# Jatin Kumar Arora

*Robotics Engineer | Safe Autonomy*

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## Summary

Robotics Engineer specializing in safe autonomy, control theory, and learning-based robotic systems. Experienced in ROS-based development, sensor fusion (EKF), and model predictive control (MPC) for autonomous ground vehicles. Demonstrated success in deploying large-scale robotic fleets, optimizing system architecture, and integrating real-time control, perception, and planning. Currently pursuing MS(R) in Robotics and Control at IIT Delhi, focusing on safe and generalizable autonomy for robotic navigation. Passionate about bridging theoretical control guarantees with scalable real-world robotic systems.

## Core Competencies

Safe and Reliable Autonomy, Model Predictive Control (MPC), Reinforcement Learning , Motion Planning and Navigation, Sensor Fusion (EKF), and Human–Robot Collaboration in Industrial Environments.

## Experience

**Aug 2023 – Oct 2024**

**Engineer - Mobile Robotics**, *Addverb Technologies*, Noida, India
- Developed architectural transition from microservices to monolithic ROS stack, improving integration and deployment speed.
- Developed adaptive AGV solutions with vertical lift modules and custom attachments.
- Implemented EKF-based localization, driver integration (LIDAR, IMU, BMS), and state machines for control.
- Deployed 40+ robots across client facilities, optimizing runtime performance by 25%.

**Aug 2022 – Aug 2023**

**Graduate Engineer Trainee - Robotics**, *Addverb Technologies*, Noida, India
- Built hardware abstraction layers and implemented modular driver stack.
- Contributed to safety protocols and state feedback in robotic fleets.

**Feb 2021 – July 2021**

**Summer Intern - R&D**, *Havells*, India
- Developed simulation tools for heater energy loss analysis.
- Automated thickness-rating selection logic for better product design.

**Dec 2020 – Jan 2021**

**Simulation Intern**, *Breathe Digital*, India
- Built SITL drone models with Gazebo and PX4.
- Verified control algorithms against simulated CAD drones from SolidWorks.

## Skills

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|---|---|
| Languages | C++, Python, Bash, MATLAB |
| Frameworks | ROS, Docker, PX4, TensorFlow |
| Tools | Gazebo, Git, SolidWorks, Linux |
| Control & Estimation | EKF, State Machines, Planning, PID, MPC |
| Soft Skills | Problem Solving, Communication, Team Leadership |

## Education

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|---|---|
| 2024 – present | **MS(R) in Robotics and Control Theory**, *Indian Institute of Technology, Delhi*, India<br>**Coursework:** Mathematical Methods in Control, Nonlinear Systems, Optimal Control Theory, Model Predictive Control, Linear Systems, Stochastic Filtering and Identification<br>**Thesis:** Generalizable and Safe Autonomy for Robotic Navigation, under Prof. Shubhendu Bhasin<br>**Working Areas of Research:** Safe RL, Planning and Control |
| 2018 – 2022 | **B.E. in Mechanical Engineering**, *Thapar Institute of Engineering and Technology*, India<br>CGPA: 9.28<br>Activities: Robotics Society (Worked with gazebo simulations) |

## Projects

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|---|---|
| MPC | **Implementation of TinyMPC (ICRA 2024):** Reproduced TinyMPC results on constrained trajectory optimization, validating real-time MPC for robotics. [Link] |
| Reinforcement Learning | **PPO Implementation:** PPO implementation for the cartpole simulation in gymnasium [Link] |
| Optimal Control | **Waypoint Following:** Implemented time- and energy-optimal control strategies for mobile robot navigation. [Link] |
| Perception | **Vision Transformers:** Developed image segmentation pipeline using the SegFormer architecture. |
| Perception | **Depth Estimation:** Implemented a deep learning model for object depth estimation from monocular images. |
| ROS Simulation | **Differential Drive Robot in Gazebo:** Simulated a mobile robot in ROS with camera and PCL sensors; integrated navigation, perception, and localization modules. [Link] |
| ROS Simulation | **Catch me if you can:** A simple game where four turtles approach from different directions to catch the player's turtle. The player must use the `turtlesim_teleop` keyboard commands to avoid them. [Link] |
| Path Planning | **A* with OpenStreetMap:** Built a shortest-path planner using real-world map data and the A* algorithm for GPS-style navigation. |
| System Tools | **Linux System Monitor in C++:** Created a tool similar to `htop` by parsing the `/proc` filesystem for process and memory monitoring. |

## Publications

*"Low-Frequency Adaptation – Deep Neural Network-Based Domain Adaptation Approach for Shaft Imbalance Fault Diagnosis."* **Jatin Kumar Arora**, Sudhar Rajagopalan, Jaskaran Singh, Ashish Purohit. **Journal of Vibration Engineering & Technologies**, Springer, 2023. [Link]

*"Unified Path Planner with Adaptive Safety and Optimality"* **Jatin Kumar Arora**, Soutrik Bandyopadhyay, Shubhendu Bhasin **arxiv**, [Link]