [Quadruped Robot \(Demo\)](#)
- Pioneered the design and development of a Quadruped Robot, mimicking walking, turning, trotting, and slope climbing abilities of canines.
- Fabricated the robot using 3D printing, reducing weight by 40% compared to acrylic or aluminum, while ensuring robust integrity and mobility
- Conducted detailed motion analysis using SolidWorks, optimizing gait patterns to achieve 90% accuracy when compared to simulation models.
- Optimized multithreaded control for 12 servo motors using an ATmega 2560 microcontroller and PCA9685 servo control board via I2C. [Comparison of 2D Mapping Algorithms \(GitHub\)](#)
- Engineered a wheeled robot using Raspberry Pi, LiDAR, and camera, mapping environments up to 20,000 sqft with autonomous GPS navigation.
- Evaluated HectorSLAM, Cartographer, and Gmapping algorithms, identifying Cartographer as the most accurate with 30% fewer artifacts and superior noise reduction in both small and large-scale environments.

PROJECTS

Human Tracking Software Module with Real-Time Object Detection ([GitHub](#))

- Designed a C++14 human tracking module with YOLO detection, achieving 84% model confidence and 99 ms inference time on MS-COCO dataset.
- Incorporated KCF tracker for precise and reliable human tracking across 164K images, optimizing performance in dynamic environments.
- Integrated CI/CD pipelines using Travis CI and Coveralls, significantly boosting testing coverage and enhancing overall code quality and reliability.

AI-Driven Real-Time Image Captioning for Enhanced Accessibility ([GitHub](#), [Demo](#))

- Developed a deep learning model using Inception V3 CNN encoders, achieving 92% accuracy in real-time captioning for visually impaired users.
- Enhanced model accuracy and reliability with Block Static Expansion and multi-headed attention, optimizing real-time descriptive captioning.
- Created Python scripts for seamless phone camera integration, enabling real-time video feed processing and immediate voice captioning.

Semantic Segmentation for Real-Time Food Item Recognition

- Achieved 80% accuracy in food item segmentation using RNN-based ResNet50 and PointRend architectures, optimizing real-time video analysis.
- Employed transfer learning, reaching 67% test accuracy on a limited dataset (4935 training, 2135 test images), surpassing a custom model's 43%.
- Fine-tuned pre-trained architectures for accurate food identification, enhancing segmentation performance in real-world scenarios.

Software module for a Multi-Robot System ([GitHub](#))

- Orchestrated a swarm robotics simulation for 25 TurtleBot3 robots in Gazebo using ROS2, achieving geometric formations with 99% accuracy.
- Devised a Master-Slave Algorithm in a multi-robot system, enabling coordinated movements and pattern formation in a simulated environment.
- Established and integrated CI/CD pipelines with 89% code coverage, ensuring robust and reliable software deployment for multi-robot system.

Autonomous Pick and Place Robot ([Demo](#))

- Constructed an autonomous robot to pick and place 9 randomly placed color-coded blocks, achieving 80% success in precise goal placement.
- Formulated a real-time color detection system using Pi Camera and integrated A* path planning for accurate block retrieval and placement.
- Engineered PID control for precise navigation, integrating IMU and encoder data with reliable obstacle avoidance using ultrasonic sensors.

SKILLS

Programming: Python, C/C++, MATLAB/Simulink, Multi-Threading, Data Structures, Algorithms, Unit Testing, PLC Ladder Logic
Software Tools: ROS/ROS2, Rviz, Gazebo, MoveIt, NAV2, Solidworks, PTC Creo, Fusion 360, MS Office, Docker
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, Problem Solving, Critical Thinking

PATENTS AND PUBLICATIONS

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- **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)

ADDITIONAL RELEVANT EXPERIENCE

Graduate Teaching Assistant | University of Maryland Aug 2023 – May 2024

- Mentored 95+ graduate students in Computer Vision concepts, including image processing, homography, calibration, stereo vision, and optical flow.