# DEVESH DATWANI

Email: dbdatwani@wpi.edu
Mobile: +1-978-809-5026
Portfolio: http://www.deveshdatwani.com
Github: https://github.com/deveshdatwani
LinkedIn: https://www.linkedin.com/in/deveshdatwani/

## 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
- **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 which costed the airline $720,000

## Lab Experience

- **Human Inspired Robots Lab - Github** — Worcester Polytechnic Institute, Worcester
  *Graduate Student Researcher* — *January 2023 - Present*
  Assisting in research for assisted-autonomy for dexterous mobile manipulation of nursing robots in the Unity engine
  Modifying navigation & manipulation pipelines to accommodate for dynamic obstacles & workspace constraints
  Exploring self-supervised & reinforcement methods for online learning & example mining for perception tasks
- **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 & wrote complementary low pass 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 & 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 & 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 & testing