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, Gropher Bot, Arduino, Raspberry Pi, Aerial Vehicles
Career Focus: Computer Vision, Deep Learning, Robot Perception

Lab Experience

- **Human Inspired Robots Lab - Github** — Worcester Polytechnic Institute, Worcester
  Graduate Student Researcher — *January 2023 - Present*
  - 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

- **Surface Meteorology Lab** — Worcester Polytechnic Institute, Worcester
  Graduate Student Researcher — *January 2022 - March 2022*
  - Contributed in building multi-scale analysis pipeline to predict material surface friction with Prof Christopher Brown
  - Implemented polynomial regression on cloud point metadata obtained with 3D microscopes for predictive analysis

- **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

Professional Experience

- **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

- **Air India Engineering Services** — Mumbai, India
  Intern Trainee — *June 2017 - July 2017*
  - Interned at the engine department & partook in the major overhaul of CFM-56B high bypass turbofan engines

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 precise semantic segmentation of medical images
  - Implemented transfer learning & conducted hyper-parameter tuning to achieve a Jaccard Index of 0.92 on the test set
  - Demonstrated significant improvement in segmentation accuracy 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