# ADITYA PRATAP SINGH RAJAWAT

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## EDUCATION

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| 2019-2020 | M.Tech. in Robotics and Control (Mechanical Engineering) | IIT Kanpur | **10.0/10.0** |
| 2015-2019 | B.Tech. in Mechanical Engineering | IIT Kanpur | **8.9/10.0** |

## WORK EXPERIENCE

### AUTOMATED DRIVING MOTION CONTROL-NEXT GEN                    Sept '20 - Present
*Graduate Mechanical Engineering Trainee, Jaguar Land Rover India*

- Developed a **V&V automation tool** to improve the robustness of the release processes of new functionalities in simulation
- Created a **Trajectory Modifier** model in existing ADMC-NG Simulink environment for lateral arbitration and blending of trajectories
- Developed a **Neural Network based control strategy** for Chauffeur stop, learning from large data-sets generated for MPC simulations
- Delivered a **Calibration tool** for multiple cameras and LiDAR, automating the process and improving detection accuracy and time of experiment
- Initiated knowledge sharing sessions within different teams, and delivered presentation on **Optimization, Learning and Control**

### OPTIMIZATION-BASED PLANNING AND CONTROL FOR LEGGED LOCOMOTION                    August '19 - July '20
*Master's Thesis under Dr. Shakti S. Gupta and Dr. Mangal Kothari*

- Worked on three-link biped model in sagittal plane with point feet, deriving **hybrid dynamics** and implementing **nonlinear feedback control**
- Created a mathematical model of **four-link kneed biped for passive walking** down a shallow slope, understanding the stability characteristics
- Generated an **optimal gait plan** for body trajectory and foothold positions using **constrained nonlinear optimization solver**
- Created a **URDF quadruped model** for position-based control in Pybullet, with experiments on **arduino-based framework**
- Performed **perception tasks using a single mobile camera** for **path planning** of quadruped over a flat-terrain

### SYSTEM IDENTIFICATION AND CONTROL DESIGN OF 18 WHEELED TRUCK                    May '18 - July '18
*Summer Research Intern at Unmanned Systems Lab, TEXAS A&M University Under Dr. Srikanth Saripalli*

- Designed experiments for **longitudinal and lateral control design** of a drive-by-wire 18 wheel electric truck, to achieve **Level 2 Automation**
- Created a **mathematical model for throttle and steering** using System Identification tools in Matlab
- Implemented the **PID Control (Throttle)** and **Stanley Control (Steering)** and fine-tuned the gains through **real-time testing**
- Created a **standalone MATLAB application** for tweaking the trajectory of waypoints followed by Pure-Pursuit algorithm
- Implemented the application on **Level 3 Automated Golf-Cart** in campus, to tweak waypoints on Google Map for **waypoint path-following**

## MAJOR PROJECTS

### FORMAL METHODS IN ROBOTICS AND AUTOMATION                    March '19 - April '19
*Course Project for Formal Methods under Dr. Indranil Saha*

- Generated the optimal path using SAT and SMT based solver for **multi robot motion planning** with constraints
- Presented a paper on **Sampling Based Motion Planning**, a geometry-based approach involving LTL formula based temporal goals

### LANDING OF A VTOL UAV ON A VERTICALLY OSCILLATING PLATFORM                    March '18 - April '18
*Course Project for Autonomous Navigation under Dr. Mangal Kothari*

- Designed a control structure that could achieve **fast, safe and precise landing of a VTOL UAV** onto a vertically oscillating landing pad
- Implemented **motion estimation** of the system using Unscented Kalman Filter
- Implemented a PID controller to track the generated **time-optimal reference trajectory** considering all motion constraints

### PURSUIT EVASION GAMES                    June '19 - September '19
*Research Project under Dr. Mangal Kothari (Intelligent Guidance and Control Laboratory, IIT Kanpur)*

- Worked on **Pursuit-Evasion strategy games** for multiple group of agents having adversarial goals
- Designed a novel guidance algorithm for the trajectory generation of the defender to defend a stationary target from a fast moving attacker
- Implemented control strategy for trajectory following for the defender to avoid the attacker

## TECHNICAL SKILLS

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| Programming Languages: | C, C++, Python |
| Libraries | OpenCV, Tensorflow, Pytorch, Git, LaTeX, LaTeX Beamer |
| Software and Utilities: | Ansys, Catia Magic, ROS, NI LabVIEW, Linux Shell Utilities, MATLAB, MS Office, Solidworks |

## EXTRACURRICULAR ACTIVITIES

- **Motorsports**: Represented IIT Kanpur in SAE events, **Formula Bharat 2018** (Technical Head) and **Mega ATV Championship 2019** (Driver & Senior Member)
- **Computer Vision**: Successfully competed in multiple hackathons on HUD Control using **Eye Gaze Tracking**, 360 Degree View **Camera-based Point Clouds**, Oracle Formula 1 Automated 3D Environment Generation, and ML for Engineering Drawings