

SUMMARY

Highly skilled Software Engineer and Researcher with experience in automotive software development, specializing in vehicle motion control and decision making. Proven expertise in MATLAB/SIMULINK, control systems, and algorithms for Adaptive Cruise Control and Autonomous Emergency Steering. Contributed to controller design, virtual validation, and testing of ADAS features.

WORK EXPERIENCE

Visiting Doctoral Researcher

10/2025 – 12/2025, 06/2026 – 08/2026

Chalmers University of Technology

Gothenburg, Sweden

- Addressed the challenge of interactive decision-making for CAVs at single-lane, four-way unsignalized intersections, accounting for diverse maneuver intents including those of HDVs.
- Formulated a decentralized and tractable decision-making framework by integrating opinion dynamics with control barrier functions and MPC, ensuring interaction-aware safety and opportune optimality.
- Achieved improved throughput in simulations involving combinatorial scenarios with four vehicles in mixed traffic, demonstrating adaptability to varied intersection geometries and reduced computational demands for scalability.
- Authored the resulting work with the Chalmers Systems and Control group, published in IEEE Control Systems Letters (2026).

KPIT TECHNOLOGIES LTD

Pune, India

Senior Software Engineer

03/2021 – 09/2023

Project 1 | Development Engineer at Arriver GmbH Germany (on behalf of KPIT)

- Developed control algorithms for Longitudinal Vehicle Motion Control as part of a low-level interface controller between ACC (Adaptive Cruise Control) and actuators.
 - Performed requirement analysis and created scenarios for virtual validation and verification.
 - Executed MIL, SIL and HIL testing; contributed to modelling, MATLAB scripting and testing.
 - Documented software design and control architecture.
- Environment: MATLAB/SIMULINK, D-SPACE, GIT, LINUX, LaTeX, Agile Methodology.

Project 2 | Software Engineer at ERAE Automotive Solutions Korea (on behalf of KPIT)

- Developed control algorithms for AES (Autonomous Emergency Steering) functionality.
 - Designed controllers based on functional requirements and performed MIL and SIL testing.
 - Contributed to control algorithm development and documentation of software design.
- Environment: MATLAB/SIMULINK, CARMAKER, MS-Office, V-Model Development.

Excellence Award (2022) for outstanding contributions to ADAS projects during 2020 and 2021.

Research Intern

06/2019 – 04/2020

- Conducted comprehensive literature reviews on traditional and advanced control techniques for trajectory tracking in self-driving cars.
- Developed and evaluated the performance of longitudinal and lateral vehicle motion control algorithms.

University Teaching Assistant

08/2018 – 05/2019

Indian Institute of Information Technology (IIIT), Jabalpur

Jabalpur, India

- For Bachelor's course PR 201 Project Innovation, focusing on the project Autonomous Firefighting Robot.
- Mentored and supervised a team of four bachelor's students through the entire project lifecycle, from prototyping in the lab to final experiments.

EDUCATION

PhD, Advanced Systems Engineering

11/2023 – Present

Free University of Bozen-Bolzano

Bolzano, Italy

- Thesis: "Cooperative decision making of autonomous ground vehicles for collision avoidance at unsignalized intersections", using signed opinion dynamics and opinion-driven control barrier functions for CAVs in mixed traffic.
- Monte Carlo simulations in MATLAB and virtual environments; hardware experiments with 1/5-scale RC cars (Pixhawk, Odroid) in ROS.
- Environment: MATLAB/SIMULINK, ROS, Mission Planner, QGroundControl, SUMO, Webots.

Master's, Mechatronics Engineering

Indian Institute of Information Technology (IIIT), Jabalpur

07/2018 – 08/2020

Jabalpur, India

- Thesis (with KPIT Technologies, Pune): "Trajectory Tracking of Autonomous Vehicles using Different Control Techniques (PID vs LQR vs MPC)".
- Developed a mathematical vehicle model, designed longitudinal and lateral motion controllers, and ran closed-loop simulations under varying speed and road conditions.

Bachelor's, Instrumentation Engineering

Andhra University College of Engineering

08/2013 – 04/2017

Visakhapatnam, India

- Thesis: "Ball and Beam control system using PID control", using ultrasound feedback and an Arduino-driven servomotor.

PUBLICATIONS AND INTERNATIONAL CONFERENCES

- [1] B. Varma, Y. Shuai Quan, K. D. von Ellenrieder and P. Falcone, "Decentralized Opinion Integrated Decision Making at Unsignalized Intersections via Signed Networks," *IEEE Control Systems Letters*, vol. 10, pp. 1123–1128, 2026, doi: 10.1109/LCSYS.2026.3704463. To be presented at IEEE CDC 2026, Hawaii, USA.
- [2] B. Varma, K. D. von Ellenrieder, Y. S. Quan and P. Falcone, "Decision Making at Unsignalized Traffic Intersections in Mixed Traffic via Signed Opinion Dynamics," *2026 15th Asian Control Conference (ASCC)*, Nusa Dua, Bali, Indonesia, 2026, pp. 66–71, doi: 10.1109/ASCC70886.2026.11702207.
- [3] B. Varma and K. D. von Ellenrieder, "Multi-robot obstacle avoidance in dynamic environments using opinion-driven CBFs," *2025 European Control Conference (ECC)*, Thessaloniki, Greece, 2025, pp. 320–325, doi: 10.23919/ECC65951.2025.11187063.
- [4] B. Varma, N. Swamy and S. Mukherjee, "Trajectory Tracking of Autonomous Vehicles using Different Control Techniques (PID vs LQR vs MPC)," *2020 International Conference on Smart Technologies in Computing, Electrical and Electronics (ICSTCEE)*, Bengaluru, India, 2020, pp. 84–89, doi: 10.1109/ICSTCEE49637.2020.9276986.

SKILLS

Tools & Software: MATLAB/SIMULINK, Octave, D-SPACE, CarMaker, ROS, Webots, SUMO, PLC & SCADA systems

Programming: Python, R, C, C ++., MATLAB scripting, PLC

Domains: Control systems, Vehicle dynamics, Vehicle motion control, Advanced Driver Assistance Systems (ADAS), Automotive software development, Autonomous vehicles, Cooperative multi-agent decision-making, Decentralized decision-making, Multimodal transportation systems, Physics-informed learning

LANGUAGES

English (C1), Telugu (mother tongue), Hindi (fluent), German (A1), Italian (A1), Swedish (beginner)

CERTIFICATES AND SCHOLARSHIPS

- 2023 – Certificate of high CSAT from the client for contributions to Adaptive Cruise Control (ACC) feature development, KPIT.
- 2022 Award: Excellence award in recognition of outstanding achievements, for the contributions in the ADAS projects during years 2020 & 2021.
- 2023 – 2026 – Doctoral scholarship (3 years), funded by the Free University of Bozen-Bolzano.
- 2018 – 2020 – Master's scholarship from the Government of India, awarded after qualifying the national-level competitive exam GATE.
- 2013 – 2017 – Bachelor's scholarship from the Government of India, awarded after qualifying the state-level competitive exam EAMCET.

ACTIVITIES

- Organizing volunteer, 18th AUTOMATICA conference of SIDRA (Italian Control Systems Society), Bolzano, Italy.
- Student coordinator, Spikes 16 national symposium on process control and automation; Andhra University; (Responsible for development and hosting of website)
- Active Robotics club organizer, IIIT Jabalpur.