TEJAS M. BHADE

Buffalo, NY | tejasmuk@buffalo.edu | +1-7165417576 | Linkedin | Github
Robotics and AI engineer with expertise in developing and deploying AI models, product design, and autonomous systems

Education

Master of Science - Robotics and Computer Science *Expected: Dec 2025*
University at Buffalo, The State University of New York, NY
Coursework: Deep Learning, Reinforcement Learning, Control Systems, Computer Vision, Robotics Algorithms

Bachelor of Engineering – Mechanical Engineering *August 2017 - June 2021*
University of Mumbai, India

Skills

Languages: Python, C++, C#, C, R, MATLAB/Simulink, SQL, JavaScript
Robotics: ROS2, MoveIt, URDF, Nav2, SLAM, Path planning, ADAS, Gazebo, Foxglove, Kalman Filter, Sensor Fusion
Computer Vision: OpenCV, NeRF, 3D Reconstruction, Diffusion, Object Detection, 3D Geometry, ONNX, AR
Machine Learning: PyTorch, MLOps, LLM, Transformers, TensorFlow, CUDA, CNN, OpenAI Gym, Isaac Sim
DevOps: Docker, Linux, Git, AWS, Azure
CAD and FEA: PTC Creo, Solidworks, CATIA, AutoCAD, Siemens NX, ANSYS Fluent, Hyperworks, PTC Windchill

Experience

Robotics Researcher, DRONES Lab May 2025 – Present

- Contributed to the Localization, Navigation, and Control stack for an autonomous excavator funded by MOOG Inc., including recording ROS bags for the analysis of Safety Nodes and motion planning algorithms.
- Integrated Nvidia Orin Jetsons with ROS2 for the control architecture of an autonomous excavation platform, ensuring seamless hardware-software interaction.
- Incorporated and streamlined a ROS topics data acquisition pipeline to record lossless published topics such as position and velocity from IMU, pressure values, CAN messages, and FLIR camera messages.
- Converted several ROS2 bag datasets to MCAP format to compress the space used, resulting in better data visualization and analysis on Foxglove Studio.
- Developed a robust April Tag detection and real-time angle and pose estimation pipeline by leveraging OpenCV and a multi-layer perceptron, efficiently correlating inclinometer readings with ground truth values using deep learning.

Student Researcher, Jun Liu Lab Dec 2024 - May 2025

- Engineered a slip detection and mitigation algorithm using a two-finger gripper setup, enhancing grasp stability and precision in robotic manipulation tasks.
- Integrated NI-DAQ and Arduino with Dynamixel servos and a tactile sensor array to create a robust data acquisition pipeline—enabling high-resolution, real-time sensor feedback for robotic control experiments.
- Designed a machine learning workflow to classify tactile sensor data, aiming to predict user-induced actions—advancing robotic perception capabilities.

Design Engineer, Blue Star Ltd. – Mumbai, India June 2022 – Aug 2024

- Revamped Product design of Packaged Air Conditioning System by creating 3D CAD model assembly using CATIA, detailed drawings of parts, subassemblies and unit assembly using GD&T to reduce the overall manufacturing cost by 30%.
- Facilitated cross-functional DFM (Design for Manufacturing) reviews by working with Electrical, Manufacturing, Production, R&D, and Supply Chain teams to improve manufacturability and sustainability of product updates, utilizing SolidWorks,AutoCAD for detailed drawings, ANSYS, and PTC Windchill.
- Integrated automated inspection tools in the manufacturing process, streamlining defect detection and adhering to industry compliance requirements.
- Engineered and deployed a robotic end-of-line testing and calibration fixture for a new line of high-efficiency, variable-speed HVAC compressor modules, which boosted calibration accuracy by 35% and cut down production testing cycle time by over 60%.

Mechanical Design Intern, Siddhitech Stainless Co. -Pune, India Jan - June 2022

- Engineered and managed over 50 detailed parts and assemblies for stainless-steel drainage products, ensuring compliance with ANSI Y14.5 GD&T standards and maintaining all drawings on an ERP system to meet customer and manufacturing requirements.
- Designed and fabricated more than five progressive tool die sets for forming operations on SS sheets, utilizing Rapid

prototyping, lathe, milling, and drilling machines.

- Prototyped Medi-kits using 3D printing for demonstration, leading to the successful manufacture of robust final products.
- Supported the design and modeling of components utilizing casting, stamping, and sheet metal processes, translating conceptual requirements into SolidWorks CAD models while maintaining compliance with manufacturing standards.

Graduate Engineer Trainee, OWTSS Pvt. Ltd. - Mumbai, India Oct 2021 - Jan 2022

- Formulated and implemented CNC programs for precision threading cycles, adhering to API 7-1/7-2 standards for down-hole tool manufacturing.
- Developed and drafted 10+ specialized horizontal drilling tools adhering to API 7-1 and 7-2 standards, boosting client satisfaction by 15%. From scratch developed Barrel Reamers of different sizes from Prototype to Pilot phase.
- Managed safe delivery and successful deployment of the reamers on drilling sites. Implemented quality control and procurement measures that improved factory production compliance by 25%, reducing defect rates to below 5%.
- Guided quality inspections in the Machine shop, ensuring 99% on-time delivery of API-standard products.

Projects

AI-Powered Inverted Pendulum Balancing with Reinforcement Learning on Isaac Sim

- The project involved creating a detailed 3D model of an inverted pendulum system, including the cart, pole, and base, within the Isaac Sim environment.
- Realistic physics and dynamics were implemented for the system, encompassing gravity, friction, and joint constraints, to accurately simulate the behavior of a real-world inverted pendulum.

SLAM based mapping and cost-map generation

- Engineered a LiDAR-based SLAM mapping system utilizing FAST-LIO2, achieving real-time point cloud mapping with a 95% accuracy in obstacle detection, and enabling autonomous navigation.
- Designed a cost-mapping algorithm that converted 3D point clouds into 2D occupancy grids using elevation gradient analysis, normalized cost thresholds to enable path planning for autonomous navigation.

Skin Cancer Detection and Classification

- Constructed a convolutional neural network pipeline for skin cancer detection and classification using the HAM10000 dataset
- Incorporating advanced data augmentation and hyperparameter tuning to enhance model accuracy leveraging PyTorch and OpenCV.

Barrel Reamers and HDD tools

- Innovated comprehensive documentation to standardize manufacturing and assembly processes for reamer and HDD tools. Standardized reamer and HDD tool construction to improve process repeatability.
- Enhanced quality control through the implementation of standardized manufacturing and assembly documentation.

Adaptive Cruise Control Using CBF-CLF-QP

- Conduct research on simulating control algorithms for adaptive cruise control systems using CBF-CLF based QPs.
- Developed a new control strategy to prevent infeasible states generated by Control Barrier Functions.

Autonomous Navigation System using RRT Path Planning

- Implemented Rapidly-Exploring Random Trees (RRT) algorithm within ROS and Gazebo, enabling TurtleBot3 navigation through intricate simulated environments and achieving a high rate of collision-free path planning.

Stereo Visual Odometry

- Utilized the KITTI dataset to estimate robot motion by implementing visual odometry techniques and RANSAC algorithm, enabling accurate trajectory reconstruction with OpenCV. Visualized the trajectory on Rviz to verify the path followed by Robot.

Achievements and Publications

- Published and Presented the research on 'Multipurpose Smart-Bin', leading to recognition as the Young Social Innovator Award 2019-20 by Rotary Club.
- Research paper on - Design and Fabrication of - 'Rice Transplantation Machine'. Won an award Best Paper for Technical Paper Presentation 2019-20