

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

- **Programming Languages:** Python, C, C++, MATLAB
- **Libraries / Frameworks:** ROS, PyTorch, OpenCV, TensorFlow, Keras, Scikit-Learn, Numpy, STL, Django, Flask
- **Tools:** Git, AWS, Linux, SQLite3
- **Career Interest:** Computer Vision, Deep Learning, Robot Perception

PROFESSIONAL EXPERIENCE

- **Worcester Polytechnic Institute** Worcester, MA, USA
Graduate Assistant August 2022 - Present
Graduate assistant to director of MBA program at Worcester Polytechnic Institute Sandra Wellinghoff
Consulting business owners in Central Massachusetts with digitization through website & social handle creations
Building small business initiative dashboard for seamless data access and analysis with the Microsoft office stack
- **WPI - Worcester Fire Department - Github** Worcester, MA, USA
Capstone Experience Project Member August 2022 - December 2022
Engaged with Chief of Worcester Fire Department to identify firefighting challenges and solutions in robotics domain
Developed a scalable mobile robot solution with a novel approach to evaluate real time fire safety of homes
Integrated a navigation stack for autonomous motion planning and validated accurate localization with particle filter
Implemented change detection algorithm with PCA & K-Means clustering to detect & localize obstacles with LiDAR
Implemented the probabilistically complete informed RRT* algorithm for finding average path lengths to nearest exits
Devised a fire safety metric for homes by evaluating harmonic means of path lengths & obstacle proximity to fire exits
Built a finite state machine to automate task scheduling and 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 and interpretation
Built web applications for business lead generation with the Django framework hosted on AWS EC2 servers
Built a Twitter trends visualizer for seamless real time news and trends access through an interactive web application
Implemented unsupervised clustering algorithms for customer segmentation for informed and targeted advertising
Built web crawling tools for real time lead acquisition from social media platforms like Reddit and Product Hunt

LAB EXPERIENCE

- **Human Inspired Robots Lab** Worcester Polytechnic Institute, Worcester
Graduate Student Researcher January 2023 - Present
Assisting in research for human-assisted robot autonomy for dexterous mobile manipulation in Unity engine
Developing communication stack for robot to provide appropriate camera viewpoint with AR visual cues to humans
Exploring self-supervised and reinforcement methods for online learning of perception tasks such as object detection
- **Surface Meteorology Lab** Worcester Polytechnic Institute, Worcester
Graduate Student Researcher January 2022 - March 2022
Carried out multi-scale analysis at different tessellation scales on cloud points obtained with 3D microscopic imaging
Contributed to the lab software by adding functionalities to enable polynomial regression with Python and PyQt
- **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 with the team and designed a robot to tackle Martian craters
Integrated 9 axis IMU sensor with the robot for and wrote complementary filter in C++ for attitude estimation
- **Propulsion Lab, Aerospace Department - Doc** Indian Institute of Technology, Mumbai
Undergraduate Thesis August 2017 - May 2018
Patent Application: 201921038313
Designed a research project on plasma actuators for airflow induction without using any conventional devices
Constructed a novel actuator design for airflow induction in hollow pipes with PVC as the dielectric medium
Conducted induction experiments with high-voltage high-frequency transformers at Indian Institute of Technology
Compared voltage magnitude and frequency with flow induction and observed maximum airflow of 9000 litres / hr

ACADEMIC PROJECTS

- **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
Implemented a deep learning pipeline to estimate hand key-points with Media-Pipe's multi-view bootstrapping model
Integrated the estimator pipeline with ROS and mapped hand poses with twist commands for manual robot control
- **Image Stitching With Classical and Deep Learning Methods - Github** Worcester Polytechnic Institute
Computer Vision August 2022 - October 2022
Wrote Python scripts to build panoramas with Harris Corners detection, Adaptive Non Max Suppression, RANSAC
Synthesized data samples by transforming COCO dataset images and 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
- **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 and dew effects
Observed a 15% increase in mAP scores by optimizing the model with sample redistribution and annotation correction
- **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 VGG-16 as the base network and trained it on FLIC dataset on Google Colab
Observed 12% decrease in MSE by cascading the network by cropping interest regions and normalizing key-points
- **Aerial Vehicle Navigation - Github** Worcester Polytechnic Institute
Unmanned Aerial Vehicles October 2022 - December 2022
Built components of the navigation stack for small unmanned aerial vehicle in MATLAB
Implemented an extended Kalman filter for robust attitude estimation in quaternions using Runge-Kutta method

PERSONAL PROJECT

- **Aerial Vehicle Design and Autonomy - Doc** Mumbai, India
Personal Project May 2011 - February 2019
Designed fabricated and flight tested scaled fixed wing aircraft and 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 with C++ and Arduino to enable cruise control autonomy for fixed wing aircraft
Experimented with carbon fibre, composites, balsa wood and 3D printed parts to build light weight durable air frames
Gained hands on experience in building aerial vehicles after 15+ successful aircraft designs and testing