

# ROHAN KHAIRE

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## TECHNICAL SKILLS

Programming Languages: C++, Python, Matlab & Simulink,

Libraries/Framework: ROS, ROS2, PCL, Lanelet2, TensorFlow-Lite, TensorFlow, PyTorch, CUDA, OpenCV, Gym, Eigen.

Tools: CMake, GTest, Git, Docker, Linux, CARLA, Gazebo, Valgrind, GDB, CI/CD.

## PROFESSIONAL EXPERIENCE

### Graduate Service Assistant

**Battery Electric and Intelligent Vehicle, ASU**   📅 11/2023 - Present

- Lead the development of Digital twin and Augmented Reality of Lab's autonomous vehicle.
- Developed a ROS2 based bridge to integrate Carla with Autoware.Universe's software stack.
- Implemented HDL-graph SLAM to generate point cloud map of ASU's campus.
- Established and maintained version control of the stack over GitHub.
- Performed on-road autonomous vehicle testing to validate self-designed improvements to the stack.

### Robotics Software Engineer

**Conigital Group**   📅 06/2021 - 07/2022

- Designed an artificial potential field like cost function for hybrid A\* algorithm for reliably maneuvering around static obstacles.
- Programmed a Linear Model Predictive Controller with error dynamics for lateral control of an AGV rendering up to 2 cm tracking accuracy.
- Crafted a geometric algorithm for safe maneuver of an autonomous vehicle on road intersections around traffic.
- Developed a localization module based on iterative closest point and lane detection for regions with sparse point clouds.
- Managed communication between two overseas teams to deliver software solutions.

### Junior Robotics Software Engineer

**Conigital Group**   📅 03/2021 - 06/2021

- Accelerated project delivery through resolving ROS related issues and providing ROS visualization tools.
- Reverse Engineered and validated Autoware.Ai's software stack on Carla simulator.
- Integrated custom vehicle and assets in Carla simulator to enhance showcasing of product demos.

## RESEARCH EXPERIENCE

### Master's Opportunity for Research in Engineering

**Arizona State University**   📅 05/2023 - Present

[https://github.com/rohanNkhair/ADAS\\_class8\\_trucks](https://github.com/rohanNkhair/ADAS_class8_trucks)

- Performed Crash tests for class 8 long haul trucks on HVE simulator to validate the need for ADAS.
- Identified and tested C-code based Non-Linear Model Predictive Control optimization tools for real-time performance in Matlab/Simulink.
- Implemented pure pursuit and NMPC based solutions to enable ADAS for class 8 trucks.
- Performed Software-in-the-Loop tests with CarSim to validate ADAS algorithms.

## EDUCATION

### MS in Robotics and Autonomous Systems

**Arizona State University**   📅 08/2022 - Present

### B.Tech in Mechanical Engineering

**Pune University**   📅 05/2015 - 06/2019

## PROJECTS

### CUDA accelerated point cloud processing

[https://github.com/rohanNkhair/SimplyAutonomous\\_stack/tree/main/sensing/pointcloud\\_preprocessor\\_gpu](https://github.com/rohanNkhair/SimplyAutonomous_stack/tree/main/sensing/pointcloud_preprocessor_gpu)

Skills used- CUDA, C++, PCL, ROS2

- Implemented cropbox filter using CUDA-C++ to increase data transfer efficiency by 10%.

### Optimization based Path Tracking Controller

[https://github.com/rohanNkhair/SimplyAutonomous\\_stack/tree/main/control/nmpc\\_path\\_tracker](https://github.com/rohanNkhair/SimplyAutonomous_stack/tree/main/control/nmpc_path_tracker)

Skills Used- C++, ROS2, Carla, acados

- Designed a Non-linear Model Predictive Controller for path tracking.
- Incorporated dynamic bicycle model for improving path tracking accuracy.

### Optimization based Motion Planning

[https://github.com/rohanNkhair/SimplyAutonomous\\_stack/tree/main/planning/mpc\\_planner](https://github.com/rohanNkhair/SimplyAutonomous_stack/tree/main/planning/mpc_planner)

Skills Used- C++, ROS2, Carla, libmpc++, acados

- Programmed a ROS2 plugin to integrate C++20 code in ROS2 nodes.
- Implemented a Non-linear Model Predictive scheme for local planning of an AV.

### End-to-end Reinforcement learning for Autonomous Vehicle

[https://github.com/rohanNkhair/RL\\_SB3\\_carla](https://github.com/rohanNkhair/RL_SB3_carla)

Skills Used- Python, SB3, Gym, Carla.

- Created a Carla environment to use SB3's custom environment template for training an RL agent.
- Increased agent performance through implementation of reward functions for trajectory adherence.

### Digital Twin and Augmented Reality for Autonomous Vehicles

[https://github.com/rohanNkhair/carla\\_autoware/tree/digital\\_twin](https://github.com/rohanNkhair/carla_autoware/tree/digital_twin)

Skills Used- C++, Python, PCL, ROS2, Carla

- Integrated Carla actors into Autoware.Universe's stack, enabling virtual reality experience for real-vehicle.
- Developed Pose transfer script to sync the digital twin and real-vehicle in real-time.

### Driver Monitoring System for Embedded Devices

[https://github.com/rohanNkhair/driver\\_monitoring\\_system](https://github.com/rohanNkhair/driver_monitoring_system)

Skills Used- Python, OpenCV, TensorFlow

- Performed transfer learning to train Convolutional Neural Networks(CNN) to achieve 82% accuracy on alertness of driver.
- Performed inferences using OpenCV's DNN module on TensorFlow's saved model by freezing the Neural Network's graph.