RISHABH SINGH

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Education

University of Maryland, College Park, MD, USA Aug 2021 – May 2023
Master of Engineering in Robotics, GPA 3.9

Dr. A P J Abdul Kalam Tech University, Ghaziabad, India Jul 2012 – May 2016
Bachelor of Technology in Mechanical Engineering, GPA 7.34/10

Skills

- **Software Skills:** Python, C++, C, MATLAB, ROS, CARLA, OpenCV, ANSYS, Inventor, Simulink
- **Functional Skills:** Vehicle Testing, Design, Robot Kinematics, Solid Mechanics, Product Engineering and Management, Mechatronics, and Control Systems, Path Planning, State Estimation, Computer Vision, Software Development, Git, Linux, Machine Learning, Stochastic Systems, Automation, Multivariate Statistics

Work Experience

Pratt Miller Motorsports Technology and Innovation Group
Simulation Software Engineer (Controls and Dynamics) May. 2021 – Present

- Leading the collaboration initiative between Pratt Miller and the ART IndyCar Autonomous Racing team, helping the ART team develop a high-fidelity vehicle model per Pratt Miller standards.
- Working on software development for vehicle model, controller development, and parameter optimization for Indylight Autonomous Vehicle by coordinating with vehicle dynamic, tire dynamic, and software engineering teams.
- Developed automation using Python for multiple runs of sensitivity analysis of Modelica-based vehicle dynamic experiments. Wrote outputs in the desired database and created HTML plots to analyze system behavior.

University of Maryland, College Park, MD
Teaching Assistant for Control Systems, Vehicle Dynamics, and Mechatronics Aug. 2021 – Dec 2023

- Held weekly office hours to resolve students' queries, create assignments, and grade them.
- Helped the students in code and circuits debugging during Mechatronics and Embedded systems lab/projects.

Intelligent Guidance & Control Lab – IIT Kanpur, India
Project Engineer (Mechatronics) Jan. 2019 – Jul. 2021

- Led an international project (IUSSTF) to design (AutoCAD), validate using ROS, IMU, and Gyro, and configure automation and electromechanical set up on a river water observatory prototype to track and report the real-time pollution level. \
- Managed the suppliers and vendors to manufacture the observatory using the casting process.

Mahindra & Mahindra – Chennai, India
Systems Validation Engineer (Commercial Vehicles) Aug 2016 – Dec 2018

- Spearheaded vehicle validation tests for Mahindra XUV300 & Marazzo and completed the task in 6 months.
- Planned and executed design verification plans for acceleration performance, coast-down, sensor testing, winter trials, durability test, and thermal tests. Debugged and reported vehicle issues using CAN and OBD (On-board Diagnostics) tools to cross-function teams.
- Conducted data analysis in Python and led discussions with the designer to debug issues and suggested improvements after comparison with benchmark vehicle data
- Performed structural analysis and design optimization of transmission parts using Ansys workbench and developed a correlation of 95% with real-world fatigue testing. Helped in design optimization in CAD (Inventor, NX).
- Analyzed and standardized a fuel economy test drive cycle for test tracks using least square estimation to save $100k (Published in SIAT 2019). Performed controller tuning using the automated accelerator, clutch, and brake pedal setup.
- Spot award for conceptualizing an automatic seat adjustment system to avoid casualties during airbag deployment.

SAE Baja, KIET, Ghaziabad India

Team Leader, Head of Powertrain and Innovation sub-team Feb 2013 - Mar 2017

- Led the team for two years, bagged 2nd rank in design with 40% vehicle weight reduction.
- Managed the project for all the phases including planning, designing, manufacturing, validation, and production.
- Designed a 4-wheel steer mechanism that helped us bag maneuverability event awards for three consecutive years.
- Designed a custom gearbox to couple with the CVT, scoring 7th position in the grid for the first time.
- Learned how to apply the concepts of DFMEA, DVP, and Validation in vehicle design, manufacturing, and testing.
- Managed the budget and timeline of the project, by interacting with all the stakeholders and the suppliers for roll cage material (Chromoly 4130), aluminiun 7075, CVT, engine, sub-parts like cable wires, shaft manufacturers, etc.

Software Projects and Certifications

- **Google Project Management Professional Certification** (in Progress 3/6): Project lifecycle, change management, scope creep management, stakeholder analysis, RACI charts, project charter, risk management plan, budget management
- Developed software for leader-follower autonomous navigation using C++ and ROS (MoveBaseAction library, amcl package, tf, lookup transforms, broadcaster) to mimic the rescue operations performed by US&R. → Project Link
- Worked on concepts of state estimation and Kalman-Filter (LQG) development using time sampling, correlations, and spectral densities for stochastic noise filtering in aircraft speed measurement, coded in Matlab
- Coded Longitudinal (PID) and Lateral Controller (Stanley, Pure Pursuit) for a vehicle model in Carla using Python → Project Link
- Coded algorithms in Python to find an optimal path for a planar robot in a 2-D environment using BFS, Dijkstra, A*, and RRT* methods. → Project Link
- Engineered the project "Four-wheeled 3-R Firefighting Robot" using ROS and Python with features like teleoperation, obstacle avoidance using Y-P Lidar, fire detection, and automated manipulation of arms. → Project Link
- Developed a machine learning pipeline to train the MPC controller gains for a bicycle model using algorithms like Perceptron, Gradient Descent, Non-Linear Regression, SVM, and Neural Networks. → Project Link
- Developed a customized vision pipeline for lane and curve detection (turn prediction) using a noisy video from a car's dashboard camera, using tools like Hough lines, homography, edge detection, and linear algebra → Project Report
- Modelled the control system for the stability of a cart with two pendulums using LQR/LQG controller → Project Link
- Coded a Human Detection and Tracking pipeline in C++ using YoloV4 and applied software development techniques like AIP and TDD including backlog and sprint planning → Project Link

Startup and Volunteer Experience

- **SHIELD 1.0** – To save lives from road accidents, we developed an emergency alert system using an accelerometer, Arduino microprocessor, and an android-based application to detect an accident in two-wheelers. The project was concluded with a prototype. A business plan was pitched before the Indian government for funding.
- Worked as a design consultant for a startup, **Evermore Pvt. Ltd**, to design a Raspberry Pi-based automated sanitization chamber during the first phase of Covid 19.
- Delegated as a design judge for Baja SAE India & Formula Bharat & mentor for college student teams (2017-2021)
- Head Organiser, SAE-Efficycle Virtual Design Meet 2015