Ayush Agrawal

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Education

University of California, Los Angeles — California, USA

Master of Science in Mechanical Engineering, specializing in Robotics and Controls — *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*
- Awarded advanced performance **(AP)** grade (1 of 80) for exemplary performance in course on **Strength of Materials** *2019*

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, Jira, Confluence, LaTex, AutoCAD, Autodesk Fusion 360
Relevant Coursework	Automatic Control, Computer Vision, Optimization, CNC Machining, 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**

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

- 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 **99.18% 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**

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

Key Automation Projects

Control design of ABB-IRB 1600 - 6-DoF Robotic Manipulator | Report — *Jan 2020 - April 2020*

- Modelled the dynamics of 6-DoF robotic manipulator with spherical joint using DH parameters in **MATLAB robotics toolbox**
- Implemented **Independent Joint Control** with **1% tracking error** for end-effector path planned using quintic polynomials
- Reduced tracking error to **0%** using **Joint Space Inverse Dynamics Controller** even with 5% error in gravity load estimation

Image Creating Robotic Arm | Certificate | Report — *May 2018 - July 2018*

- Designed a **2-link manipulator** in **SolidWorks** and determined the requisite torque capacity for servo motor using **FEA**
- Assembled the manipulator using **Aluminium brackets** and **double-axle servo motors** with base mounted on plywood
- Deployed **Canny Edge Detection** algorithm to convert an input RGB image to **bit-Matrix** for planning end-effector's path
- Determined the joint space trajectory using **Inverse Dynamics** and programmed **Arduino** with **PD control** to trace the edges