Manthan **Patel**

Research Engineer · ETH Zurich · Robotics & Learning

Leonhardstrasse 21, 8092 Zurich, Switzerland

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Research Interest

Main Areas Perception, Self-supervised learning, Navigation, 3D Vision, SLAM

Education

M.Sc. in Robotics Systems and Control - Grade: 5.9/6.0

ETH Zurich

Thesis: Learning Traversability Maps for Autonomous Off-road Navigation - Best grade 6.0/6.0

Sep. 2021 - Apr. 2024

B.Tech. in Mechanical Engineering - Academic Rank: 1/140

IIT Kharagpur

Thesis: Collaborative Mapping of Archaeological Sites using Multiple UAVs - Best grade 10.0/10.0

Micro-specialization in Entrepreneurship and Innovation

Sep. 2017 - Apr. 2021

Work and Research Experience

Research Engineer

Switzerland

ETH Zurich - Robotic Systems Lab

6/2024 - Present

- Geometric Foundation model for robotic perception
- Large-scale synthetic perception dataset for ground robots
- Long-range autonomous hiking with ANYmal legged robot

Visiting Researcher (Master's Thesis)

CA, USA

NASA - Jet Propulsion Laboratory

9/2023 - 4/2024

- Learning Traversability Maps for Autonomous Off-road Navigation using multiple cameras and LiDARs
- Development of the RoadRunner M&M framework and real-world field deployments

Research Project

Switzerland

ETH Zurich - Computer Vision Lab

3/2023 - 6/2023

- Dense monocular SLAM approach using a point cloud-based neural occupancy field
- Laid the foundation for the GlORIE SLAM framework

Computer Vision Intern

Switzerland

Sony Research and Development Center

9/2022 - 2/2023

- Spatio-temporal CNNs for Event-based Vision System
- Application for high-speed spin estimation of a rotating object

Semester Thesis

Switzerland

ETH Zurich - Vision for Robotics Lab

3/2022 - 8/2022

- Development of COVINS-G, a generic collaborative visual-inertial SLAM framework
- Large-scale collaborative SLAM with any arbitrary VIO, Stereo and tracking camera frontends

Research Project

Switzerland

ETH Zurich - Robotic Systems Lab

7/2021 - 12/2021

- Clustering-based object proposal pipeline for Subterranean environments using LiDAR range and intensity
- Application for long-range object detection using a Pan-Tilt-Zoom camera on ANYmal legged robot

Vising Researcher (Bachelor's Thesis)

Germany

MPI-Intelligent Systems - Robot Perception Group

5/2020 - 4/2021

- Collaborative SLAM approach for a team of UAVs for archaeological mapping
- Informative path-planning for autonomous archaeological mapping with bounded-distributive strategy

Student Researcher

India

IIT Kharagpur - Autonomous Ground Vehicle Research Group

2/2018 - 4/2021

- Path tracking for Ackermann steering-based vehicles using optimal control methods like LQR and MPC
- Design and development of localization and sensor integration modules for Mahindra e2o driverless car

Teaching

2024 **Student Supervision**, 2 x Master's Thesis *ETH Zurich*
2023 **Teaching Assistance**, ETH - Robotics Summer School - Dr. Cesar Cadena *ETH Zurich*
2018 **Mentor**, IEEE Winter Workshop on Autonomous robotics using Arduino *IIT Kharagpur*

Others

Scholarships and Awards

2023 **JPL Visiting Research Fellowship**, NASA Jet Propulsion Laboratory *USA*
2021 **ETH D-MAVT Scholarship**, for Master's Degree ETH Zurich *ETH Zurich*
2021 **Dr. B C Roy Memorial Gold Medal**, Best all-rounder among all graduating (1400) B.Tech students *IIT Kharagpur*
2021 **Institute Silver Medal (Academic Rank 1)**, Highest GPA, Department of Mechanical Engineering *IIT Kharagpur*
2021 **TKT Srikrishnan Endowment Prize**, for Best Bachelor's Thesis, Department of Mechanical Engineering *IIT Kharagpur*
2020 **DAAD-WISE**, for Bachelor's Thesis at MPI-IS *Germany*
2020 **OP Jindal Engineering and Management Scholarship**, for academic and leadership excellence *India*

Competitions

2020 **Inter-IIT Tech Meet 9.0**, First Place - Vision-based obstacle avoidance and exploration drone *IIT Guwahati*
2019 **Inter-IIT Tech Meet 8.0**, Second Place - UAV swarm solution - search and reconnaissance *IIT Roorkee*
2019 **27th Intelligent Ground Vehicle Competition (IGVC)**, Second Place - AutoNav Challenge *Michigan, USA*
2018 **Inter-IIT Tech Meet 7.0**, Third Place - Autonomous Agricultural Robot Prototype *IIT Bombay*

Others

2019 **Head, Robotix Society**, Led a team of 42 people for organizing one of India's biggest college robotics fest *IIT Kharagpur*
2018 **Volunteer**, National Service Scheme (NSS) for rural empowerment in India *Kharagpur*

Publications

Journal Articles

RoadRunner M&M-Learning Multi-range Multi-resolution Traversability Maps for Autonomous Off-road Navigation
Patel, Manthan, Jonas Frey, Deegan Atha, Patrick Spieler, Marco Hutter, Shehryar Khattak
IEEE Robotics and Automation Letters (RA-L) (2024)

RoadRunner - Learning Traversability Estimation for Autonomous Off-road Driving
Jonas Frey, **Patel Manthan**, Atha Deegan, Nubert Julian, Padgett Curtis, Spieler Patrick, Hutter Marco, Shehryar Khattak
IEEE Trans. Field Robotics (2024)

Glorie-slam: Globally optimized rgb-only implicit encoding point cloud slam
Ganlin Zhang, Erik Sandström, Youmin Zhang, **Patel, Manthan**, Luc Van Gool, Martin R Oswald
Under review IEEE Robotics and Automation Letters (RA-L) (2024)

Conference Proceedings

Covins-G: A generic back-end for collaborative visual-inertial slam
Patel, Manthan, Marco Karrer, Philipp Bänninger, Margarita Chli
2023 IEEE International Conference on Robotics and Automation (ICRA), 2023

LiDAR-guided object search and detection in Subterranean Environments
Patel, Manthan, Gabriel Waibel, Shehryar Khattak, Marco Hutter
2022 IEEE International Symposium on Safety, Security, and Rescue Robotics (SSRR), 2022

Collaborative mapping of archaeological sites using multiple uavs
Patel, Manthan, Aditya Bandopadhyay, Aamir Ahmad
International Conference on Intelligent Autonomous Systems, 2021