Jayaprakash Harshavardhan

734-489-2654 | jharsh@umich.edu | github.com/harsh01

Education

Univerisity of Michigan, Ann Arbor Aug 2023 - Present
Master of Science in Mechanical Engineering (Concentration - Mechatronics) *GPA - 3.95 / 4.00*

Indian Institute of Technology, Kharagpur Aug 2019 – Apr 2023
Bachelor of Technology (Honours) in Mechanical Engineering *CGPA – 8.65 / 10*

Technical Skills

Languages: C, C++, Python, HTML/CSS, Fortran, MATLAB, Shell scripting
Developer/Technical Tools: ROS2, Git, Docker, Vector CANoe, SolidWorks, Visual Studio, Simulink, SSH, Gstreamer, NXP Design Studio, U-center, Busmaster
Libraries: NumPy, Matplotlib, OpenCV, Flask, Scipy, Casadi, OSM. Evtest, OS, Threading, Cantools, Python-can, pyubx2, paho-mqtt

Experience

Magna International | New Mobility Division Troy, United States
Controls Intern | Last-Mile Delivery Bot Project | Supervisor – Mr Adiel Astudillo *May 2024 - Mar 2025*

- Developed OTA update architecture to maintain latest version in bot's docker containers over cloud managed FMS
- Designed a streaming pipeline to store data/video along with logging architecture and deployed as a Blackbox.
- Developed a ROS2 package to convert CAN signals efficiently into custom ROS messages for sensor integration
- Contributed on Modem configurations, static IP, routing setup and updating API of teleoperations software on bot
- Collaborated with suppliers in India to bring up GNSS service (Ublox module) sending (NMEA,UBX) protocol messages over SPI and publish as corrected (RTCM correction included) custom ROS messages.

LATTICE | Multi Agent Path Finding Ann Arbor, United States
Graduate Researcher | Airport Airside Project | Supervisor - Prof Max Li *Jan 2024 - Apr 2024*

- Developed a weighted matrix representing LAX airport in a graph data structure.
- Integrated an improved CBS algorithm which involves A* at the low level and conflict tree at the high level to create paths for multiple agents moving in graph environment at constant speed.
- Worked on custom time and path constraints to create a realistic simulation of ground traffic flow in LAX airport.

Kanan Park | Electrical Division Pune, India
Mechatronics Intern | Supervisor – Mr Mayank Gandhi *Jun 2023 – Jul 2023*

- Designed and validated code for an autonomous vehicle (differential drive) to follow a curved lane path.
- Using flask, linked the vehicle, via Wi-Fi to a mobile phone for manual control options, as a failsafe.

Academic Projects

Embedded Controls Lab | *C, MATLAB, SIMULINK, NXP Design Studio* Sept 2024 – Dec 2024

- Designed ACC features using Simulink with NXP library (NXP S32K144) and deployed then on a virtual environment with Haptic wheel and potentiometer as control inputs.
- Deployed multiple cars via CAN bus to test ACC response under different scenarios and achieve level 2 autonomy

BotLab | *Python, C++. LCM, Jetson Nano, ssh, OpenCV* Mar 2024 – May 2024

- Constructed an A* path planner and a cascaded PID controller to regulate a differential drive robot's movements.
- Built a complete SLAM system using a 2D LiDAR occupancy-grid mapping and Monte-Carlo localization.

Autonomous Robotic Arm | Armlab | *Python, ROS2, OpenCV, Git* Jan 2024 - Mar 2024

- Developed algorithms for autonomous block stacking/unstacking on a 5-DoF ReactorX200 Robot Arm.
- Implemented block detection system including color/height detection with a Realsense 435i sensor and OpenCV.

Course Projects on Model Predictive Control | *Python, MATLAB, Simulink* Oct 2023 - Apr 2024

- Designed a Non-linear MPC using Ipop solver (Casadi) to simulate vehicle dynamics (steering angle, acceleration as inputs) during overtaking lead vehicle at constant speed, ensuring safe distance.
- Fine-tuned an MPC block on Simulink, for vehicle dynamics in a ACC (Adaptive Cruise Control) model, for maintaining safe distance from lead vehicle.
- Designed and fine-tuned a probabilistic MPC to simulate Quadcopter control, avoiding obstacles with uncertain positions in a forest environment on MATLAB.

TeamKART | FSAE team at Indian Institute of Technology Kharagpur Mar 2020 - May 2022

- Worked in a team of 25 highly motivated students, designing and manufacturing a formula student car, to compete in Formula Bharat (FSAE) competition in India.
- Designed and simulated multiple 2D, and 3D airfoils to achieve maximum lift at low speeds, worked on nose cone
- Mentored aerodynamic TeamKart trainees and coach them technically and monitored their progress.