

# Devesh Datwani

Portfolio: <https://deveshdatwani.com>

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## EDUCATION

- **Worcester Polytechnic Institute** Worcester, USA  
*Masters of Science - Robotics Engineering* Aug 2021 - May 2023  
*Courses:* Machine Learning, Computer Vision, Robot Dynamics, Artificial Intelligence, Robot Control, AI for Autonomous Vehicles
- **University of Mumbai** Mumbai, India  
*Bachelor of Engineering - Mechanical Engineering* Aug 2014 - May 2018  
*Awards:* Young innovator and best thesis award for exemplary research demonstrations of plasma actuators

## SKILLS SUMMARY

- **Focus:** Computer Vision, Deep Learning, Image Segmentation, Object Detection, SLAM, Augmented Reality
- **Languages:** Python, C, C++, C#. MATLAB
- **Libraries:** PyTorch, OpenCV, Scikit, Keras, TensorFlow, STL, Django, Flask, Numpy, PCL
- **Tools:** ROS, Linux, Docker, Git, PostgreSQL, SQLite

## EXPERIENCE

- **Human Inspired Robotics Lab, WPI** Worcester, USA  
*Research Assistant* Jan 2023 - Jul 2023  
Conducted extensive research to improve human-robot collaboration for 7-DOF Kinova-armed mobile manipulator  
Built an interactive interface for task level grasping & motion commands through ROS-Unity TCP bridge  
Developed augmented reality features in Unity engine with C# that assist shared-control robot teleoperation  
Demonstrated effectiveness of AR cues during teleoperation with 33% reduction in human errors in user studies
- **Worcester Fire Department & WPI** Worcester, USA  
*Graduate Student Researcher* Aug 2022 - Dec 2022  
Devised a fire exit safety evaluation system based on Roomba robots in consultation with Worcester Fire Department  
Integrated software stack for SLAM in indoor environments with LDS-01 LIDAR, ICP registration & particle filters  
Implemented change detection algorithm with PCA & K-Means clustering to localize objects in robot-generated maps  
Devised & integrated a hierarchical state machine with SMACH package to automate navigation & mapping tasks  
Simulated the system in ROS & Gazebo environment & demonstrated applications to 350,000+ fires in USA annually
- **Popovic Labs, WPI** Worcester, USA  
*Graduate Student Researcher* Sep 2021 - Jan 2022  
Represented WPI in a team of 15 students at the NASA Big Idea Challenge & built a robot for Martian surface  
Wrote complementary & extended Kalman filters with Runge-Kutta method in C++ for robot attitude estimation
- **Admatazz** Mumbai, India  
*Data Analyst* Dec 2019 - Dec 2020  
Built web applications for business lead generation with the Django web framework hosted on AWS EC2 servers  
Implemented unsupervised clustering algorithms for customer segmentation for informed & data-driven advertising  
Developed re-marketing tools by deploying object detection deep learning models to analyze customer behavior  
Built back-end application for real time lead acquisition from social media platforms like Reddit & Product Hunt

## PROJECTS

- **Deep Image Segmentation With Attention - Github:**  
Developed the U-Net model with attention mechanism for semantic segmentation of Kvasir dataset with PyTorch  
Implemented training pipelines & validated 2.3% improvement in the Dice mean coefficient with attention mechanisms
- **Classical and Deep Image Stitching - Github:**  
Developed Python scripts to create panoramas with Harris corner detection, non-max suppression & RANSAC with OpenCV  
Built HomographyNet from scratch in PyTorch & validated Spatial Transformer Network for homography estimation
- **Deep Pose Estimation - Github:**  
Implemented the Deep Pose paper from scratch to estimate human body pose in 2 dimensional space with TensorFlow  
Observed 12% decrease in MSE by cascading the network through interest region cropping & key-point normalization
- **Object Detection Model Optimization - Github:**  
Fine-tuned a pretrained mask-rcnn on Tencent traffic sign dataset sampled by synthesizing motion blur, rain & dew effects  
Observed 15% increase in mAP scores through sample redistribution & annotation correction during training
- **Structure From Motion / SLAM - Github:**  
Calibrated a Samsung S22 with Zhang's method & constructed a 3D cloud point of a scene from 2D monocular images  
Implemented Python pipelines for camera pose estimation, non-linear optimization, triangulation, PnP & bundle adjustment
- **Plasma Actuators - Link:**  
Constructed a novel design for plasma-induced wall-bounded jet actuators inside hollow pipes using high-voltage transformers  
Conducted experiments at aerospace facility of IIT & measured 9000 litres/hr airflow without using conventional devices