ASHWIN KUMAR RANGARAJAN

+1- (864)-449-9085 rangar2@g.clemson.edu www.linkedin.com/in/ashwin-kumar-rangarajan Dearborn,MI Portfolio

EDUCATION

Clemson University - International Centre for Automotive Research ***Aug 2023 – Present***

Master of Science - Automotive Engineering (Majors in Vehicle Dynamics & Controls) *Greenville, South Carolina (US)*

Relevant Coursework: Vehicle dynamics, Automotive stability & safety systems, Classical & Modern control theories, Automotive control systems design, Robust predictive control, Applied systems and electronics integration and Tire dynamics & behavior

SSN College of Engineering ***Aug 2014 – May 2018***

Bachelor of Engineering - Mechanical Engineering *Chennai, Tamil Nadu (India)*

EXPERIENCE

Summer Intern, Ford Motor Company ***May 2025 – Present***

Chassis Controls Engineer – Research & Advanced Engineering Division *Dearborn, Michigan (US)*

Steer-by-wire System

Developing a Steer-by-Wire system based on fixed wheel concept with dual redundancy - concept development utilizing hand wheel torque and yaw moment-based control inputs. Integrate control software in **vehicle motion controls** architecture.

Responsibilities:

- Develop software control strategy; integrate & validate for SiL, HiL and real-world in-vehicle testing
- Integrate steering system hardware on the test vehicle to enable real-time calibration and data acquisition
- Collaborate with suppliers and cross-functional internal teams to ensure seamless hardware integration and alignment with system requirements.
- Plan and execute testing and calibration procedures on proving grounds to validate system functionality & robustness

Deep Orange 16 Intern, Clemson University (ICAR) ***Jan 2024 – Apr 2025***

Vehicle dynamics & Controls team *Greenville, South Carolina (US)*

Focused on developing a rapid response prototype vehicle for disaster scenarios, involving prototype vehicle development and close industry collaboration.

Brakes and Suspension Control Systems Design Engineer:

- Designed & implemented a **HiL** bench test setup for Brembo's **Sensify brake-by-wire** system; performed hardware test plans creation and execution, calibration, fault detection and fail-safe strategy development using State flow
- Developed **brake supervisory control and a start-up state machine** using New Eagle Raptor ECU, modeled in Simulink and State flow to validate in SiL & HiL environments
- Conducted HiL testing with Raptor ECU in the loop for real-time validation of braking functionalities
- Designed a **torque vectoring** algorithm to emulate differential behavior in a 4-wheel hub motor series hybrid vehicle
- Designed wiring harness and implemented a **suspension HIL test setup** to validate real-time control strategies
- Designed a custom HMI using the MoTeC C1812 display, establishing CAN communication, GUI development to visualize vehicle data and enable intuitive driver interaction via steering wheel page navigation buttons
- Applied the **V-model** systems engineering approach to derive requirements, align cross-functional teams, manage timelines, and conduct physical testing in compliance with **US Army TOPs and FMVSS** standards

Research Assistant, Clemson University (ICAR) ***Mar 2024 – Dec 2024***

Professor Dr. Matthias J. Schmid *Greenville, South Carolina (US)*

Responsibilities:

- Served as Data Acquisition and Vehicle Dynamics Controls & Test Engineer for the Deep Orange 14 project, a U.S. Army research vehicle
- Instrumented a BMW 535xi for data collection during 4-post shaker, skid pad, slalom, double lane change, and brake tests as part of research activities at both in-house facilities and ITIC proving grounds.

Royal Enfield (A unit of Eicher Motors Pvt. Ltd.), Global Headquarters ***Aug 2018 – Jun 2023***

Assistant Manager, Product Development - New product vehicle testing and validation *Chennai, Tamil Nadu (India)*

Responsibilities:

- **Project Manager** for chassis systems integration, scheduling project meetings with cross-functional teams to address development-stage challenges, conducting trials, root cause analysis, recommending design modifications, and validating solutions. Established new internal testing procedures aligned with **ECE, FMVSS and Indian regulations**.
- Led as the **ABS Development manager & test engineer**, overseeing the testing and validation of ABS calibration programs to meet safety standards, homologation requirements, and subjective/objective performance criteria. Managed alternate sourcing evaluations and final approvals while coordinating weekly meetings with cross-functional teams to ensure project accountability.
- Served as a **Vehicle Performance Test Engineer**, developing verification plans, maintaining validation reports and conducting testing activities to assess vehicle attributes, including brake systems, ride and handling and ergonomics

- Gained hands-on expertise in prototype development, successfully building **five motorcycle prototypes** from concept to SOP, with proficiency in tool handling and assembly processes.

TECHNICAL SKILLS

Programming Languages: MATLAB, C , C++ and Arduino
Simulation & Calibration Tools: Simulink, CarSim , State flow, dSPACE Controldesk & ATI Vision
Data Acquisition Software: Vision Data Analyzer, Siemens Testlab, 2D Racelogic, VBox Automotive & HBM eDaq
Modelling Tools: PTC Creo parametric, Siemens NX and SolidWorks
Other Applications: Kvaser CANKing, Vector CANdb++**,** MS-Office, G-Suite and Power BI
Training: HV & LV electrical systems functional safety training, Basic Quality Tools and FMEA analysis
Riding: Professionally trained for motorcycle off-road & trail riding

ACADEMIC PROJECTS

Robust predictive lithium battery charging controller under measurement uncertainties and dynamic thermal boundary conditions | MATLAB & Simulink ***Sep – Dec 2024***

- Developed and implemented a robust Model Predictive Control **(MPC)** strategy using MATLAB and Simulink to ensure safe charging of Li-ion batteries by addressing uncertainties and preventing thermal runaway. Designed a non-linear electro-thermal model incorporating State of Charge (SOC) and temperature states, utilized fmincon optimizer to handle non-linear model thereby balancing charging speed and thermal run-away temperature.

Thermal Management System for EVs utilizing dual-loop pump circuit for battery and cabin | MATLAB & Simulink ***Aug – Dec 2024***

- Designed a predictive integrated thermal management system for electric vehicles (EVs) using Model Predictive Control **(MPC)** to optimize energy-efficient operation of components like the compressor, pump and cabin blower. The system addresses simultaneous cooling demands of the battery and cabin through dual-loop architecture, enhancing energy efficiency, extending battery life and enhancing passenger comfort under diverse environmental conditions.

Vehicle stability control using optimal torque allocation in four-wheel independent hub/motor vehicle | MATLAB, CarSim ***Jan - May 2024***

- Designed a hierarchical model-based controller using direct yaw moment control **(DYC)** strategy to maintain yaw stability of a 4-Wheel Independent Motor driven vehicle by implementing individual **torque vectoring and braking algorithms**; built a hierarchical control system and successfully demonstrated simulations with increased vehicle stability; simulated maneuvers like **double lane change, J-turn, sine with dwell** under normal and split-μ surfaces with and without vehicle stability control.

Numerical modeling and simulation of tractor-trailer system | MATLAB ***Aug – Dec 2023***

- Approached first principles methodology to derive fundamental equations of motion for a tractor-trailer system; applied linear system concepts and transport theorem for state space representation; modelled the entire system in MATLAB; analyzed stability for different initial hitch angles, CG cases and with and without lateral and longitudinal load transfer for step input and fishhook maneuvers

Adaptive Cruise Control and Autonomous Lane Keeping of an RC car using Arduino programming for RC car | MATLAB, Arduino and Excel ***Aug – Dec 2023***

- Developed a control algorithm to autonomously track and follow a lane (LKA) with adaptive speed control (ACC) using **PID** control strategy and with the help of **ultrasonic sensors** using Arduino programming; developed sensor fusion using **Kalman filter technique**; tuned PID parameters; tested the working of the control algorithm program successfully on random tracks using data-driven approach

LANGUAGES

- English (Professional proficiency – CEFR C1)
- German (A2)
- Tamil (Mother Tongue)

EXTRACURRICULARS

- Co-founder and member of an NGO named ABCD10 (2017 – Present)
- Part of the inter-year cricket team during bachelors (2017 - 18)
- Served as student placement coordinator during bachelors (2016 - 18)
- Served as President of the student rotary club during higher secondary (2012 - 14)
- Part of the volleyball and table tennis team during high school (2010 – 13)
- Participated in Mathematics and Science Olympiads during high school and higher secondary (2010 – 14)

HOBBIES

Bike rides, Cricket, Badminton, Volleyball, Motorcycle repairs/modifications, Arduino DIY projects, household modifications, 3D modeling & printing