

Experience

Dematic, Kion Mobile Automation

Machine Learning Engineer

Holland, MI
Sept 2020 – Present

- Developing a robust SLAM algorithm testing pipeline using ROS, Gazebo and Rviz.
- Creating Occupancy Grids for 2D and 3D Lidar sensors using Gmapping, Octomap and Cartographer.
- Evaluating the use of Visual Inertial Odometry and GraphSLAM to improve AGV navigation in warehouse environments.

Stony Brook University

Research Assistant

Stony Brook, NY
May 2017 – Aug 2020

- Developed a Computational Framework for Data-Driven Mechanism Design Innovation supported by a \$450K NSF grant.
- Designed algorithms for simulation and synthesis of Planar, Spherical, and Spatial single-degree-of-freedom Robotic systems resulting in multiple publications in journals by the American Society of Mechanical Engineers.
- Created [MotionGen](#) a web-based mechanism design framework. Uses MEAN (MongoDB, Express.js, Angular.js, Node.js) stack to create a RESTful web service based on MVC architecture. iOS and Android apps created using Apache Cordova framework.
- In-charge of Computer-Aided Design and Innovation Lab and collaborating with a research group of 10+ graduate students.

Teaching Assistant

Aug 2016 – Apr 2017

- Developed [SnappyXO](#), a laser-cut design-driven robotics platform that enables designing mechanisms, structures, and robots. It has successfully raised \$16K+ on [Indiegogo](#) for a crowdfunding campaign.
- Advised 250+ students in MEC101-Freshman Design Innovation, MEC 102-Engineering Computing, and Vertically Integrated Projects(VIP) Program. The Robot Design projects gained recognition from the Office of President at university.

Education

Stony Brook University

Ph.D., Mechanical (Concentration: Design and Robotics, Minor: Applied Mathematics), GPA 3.95

Stony Brook, NY
Aug 2015 – Aug 2020

- **Relevant Courses:** Robotics, Advanced Dynamics, Vibration and Control, Kinematic Analysis and Synthesis, Applied Stress Analysis, Product Design Optimization, Geometric Modeling, Analysis of Algorithms

Udacity, School of Autonomous Systems

Self Driving Car Engineer Nanodegree

Mountain View, CA
Mar 2019 – Mar 2020

- **Relevant Areas:** Computer Vision, Deep Learning, Sensor Fusion, Localization, Planning, Control, System Integration

Relevant Projects

Self Driving Car subsystem design and integration

Python, Jupyter, OpenCV, TensorFlow, Keras, C++, ROS

Udacity
May 2019 – Aug 2019

- **Detection:** A robust image processing pipeline is created to detect highway lanes in dashcam live-feed.
- **Perception:** Car's position within lane and lane curvature is calculated using perspective transform and polynomial fitting.
- **Classification:** LeNet inspired convolution neural network is developed to detect and classify 40+ kinds of traffic signs.
- **Deep Learning:** Cloned human behavior using an end-to-end neural network to autonomously steer a car using camera input.
- **Sensor Fusion:** Car location is estimated using an extended Kalman filter which acts on LIDAR and RADAR sensors data.
- **Localization:** A 2D particle filter for sparse localization is designed and uses GPS and sensor data with a landmark map.
- **Trajectory Planning:** A Finite State Machine based planner is created to achieve autonomous highway driving with other cars.
- **Control:** A PID controller is implemented to maneuver a vehicle around a virtual track using steering, throttle and brake.
- **System Integration:** Robot Operation System (ROS) is used to robustly combine Perception, Planning, and Control.

Technical Proficiency

- **Languages :** Python, Javascript, C++, MATLAB, Mathematica
- **CAD softwares :** Solidworks, Autodesk Inventor, PTC Creo, CATIA, Ansys (CFD and Mechanical), Autodesk AutoCAD, Autodesk Moldflow, FeatureCAM, MSC-Adams, ZWCAD, Altair HyperMesh, Altair OptiStruct, Materialize Magics, Materialize Mimics, CNC G-M Code
- **Tools & Technologies :** Keras, Tensorflow, OpenCV, HTML, CSS, Canvas, Node.js, Express.js, Redis, Apache Cordova, OpenGL, Jupyter, Anaconda, Git, npm, MongoDB, Docker, ROS

Selected Publications

- Sharma S., Purwar A.; **Path Synthesis of Defect-Free Spatial 5-SS Mechanisms Using Machine Learning.**, ASME IDETC-CIE2020; doi:10.1115/DETC2020-22731
- Sharma S., Purwar A.; **Unified Motion Synthesis of Spatial Seven-Bar Platform Mechanisms and Planar-Four Bar Mechanisms.**, ASME IDETC-CIE2020; doi:10.1115/DETC2020-22718
- Sharma S., Purwar A.; **Using a Point-Line-Plane Representation for Unified Simulation of Planar and Spherical Mechanisms**, ASME J. Computing and Information Science in Engineering; doi:10.1115/1.4046817
- Sharma S., Purwar A., Ge Q.J.; **A Motion Synthesis Approach to Solving Alt-Burmester Problem by Exploiting Fourier Descriptor Relationship Between Path and Orientation.**, ASME J. Mechanisms Robotics; doi:10.1115/1.4042054
- Sharma S., Purwar A., Ge Q.J.; **An Optimal Parametrization Scheme for Path Generation Using Fourier Descriptors for Four-Bar Mechanism Synthesis.**, ASME J. Computing and Information Science in Engineering; doi:10.1115/1.4041566