

# SAKSHAM KUKREJA

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## EDUCATION

**Carnegie Mellon University, Pittsburgh, PA** 2023 - Present  
*Master of Science - Robotic Systems Development*  
**Coursework:** Manipulation Estimation and Control, Robot Mobility, Computer Vision, Systems Engineering and Project Management

**Punjab Engineering College, Chandigarh, India** 2017 - 2021  
*Bachelor of Engineering in Aerospace Engineering.* GPA: 8.50/10.00

## SKILLS

**Programming Languages:** Python, C++

**Technical Skills:** ROS1 and ROS2, Gazebo and VTD, Docker, Git, Pytorch

**Robotics Skills:** Deep-Learning, Reinforcement-Learning, Control-Theory, Motion Planning, Computer-Vision

## EXPERIENCE

**Flux Auto / Drivn, Bangalore, India** Aug2021-Jul2023  
Robotics - Motion Planning Engineer

- Designed a novel algorithm using **bicycle lattice trajectories to change the orientation of a uni-directional forklift** in a constrained warehouse environment, resulting in 60% shorter paths in completing a trip.
- Independently developed a **self-adaptive local path planner based on a dynamic window approach** and particle swarm optimization. The algorithm delivered high-performance, kinematically feasible smooth trajectories for continuously moving frames with 100% collision avoidance.
- Spearheaded a 5 member team to **redesign the behaviour model of the existing stack** using multi-threading and an exhaustive state machine in C++. This system, deployed as a prototype in Hyderabad, India.
- Engineered a **Multi-agent path planner to manage a fleet of 10 robots** using a centralised A\* planner and decentralised velocity obstacle method; improved using extensive simulation in OpenCV and VTD. Deployed the firmware on an AWS server for fast data communication and quantifiable performance evaluation.
- Wrote **production-level ROS codes in C++ and python for the motion planning stack**. This was followed by rigorous testing and prototype deployments in Hyderabad, India and Houston, USA.
- Designed and **implemented a DDPG-based Reinforcement Learning path-tracking controller**, generating precise steering commands and optimizing vehicle velocity for improved autonomous navigation.

**Punjab Engineering College, Chandigarh, India** Jun2021 - Aug2021  
Research Assistant project-link

- Designed an object tracking module** by utilising OpenCV's BOOSTING object tracker, providing a tracking accuracy of 88% for a fixed-wing UAV while performing a precision dive on the user-selected target.
- Developed a flight control algorithm and custom flight mode** for a dive maneuver using python, ROS and integrated it with the **PX4 autopilot stack using MAVROS**, resulting in an increase in data transfer and state switching.

## ACADEMIC PROJECTS

**Real-time Drivable Avatars in Metaverse using a Drone (Master's Capstone - in progress)**

- Developing a real-time human-following drone planner, instrumental in capturing dynamic human poses for reconstructing full-body avatars within the context of the Metaverse
- Optimizing the Avatar construction module by integrating data from full-body 3D human joint poses.

**Real-Time Navigation and Obstacle Avoidance solution for a QuadCopter (Bachelor's Capstone)** [link](#)

- Engineered a quick response, obstacle avoidance system with online path planning, augmenting stereo camera for obstacle detection, **customized RRT algorithm** for path planning and **PX4 for quadcopter control**. Modules were integrated through **ROS** and simulation testing was done on **Gazebo**. Hardware was assembled and testing resulted in the system following **waypoints provided by a global A\* planner** and avoiding static obstacles with 90% accuracy.

## HONOURS AND AWARDS

- Awarded employee of the quarter by Flux Auto Inc. for two consecutive quarters from January to June 2022
- Secured the First position at IIGP(2.0) (India Innovation and Growth Programme) organised by Lockheed Martin and Tata Trusts.
- Received Gold medal from Punjab Engineering College, for best Capstone Project, batch of 2021