

# DEVESH DATWANI

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

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## EDUCATION

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- **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

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**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

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- **Human Inspired Robots Lab - Github** Worcester Polytechnic Institute, Worcester  
*Graduate Student Researcher* January 2023 - Present
  - Assisting Dr Li's research on assisted autonomy of dexterous mobile nursing robots in hospital environment
  - Identifying autonomy failures & developing AR cues for effective manipulation & navigation with human assistance
- **Surface Meteorology Lab** Worcester Polytechnic Institute, Worcester  
*Graduate Student Researcher* January 2022 - March 2022
  - Contributed in building multi-scale analysis pipeline to predict surface friction with Prof Christopher Brown
  - Implemented polynomial regression on cloud point metadata obtained by 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 with the team and designed a robot to tackle Martian craters
  - Wrote complementary & extended Kalman filter 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

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- **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 & targeted 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
  - Assisted in the analysis & cause identification of high-pressure turbine blade damage that costed the airline \$720,000

## ACADEMIC PROJECTS

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- **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 build obstacle course
- **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 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 VGG-16 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 PROJECT

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- **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