

DEVESH DATWANI

Portfolio: <http://www.deveshdatwani.com>

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EDUCATION

- **Worcester Polytechnic Institute** Worcester, MA, USA
Master of Science, Robotics Engineering August 2021 - May 2023
Courses: Computer Vision, Artificial Intelligence, Machine Learning, Human Robot Interaction, Robot Control
- **University of Mumbai** Mumbai, India
Bachelor of Engineering, Mechanical Engineering January 2014 - March 2018
Notable Achievement: Young Innovator Award at ICASTe Conference for exemplary work on Plasma Actuators

SKILL SET

Focus: Classical Computer Vision, Deep Learning, Image Segmentation, Object Detection, Localization, SLAM

Programming Languages: Python, C, C++, C#, MATLAB

Libraries / Frameworks: ROS, PyTorch, OpenCV, TensorFlow, Keras, Scikit-Learn, Numpy, STL, Django, Flask

Tools: Git, AWS, Linux, Unity, SQLite3, Mobile Manipulator, Arduino, Raspberry Pi, Aerial Vehicles

PROFESSIONAL EXPERIENCE

- **Human Inspired Robotics Lab, Worcester Polytechnic Institute** Remote, USA
Lab Assistant June 2023 - Present
 - Modifying existing graphical user interface to improve human-robot interaction in Unity simulator with C#
 - Incorporating augmented reality (AR) features to aid teleoperative navigation & manipulation assistance
 - Extending research on improving human-robot collaboration pertaining to mobile manipulator nursing robots
- **WPI - Worcester Fire Department - Github** Worcester, MA, USA
Capstone Experience Project Member August 2022 - December 2022
 - Engaged with the Worcester Fire Department to identify firefighting challenges & their solutions in robotics domain
 - Developed a scalable solution based on differential drive robots with a novel approach to evaluate real time fire safety
 - Devised a fire safety metric for homes by evaluating harmonic means of path lengths & obstacle proximity to fire exits
 - Integrated a navigation stack for autonomous motion planning & validated accurate localization with particle filter
 - Implemented change detection algorithm with PCA & K-Means clustering to detect & localize obstacles with LiDARs
 - Implemented the informed RRT* algorithm for finding average path lengths to nearest fire exits on buildings floors
 - Built a finite state machine to automate task scheduling & tested the system to evaluate fire safety of apartments
- **Admatazz** Mumbai, India
Data Analyst December 2019 - December 2020
 - Worked in the data specialist team to improve marketing strategies through data acquisition & interpretation
 - Built web applications for business lead generation with the Django web framework hosted on AWS EC2 servers
 - Built a Twitter trends visualizer for seamless real time news & trends access through an interactive web application
 - Implemented unsupervised clustering algorithms for customer segmentation for informed & data-driven advertising
 - Built crawling tools for real time lead acquisition from social media platforms like Reddit, JustDial & Product Hunt

LAB EXPERIENCE

- **Human Inspired Robotics Lab - Github** Worcester Polytechnic Institute, Worcester
Graduate Student Researcher January 2023 - May 2023
 - Working with Dr Li on human robot interaction in assisted autonomy of dexterous manipulation by nursing robots
 - Identifying autonomy failures & building robot interface that enhances operator spatial awareness through cameras
 - Conducting user studies to compare interfaces for effective navigation of a Gopher nursing bot in Unity simulator
- **Popovic Labs** Worcester Polytechnic Institute, Worcester
Graduate Student Researcher January 2023 - Present
 - Represented Worcester Polytechnic Institute in a team of 15 students at the NASA Big Idea Challenge 2022
 - Brainstormed terrain challenges on Martian surface & fabricated an 'OTM' mechanism to build a light-weight rover
 - Wrote complementary & extended Kalman filters with Runge-Kutta method in C++ for robust attitude estimation
- **Propulsion Lab - Doc** Indian Institute of Technology & University of Mumbai
Undergraduate Thesis - Patent Application: 201921038313 August 2017 - May 2018
 - Designed a research project on plasma actuators for airflow induction without conventional devices under Prof Bodi
 - Constructed a novel actuator design for airflow induction in hollow pipes powered by high voltage AC transformers
 - Compared voltage magnitudes & frequencies with flow velocities & observed maximum airflow of 9000 litres / hr

ACADEMIC PROJECTS

- **Deep Image Segmentation With Attention- Github** Worcester Polytechnic Institute
Computer Vision March 2023 - April 2023
 - Developed a U-Net model with attention mechanism for semantic segmentation of medical images on Kvasir dataset
 - Implemented the training pipeline & conducted hyper-parameter tuning to achieve a Dice coefficient of 0.87 on test set
 - Demonstrated 2.3% improvement in the Dice mean coefficient with attention mechanisms for clinical applications
- **Vision Based Teleoperation Study - Github** Worcester Polytechnic Institute
Human Robot Interaction September 2022 - December 2022
 - Conducted user study to compare hand gestures and joysticks for mobile robot teleoperation in Gazebo environment
 - Integrated Media Pipe's pipeline with ROS & Gazebo framework to estimate hand pose with multiview bootstrapping
 - Observed 53% higher user control efficiency with joystick teleoperation in a custom scratch-built obstacle course
- **Classical and Deep Image Stitching - Github** Worcester Polytechnic Institute
Computer Vision August 2022 - October 2022
 - Wrote Python scripts to build panoramas with Harris corner detection, Adaptive Non Max Suppression & RANSAC
 - Synthesized data samples by transforming COCO dataset images & finding their closed form solutions in OpenCV
 - Built HomographyNet from scratch in PyTorch & validated Spatial Transformer Network for homography estimation
- **Structure From Motion / SLAM - Github** Worcester Polytechnic Institute
Computer Vision August 2022 - October 2022
 - Optimized non-linear geometric projection with Zhang's camera calibration method
 - Constructed a 3D structure from images of different views of WPI's Unity Hall through epipolar geometry principles
 - Wrote non-linear triangulation, PnP & bundle adjustment scripts in Python to build 3D structures from 2D images
- **Deep Pose Estimation - Github** Worcester Polytechnic Institute
Artificial Intelligence March 2022 - May 2022
 - Implemented the Deep Pose paper from scratch to estimate human body pose in 2 dimensional space with TensorFlow
 - Built a deep learning regressor with AlexNet as the base network and trained it on FLIC dataset on Google Colab
 - Observed 12% decrease in MSE by cascading the network through interest region cropping & key-point normalization
- **Optimizing Mask R-CNN For Traffic Sign Detection - Github** Worcester Polytechnic Institute
Machine Learning September 2021 - December 2021
 - Experimented with the Mask R-CNN model to optimize it for traffic sign detection in harsh weather conditions
 - Trained the model on an augmented traffic sign dataset sampled by synthesizing motion blur, rain & dew effects
 - Observed a 15% increase in mAP scores by optimizing the model with sample redistribution & annotation correction

PERSONAL PROJECTS

- **Aerial Vehicle Design and Autonomy - Doc** Mumbai, India
Personal Project May 2011 - February 2019
 - Designed fabricated & flight tested scaled fixed wing aircraft & quad-copters to satiate passion for aviation
 - Constructed fixed wing aircraft powered by one of the smallest internal combustion engines in production
 - Implemented PD controller in C++ on Arduino microcontroller to enable cruising autonomy for fixed wing aircraft
 - Built aerial vehicles with carbon fiber, composites, balsa wood & 3D printed parts for light-weight durable airframes
 - Gained hands-on experience in building aerial vehicles after 15+ successful aircraft designs & tests