

MANTHAN PATEL

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EDUCATION

ETH Zurich, Switzerland ([Transcript](#))

Robotics, Systems and Control M.Sc.

Grade: 5.90/6.00

September 2021- April 2024

IIT Kharagpur, India ([Transcript](#))

B.Tech in Mechanical Engineering

Micro-specialisation in Entrepreneurship and Innovation

Grade: 9.65/10.00

July 2017- May 2021

RESEARCH EXPERIENCE

Traversability Mapping for Off-road environments (Master's thesis)

NASA JPL, California

Guide: Dr. Shehryar Khattak, Perception Systems (347 J)

Sep 2023 - Apr 2024

- Developed an end-to-end Bird's eye View (BEV) based traversability and elevation mapping pipeline using multiple cameras and LiDAR inputs; self-supervised approach using hindsight for generating groundtruth
- Integrated and deployed in closed-loop with the planner to perform high-speed autonomous navigation

Neural point cloud based Dense RGB SLAM

ETH Zurich

Guide: Prof. Martin Oswald

Mar 2023 - Jun 2023

- Developed a dense monocular SLAM approach using a pointcloud-based neural occupancy field.
- Approach was based on extending point-slam with a monocular depth estimator and using geometric, photometric, warping and dense correspondence losses; performed evaluations on Replica and ScanNet datasets

Motion Estimation using Event-based Vision

Sony RDC, Zurich

Computer Vision Intern

Sep 2022 - Feb 2023

- Developed different spatio-temporal CNN-based approaches for spin estimation of a fast-rotating object
- Deployed and evaluated the approaches on a real-world setup after training only on synthetic event-data

Generalized Back-end for a Collaborative VI-SLAM framework (Sem. Thesis)

ETH Zurich

Guide: Prof. Margarita Chli, Vision for Robotics Lab

Mar 2022 - Aug 2022

- Developed a generalized backend for Collaborative VI-SLAM compatible with any arbitrary VIO, Stereo and tracking camera frontends; performed extensive evaluation, and released the framework as COVINS-G [\[Link\]](#)
- Backend utilizes only 2D keypoint information (no 3D landmarks) to estimate loop transformations
- Demonstrated collaborative SLAM in large scale outdoor environment and obtained performance at par with the existing SOTA approaches using different frontends (ORB-SLAM3, VINS-Mono, SVO-Pro, OpenVINS)

Lidar-directed Object detection in Subterranean environments

ETH Zurich

Guide: Dr. Shehryar Khattak, Robotic Systems Lab

Jul 2021 - Dec 2021

- Developed a clustering-based artifact proposal pipeline for SubT environments using Lidar range and intensity
- Deployed on ANYmal-C quadruped to facilitate the long-range object detection using a mounted PTZ camera
- Demonstrated artifact detection upto range of 12 metres on the dataset collected at DARPA SubT Challenge

Mapping of Archaeological Sites using UAVs (Bachelor Thesis)

MPI-IS, Tuebingen

Guide: Prof. Aamir Ahmad, Flight Robotics and Perception Group

May 2020 - Apr 2021

- 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
- 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 [\[Thesis\]](#)

PUBLICATIONS

- M Patel**, M Karrer, P Bänninger and M Chli (2023). “*COVINS-G: A generic Back-end for Collaborative Visual-Inertial SLAM framework*” In: IEEE International Conference on Robotics and Automation (ICRA 2023) [\[Link\]](#)
- M Patel**, G Waibel, S Khattak and M Hutter (2022). “*LiDAR-guided object search and detection in Subterranean Environment*” In: IEEE International Symposium on Safety, Security and Rescue Robotics (SSRR 2022) [\[Link\]](#)
- M Patel**, A Bandopadhyay and A Ahmad (2021). “*Collaborative Mapping of Archaeological Sites using multiple UAVs*” In: 16th Intelligent Autonomous Systems (IAS-16), Singapore [\[Link\]](#)

COURSE PROJECTS

- **3D Vision**: Learning-based methods for the task of reassembly of 3D fractured objects [\[Link\]](#)
- **Deep Learning for Autonomous Driving**: Projects on Multi-task Learning (Semantic Segmentation, Monocular Depth Estimation) and 3D Object Detection using LiDAR data
- **Vision Algorithms for mobile Robotics**: Implemented a Visual Odometry pipeline from scratch in MATLAB along with local Bundle Adjustment and evaluated the pipeline on 3 different datasets. [\[Link\]](#)
- **Planning and Decision Making for Autonomous Robots**: Implemented an RRT-based global planner and MPC-based trajectory tracking for navigation of a spaceship in simulation. [\[Link\]](#)
- **Probabilistic Artificial Intelligence** : Projects on (1) Bayesian Neural Network for classification on MNIST dataset, (2) Constrained Bayesian Optimization using Expected Improvement as the Acquisition function, (3) Advantage Actor Critic method for learning policy to land space-ship in a simulation-environment

SCHOLARSHIPS AND HONORS

2021	ETH D-MAVT Scholarship	<i>ETH Zurich</i>
	Full scholarship to pursue MSc. Robotics at ETH Zurich	
2021	Dr. B C Roy Memorial Gold Medal	<i>IIT Kharagpur</i>
	Adjudged best all-rounder among all graduating (1400) B.Tech students	
2021	Institute Silver Medal (Academic Rank 1)	<i>IIT Kharagpur</i>
	Highest Cumulative Grade in Mechanical Engineering among all graduating B.Tech students	
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	

TECHNICAL SKILLS

- **Programming** : Python, C++, C, PyTorch, MATLAB, ROS, OpenCV, PCL, Open3D, Docker
- **Software** : Gazebo, Airsim, Unreal Engine, Git, Solidworks, Cura, Mission Planner
- **Hardware** : Nvidia Jetson TX2/Nano, PixHawk, Ras-Pi, Arduino, Odroid

TEACHING EXPERIENCE

- **ETH Robotics Summer School (2023) Teaching Assistant**: Tasks involved creating tutorials, preparing hardware and software (SLAM, navigation, exploration) for the robots, and mentoring the students.
- **IEEE Winter Workshop Mentor (2018)**: Mentored a batch of 40 students in a week-long workshop on concepts of autonomous robotics. Supervised them to develop a self-balancing robot using arduino.
- **KRAIG Mentor (2018)**: 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 Group.

LEADERSHIP

2019 - 2020	Head, Technology Robotix Society	<i>IIT Kharagpur</i>
	Led a team of 42 people for organising Robotix'20, one of 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	