DEVESH DATWANI

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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
  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 Alex Net 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-Kuetta 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