Ayush Agrawal

ayushagrawal26@ucla.edu | +1 (424) 430-5322 | ayushagrawal149.github.io | https://www.linkedin.com/in/ayush145agrawal/

Education

University of California, Los Angeles — California, USA

Master of Science in Mechanical Engineering, specializing in Robotics — *Sept 2024 - March 2026*

- Recipient of the prestigious **Narotam Sekhsaria Foundation PG Scholarship** given to 15 students across India *2024*

Indian Institute of Technology (IIT) Bombay — Mumbai, India

Bachelor of Technology in Mechanical Engineering with minors in Controls Engineering; ***GPA: 9.37/10.0*** *July 2017- June 2021*

- Conferred with the **MITACS Globalink Research Fellowship** for conducting research at the **University of Toronto** *2020*

Technical Skills

Programming	C++ (Object Oriented Programming), Python, MATLAB, Maple, Git, Excel VBA
Robotics	ROS 1/2, Gazebo, Simulink, MATLAB - Robotics Toolbox, MATLAB - Control Systems Toolbox
Software	CarMaker 8.1, SolidWorks, ABAQUS, Agile Framework, Jira, Confluence, LaTex, 3D-Experience
Relevant Coursework	Linear and Nonlinear Control Systems, Computer Vision, Optimization, Dynamics of Machines

Professional Experience

Jaguar Land Rover TBSI Pvt. Ltd. | Motion Controls Engineer — Bangalore, India

Active Ride Functionality | *Dept. of Chassis & Motion Controls Systems* | **Publication** *August 2021 - August 2024*

Active ride functionality is a vehicle ride enhancement algorithm designed to deliver superior comfort than JLR's adaptive dampers

- Spearheaded the **model-based design of optimal controllers** to reduce road-induced vibrations in Range Rover by **38.6%**
- Tuned **MPC** to limit actuation power consumption to **0.08% of battery capacity** for 30-minute-long **WLTP test cycle**
- Designed **Kalman Filter for state-estimation** of heave velocity, pitch, and roll angle signals with **max RMS error = 0.11**
- Responsible for maintaining the **Git repository** for the active ride functions, including **LQR**, **MPC**, and **H-infinity** algorithms
- Assessed the controller's performance in the presence of noise, delays, and 5% actuation bandwidth in **Carmaker + Simulink**

Torque Split for Efficiency (TSE) | *Dept. of Powertrain Energy & Thermal Management Systems* *April 2023 - Sept 2023*

TSE is an optimization algorithm for the most energy-efficient distribution of driver's torque demand between front and rear EDU

- Modified TSE for improved efficiency by integrating **energy consumption maps** for vanes, fans, & pumps in the cost function
- Designed the **logic architecture diagram** outlining the signal flow among EDUs, powertrain cooling and refrigeration circuits
- Reported **80Wh** energy saving using the updated algorithm by co-simulating 30min WLTP test cycle in GTSuite + Simulink

Crash Pulse Prediction | *Dept. of Structural Integration* *August 2021 - July 2022*

A mathematical model for rapid assessment of vehicle crashworthiness in Full Wdith Rigid Barrier frontal crash test by NCAP

- Developed a **physics engine** to simulate vehicle crash kinematics with **92% accuracy** in **4 minutes** compared to **8-hour FEA**
- Delivered the engine as a **MATLAB application** to save **20% workdays** in CAD model development of **Panthera**'s body-in-white
- Utilized the app to estimate the crashworthiness of **Lucid Air**, **BMW iX**, **Mercedes EQS** to set the benchmark for **JLR's EMA**

AI & Robotics Technology Park | Robot Programming & Controls Intern | Publication — Bangalore, India

Formation control of differential-drive robot with input saturation and constraints on formation size *May 2021 - August 2021*

- Developed a novel path tracking controller ensuring **99% tracking accuracy** and smooth saturation of robot's speed limits
- Extended the tracking controller as a **scalable formation control framework** for navigating goods inside a warehouse
- Verified the stability of control framework for a formation of $n = 5$ **Turtle Bot 3** through simulations in **ROS2/Gazebo**
- Determined **constraints on the formation size** as a function of the path curvature ($\boldsymbol{\kappa}$) to prevent instability while cornering

University of Toronto | Mitacs Globalink Research Intern | Report — Toronto, Canada

Seismic response of vertical post-tensioned connection for modular steel buildings (MSBs) *April 2020 - August 2020*

- Modeled and simulated the novel vertical post-tensioned connection using **Finite Element Analysis** in **ABAQUS** for assessing the self-centering properties and **30% higher energy dissipation capabilities** compared to welded steel structures
- Reported hysteresis and seismic capabilities of vertical post-tensioned connection with **91% accuracy** relative to experiments
- Researched contact models and fracture criteria in **ABAQUS** to achieve **99.75% accuracy** in the frictional dissipation model

Publications

- **Agrawal, A.**, Negi, A., and Joshi, D., Exploring Capabilities of Hydraulic Actuators to Achieve Vehicle Ride Targets in Frequency Range beyond Their Operational Bandwidth, SAE Technical Paper 2024-26-0060, 2024. **Link to Publication**
- **A. Agrawal**, M. Bharatheesha and S. Kolathaya, "Formation Control of Differential-Drive Robots with Input Saturation and Constraint on Formation Size," 2023 62nd IEEE Conference on Decision and Control (CDC), Singapore, pp. 8620-8627. **Link**