

MANTHAN PATEL

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EDUCATION

ETH Zurich, Switzerland

Robotics, Systems and Control M.Sc.

September 2021- August 2023 (expected)

Indian Institute Of Technology Kharagpur, India

B.Tech in Mechanical Engineering with micro-specialisation
in Entrepreneurship and Innovation

CGPA: 9.65/10.00

July 2017- May 2021

Academic Rank 1 among 170 students

RESEARCH INTERESTS

Field Robotics | vSLAM | Exploration | Control Systems | Micro Aerial Vehicles

RESEARCH PUBLICATIONS

- **M Patel** (2021) "Mapping of Archaeological Sites using UAVs" [Bachelor Thesis](#)
- **M Patel**, A Bandopadhyay and A Ahmad (2021). "Collaborative Mapping of Archaeological Sites using multiple UAVs" In: 16th Intelligent Autonomous Systems (IAS-16), Singapore [Preprint](#)
- A Patnaik, **M Patel**, V Mohta, H Shah, S Agrawal, et al. (2020). "Design and Implementation of Path Trackers for Ackermann Drive based Vehicles" [ArXiv Preprint](#)
- **M Patel**, et al. (2020). "A Proposal of FPGA-based Low Cost and Power Efficient Autonomous Fruit Harvester" In: 6th International Conference on Control, Automation and Robotics, Singapore [IEEE Xplore](#)
- **M Patel**, et al. (2019). "A Prototype of an Intelligent Ground Vehicle for constrained environment: Design and Development" In: 2nd International Conference on Control and Robot Technology, S Korea [ACM Lib](#)

RESEARCH EXPERIENCE

Lidar-based Object detection for Subterranean environments

ETH Zurich

Guide:- [Dr. Shehryar Khattak, Robotic Systems Lab](#)

July 2021 - Present

- Developed an object clustering pipeline for subT environments using Lidar range, intensity and reflectivity
- Evaluated the pipeline on the DARPA SubT finals CERBERUS (winner team) Dataset and artifacts upto a range of 12 m were detected (while the camera could only detect upto distances less than 3 m)
- To be deployed on ANYMAL to facilitate the long-distant object detection using a mounted PTZ camera

Mapping of Archaeological Sites using UAVs (Bachelor Thesis)

IIT Kharagpur

Guide:- [Prof. Aditya Bandopadhyay, Dept. of Mechanical Engineering](#)

May 2020 - April 2021

Co-Guide:- [Dr. Aamir Ahmad, Robot Perception Group](#)

Max Planck Institute for Intelligent Systems

- Developed and open-sourced a novel archaeological simulation environment for AirSim [\[Link\]](#)
- Implemented a collaborative SLAM approach for a team of UAVs and extended it for archaeological mapping
- Prepared a first archaeological dataset consisting of 17 sequences for evaluating collaborative SLAM methods
- Demonstrated the collaborative mapping of the Sadra Fort (13th Century Indian Fort) with multiple UAVs
- Implemented an RRT* based informative path-planning approach for autonomous archaeological mapping
- Extended the approach to multi-UAVs using a bounded-distributive strategy for mapping larger sites [\[Thesis\]](#)

Autonomous Ground Vehicle Research Group

IIT Kharagpur

Guide:- [Prof. Debashish Chakravarty, Dept. of Mining Engineering](#)

Feb 2018 - April 2021

- Designed and implemented control strategies for efficient path tracking of Ackermann steering based vehicles using **optimal control** methods like Linear Quadratic Regulator, and Model Predictive Control [\[Link\]](#)
- Designed the control systems, localization and sensor integration for Mahindra e2o driverless car [\[Link\]](#)
- Built an autonomous differential-drive robot which could navigate in constrained environment [\[Link\]](#)

Advanced Coordination Robotics Group

IIT Kharagpur

Guide:- [Prof. Aditya Bandopadhyay, Dept. of Mechanical Engineering](#)

August 2019 - April 2021

- Implemented a receding horizon-based planner and visual odometry to perform information gain-based multi-agent exploration with failure recovery in simulation and real test platforms [\[Link\]](#)
- Designed and developed a swarm of four UAVs (3 Quadcopters and 1 Hexcopter) for testing and evaluation

PROJECTS

D.R.D.O. SASE's UAV Fleet Challenge

IIT Roorkee

Mission Strategist, simulation and path planning developer

Oct 2019 - Dec 2019

- Conceptualized and implemented efficient mission planning strategy, finite state machine and path planning algorithm for a UAV fleet to scan and search described targets in given arena in least time. [\[Link\]](#)
- Contributed to the hardware design and development, simulation and testing of four quadrotors

Autonomous Agricultural Robot

IIT Bombay

Control Systems and Embedded Team

Nov 2018 - Dec 2018

- Developed a low-cost autonomous agri-robot with capabilities of autonomous fruit plucking and seed-sowing
- Designed the controller for the 4-DOF Robotic arm, trajectory tracking and electronic architecture [\[Link\]](#)

TEACHING EXPERIENCE

- **IEEE Winter Workshop Mentor:** Mentored a batch of 40 students in a week-long workshop on concepts of autonomous robotics. Supervised them to solve the problem statement of building a self-balancing robot.
- **KRAIG Mentor:** Designed and delivered classes on basic concepts of robotics and arduino programming to an audience of 150 freshmen as a part of the Kharagpur Robotics and Artificial Intelligence Group

HONORS AND AWARDS

2021	ETH D-MAVT Scholarship	<i>ETH Zurich</i>
	Full Department scholarship for pursuing MSc. in Robotics, systems and control at ETH Zurich	
2021	Institute Silver Medal	<i>IIT Kharagpur</i>
	Highest CGPA in the Department of Mechanical Engineering among graduating B.Tech students	
2021	SM Memorial Scholarship & KB Best All-rounder Award	<i>IIT Kharagpur</i>
	Institute's best all rounder (Academic and extra-curriculars) at the end of final year	
2020	DAAD WISE Scholarship	<i>German Academic Exchange Service</i>
	Recipient of the prestigious scholarship to perform a research internship at a German Research Institute	
2020	OP Jindal Engineering and Management Scholarship	<i>O P Jindal group</i>
	Recipient of the scholarship awarded to 100 students across India for academic and leadership excellence	
2019	Inter-IIT Tech Meet 8.0	<i>IIT Roorkee</i>
	First Runners up (developed a UAV swarm solution for the given problem statement on search mission)	
2019	27th Intelligent Ground Vehicle Competition(IGVC)	<i>Michigan, USA</i>
	Secured the second position in the AutoNav Challenge among 40+ participating international teams	
2019	Hardware Modelling General Championship	<i>IIT Kharagpur</i>
	Captained a team of 10 students to build a semi-autonomous fire fighting robot (stood 5th in the event)	
2018	Inter-IIT Tech Meet 7.0	<i>IIT Bombay</i>
	Second Runners up (developed a prototype autonomous agricultural robot for respective event)	

LEADERSHIP

2019 - 2020	Head, Technology Robotix Society	<i>IIT Kharagpur</i>
	Led a 3-tier team of 42 people for organising Robotix'20, India's biggest college robotics fest	
2017 - 2018	Volunteer, National Service Scheme (NSS)	<i>Kharagpur</i>
	Awarded with silver medal for impeccable social service in the direction of rural empowerment	

TECHNICAL SKILLS

Programming Languages	C, C++, Python, MATLAB
Libraries and Environments	ROS, Airsim, Gazebo, OpenCV, PCL, Numpy, Git, PX4, Ardupilot
Hardware	Nvidia Jetson TX2/Nano, PixHawk, APM, Ras-Pi, Arduino, Odroid
Other Software	Unreal Engine 4, Solidworks, AutoCAD, Cura engine, Mission Planner