Akshay Kumar

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EDUCATION

Worcester Polytechnic Institute - MS in Robotics Engineering, May 2019, GPA: 3.93/4.0
- **Relevant Coursework** - Robot Dynamics, Robot Control, Artificial Intelligence, Deep Learning for Advanced Robot Perception, Deep Reinforcement Learning, Foundations of Robotics (Probabilistic Robotics)

MNIT Jaipur - B Tech. in Electrical Engineering, May 2017, GPA: 8.25/10.0
- **Relevant Coursework** - Control System Engineering, Modern Control Theory, Computer Architecture and Organisation

Coursera Self-Driving Cars Specialization, January 2020 - Present

EXPERIENCE

Robotics Software Developer- Modbot Inc., July 2019 - Present, San Francisco, US
- Responsible for developing kinesthetic teaching, collaborative safety, motion planning, and kinematics algorithms for modular robots using C++ & Python
- Responsible for all stages of robot feature development - prototyping, hardware verification and production quality code generation in a test driven development setting

Robotics Software Intern - Modbot Inc., June 2018 - April 2019, San Francisco, US
- Developed dynamical models and control, planning, collision detection, and performance enhancement algorithms for modular robots using C++ & Python

Robotics Intern - Swaayatt Robots Pvt. Ltd., May - July 2016, Bhopal, India
- Developed a differential drive-based mobile robot with a 6-DOF serial manipulator for indoor navigation applications

SKILLS

- **Languages** - C++, Python, MATLAB
- **Softwares** - ROS, SolidWorks, Gazebo, V-REP
- **Libraries & Packages** - KDL, FCL, Conda, TensorFlow, MoveIt, NumPy, Keras, CUDA, OMPL, Eigen, Ipopt, SBPL, GTest
- **Hardware** - TurtleBot, Jetson Nano, Arduino, Raspberry Pi, Atmega 328/2560, NodeMCU, YDLiDAR, Intel RealSense D435i
- **Interests** - Robot Control, Manipulation, Motion Planning, Mobile Robotics, Computer Vision, Deep Learning

SELECTED PROJECT WORK

Autonomous navigation for holonomic drive robot, Jan 2020 - Present
- Developed a 4-wheel mecanum drive robot powered by a Jetson Nano with IMU, LiDAR and camera for onboard sensing
- Implemented ROS nodes for serial communication with Arduino for motor control, simulation in Gazebo and teleoperation
- Implementing ROS navigation pipeline with SBPL-based ARA* global planner and timed-elastic-band local planner

Control methods for autonomous robot navigation, Dec 2019 - Present
- Developed a library with model predictive, PID, and pure-pursuit controllers configurable for ackerman, differential, and holonomic drive robots using C++
- Tested MPC and PID controllers on the Udacity Car Simulator

Visual odometry estimation using deep learning, Aug 2018 - Dec 2018, WPI (URL)
- Developed a vehicle pose estimation pipeline using Deep CNN + LSTM networks on the KITTI dataset

Motion Planning for 15-DOF dual-arm robot, Aug 2017 - April 2018, WPI (URL)
- Developed vision-guided motion planning solutions for two 7-DOF robot arms using OMPL library in ROS MoveIt (in simulation and on actual robot)

Fuzzy Logic Controller for indoor robot navigation, Feb 2018 - April 2018, WPI (URL)
- Developed a FLC- based autonomous navigation pipeline for the TurtleBot2 robot in a map-denied environment
- Implemented goal tracking and obstacle avoidance FLCs using Kinect generated Point Cloud data in Gazebo

Collaborative task planning using reinforcement learning, Aug 2017 - Dec 2017, WPI (URL)
- Implemented object transfer between two 5-DOF manipulators using Deep Q-Learning with Keras & Tensorflow in V-REP simulation environment

PUBLICATIONS

- **Kumar, Akshay** , et al. "Hardware in the loop based simulation of a robotic system with real time control and animation of working model" 2017 International Conference on Inventive Systems and Control (ICISC)", IEEE 2017.   URL

- **Kumar, Akshay** , et al. "Joint Angle measurement for biped robot orientation estimation using MEMs based inertial sensors" 2nd IEEE International Conference on Electronics, Communication and Aerospace Technology (ICECA 2018)   URL