Ayush Agrawal

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

Education

University of California, Los Angeles (UCLA) — Los Angeles, CA

M.S. in Electrical and Computer Engineering, specializing in Robotics; ***GPA: 3.96/4.0*** — *June 2026*

- Awarded merit-based scholarship worth **$72,000** from JN Tata Endowment Fund and Narottam Sekhsaria Foundation
- Thesis: "*WorldBench: Disambiguating Physics for Diagnostic Evaluation of World Models*," under review at **CVPR'26**

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

B.Tech. in Mechanical Engineering with a minor in Systems & Controls Engineering; ***GPA: 9.37/10.0*** — *June 2021*

- First-author oral presentations to 50+ researchers representing 40+ countries at IEEE CDC Singapore, and SAE SIAT India

Technical Skills

Programming	C++ (OOP), Python, Pytorch, Model-in-loop testing (MiL), Software-in-loop testing (SiL), Linux
Robotics	ROS 1/2, Gazebo, MIT Drake, Tensorflow, Git, MISRA, ISO26262, CAN protocol, CANalyzer
Software	MATLAB-Simulink, CarMaker 8.1, SolidWorks, ABAQUS, Jira, Confluence, AutoCAD, AutoSAR
Relevant Coursework	Computer Vision (**A**), Deep Learning (**A**), Digital Control (**A+**), MPC - Motion Planning (**A**)
Professional Skills	Automotive Software Worksflows, Cross-functional Collaboration, Vehicle Dynamics

Professional Experience

Tesla Inc. | Software Intern - Vehicle Controls — Palo Alto, California

Grey box model of Tesla Model 3 semi-active hydraulic suspension — *June 2025 - September 2025*

Hydraulic dampers exhibit extremely nonlinear behavior due to fluid cavitation during high-current and high-speed stroke operation

- Automated static map generation process using **least-squares** optimization, achieving **78%** fit against ground-truth data
- Cascaded static maps with **globally optimized** exponential smoothing filter to fit force-velocity hysteresis with **83%** accuracy
- Optimized the adaptive smoothing constant as nonlinear function of damper inputs to model cavitation with **92.8%** accuracy
- Built a **hybrid physics-deep learning model** integrating static maps, filtering and neural network, reaching **96%** accuracy
- Delivered **ML-based system identification python tool**, streamlining damper's model development and control design

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

Active Ride Functionality | *Dept. of Chassis & Motion Controls Systems* | **Publication** — *August 2022 - 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%**
- Authored system requirements for actuators, translating ride KPIs and functional safety goals into verifiable control specification
- Implemented **LQR**, **MPC**, **H_∞** and conducted **unit testing** to verify mathematical correctness, bounded outputs, and robustness
- Tuned **LQR, MPC, H_∞** to limit actuation power consumption to **0.08% of battery capacity** for 30-min-long **WLTP test cycle**
- Designed **Kalman Filter for state-estimation** of heave velocity, pitch, and roll angle signals with **max RMS error = 0.11**

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
- Reported **80Wh** energy saving during MiL and SiL testing of the algorithm for a 30min WLTP test cycle in **GTSuite+Simulink**

AI & Robotics Technology Park | Robot Controls Intern | IEEE CDC'23 Publication — Bangalore, India

Formation control of autonomous mobile robots with input saturation and constraints on formation size — *May 2021 - August 2021*

- Developed a novel path-following controller ensuring **99.2% tracking accuracy** and smooth saturation of robot's speed limits
- Proved the **Lyapunov stability** of the controller and demonstrated its scalability for formation control in **ROS2/Gazebo**

Key Academic Projects at UCLA

Reinforcement learning based safe autonomous parking | Report | Code — *Fall 2025*

- Trained an **RL control policy** using **SAC + HER framework** for reverse and parallel parking in obstacle-rich environment
- Achieved 100% success rate with **curriculum training** across increasing parking difficulty (static –> dynamic obstacles)
- Implemented **MPC** for **motion planning** using a 20K-parameter **neural bicycle behavior model** trained on state-action data

Control of 3DoF Robotic Manipulator for Lego Assembly | Report | Code — *Spring 2025*

- Designed **joint-space impedance controller** for picking, placing and fitting Lego blocks with **tracking precision of** 1.5°
- Implemented the controller in real-time on a 3D printed 2R-1P manipulator actuated by Dynamixel MX-28 dual shaft servo