Manthan **Patel**

PhD Student · ETH Zurich · Robotics & Learning

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Research Interest

Main Areas Foundation models, Embodied AI, Perception, Navigation, SLAM, Datasets

Education

Ph.D. in Robotics - ongoing

ETH Zurich

Foundation Models for Perception and Navigation in the Wild.

Supervisors: prof. Marco Hutter, dr. Cesar Cadena

Oct. 2024 - Present

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

PhD Research Projects

Switzerland

ETH Zurich - Robotic Systems Lab

10/2024 - Present

- Hierarchical Vision Language Navigation Framework for Long Range Autonomy
- DeFM: Learning Foundation Representations from Depth for Robotics (Large-scale self-supervised pretraining)
- Large-scale synthetic perception dataset for ground robots (TartanGround)

Research Engineer

Switzerland

ETH Zurich - Robotic Systems Lab

6/2024 - 10/2024

- 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-Pr	**Student Supervision**, 8 x Master's Thesis, 3 x Semester Thesis, 3 x PLR projects	*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 (1/140)	*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

2024-Pr	**Reviewer Conferences & Journals**, ICRA, IROS, RA-L, CoRL, CVPR	*IIT Kharagpur*
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

WildOS: Open-Vocabulary Object Search in the Wild
Hardik Shah, **Manthan Patel**, Erica Tevere, Deegan Atha, Marcel Kaufmann, Shehryar Khattak, Marco Hutter, Jonas Frey, Patrick Spieler
IEEE Trans. Field Robotics (2026)

Large-Scale Autonomous Gas Monitoring for Volcanic Environments: A Legged Robot on Mount Etna
Julia Richter, Turcan Tuna, **Manthan Patel**, Takahiro Miki, Devon Higgins, James Fox, Cesar Cadena, Andres Diaz, Marco Hutter
IEEE Robotics & Automation Magazine (2026)

RoadRunner M&M-Learning Multi-range Multi-resolution Traversability Maps for Autonomous Off-road Navigation
Manthan Patel, 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, **Manthan Patel**, Deegan Atha, Julian Nubert, Curtis Padgett, Patrick Spieler, Marco Hutter, Shehryar Khattak
IEEE Trans. Field Robotics (2024)

Conference Proceedings

EgoHTR: Egocentric 4D Demonstrations of Human Terrain Traversal
Alex Brandes, Haig Conti Georges Sajelian, **Manthan Patel**, Dominik Hollidt, Chenhao Li, Matthias Heyrman, Oliver Hausdoerfer et.al.
Conf. on Robot Learning (CoRL) (2026)

CoMind: Understanding Collaborative Human Activity from Multiple Minds and Views
Alexey Gavryushin, Dingxi Zhang, Zhao Huang, Alexandros Delitzas, Jiaqi Chen, Ben Ellis, Cedric Zöllner, **Manthan Patel**, Manuel Kaufmann, Marc Pollefeys et.al.
Eur. Conf. on Computer Vision (ECCV) (2026)

NaviTrace: Evaluating Embodied Navigation of Vision-Language Models
Tim Windecker, **Manthan Patel**, Moritz Reuss, Richard Schwarzkopf, Cesar Cadena, Rudolf Lioutikov, Marco Hutter, Jonas Frey
IEEE International Conference on Robotics and Automation (ICRA), 2026

TartanGround: A Large-Scale Dataset for Ground Robot Perception and Navigation
Manthan Patel, Fan Yang, Yuheng Qiu, Cesar Cadena, Sebastian Scherer, Marco Hutter, Wenshan Wang
International Conference on Intelligent Robots and Systems (IROS), 2025

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

LiDAR-guided object search and detection in Subterranean Environments
Manthan Patel, 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
Manthan Patel, Aditya Bandopadhyay, Aamir Ahmad
International Conference on Intelligent Autonomous Systems, 2021

Workshops

Splat-slam: Globally optimized rgb-only slam with 3d gaussians
Erik Sandström, Ganlin Zhang, Keisuke Tateno, Michael Oechsle, Michael Niemeyer, Youmin Zhang, **Manthan Patel**, Luc Van Gool, Martin Oswald, Federico Tombari
Proceedings of the Computer Vision and Pattern Recognition Conference, 2025

Under Review / ArXiv

RangeNav: Task-Aligned LiDAR Range-Image Pretraining for Robot Navigation
Samuel Foo Enze, **Manthan Patel**, Fan Yang, Linus Kramer, Pascal Roth, Marco Hutter, Cesar Cadena
Under Review at ICRA (2027)

Common Sense Reasoning for Wild Navigation: Are Foundation Models Ready to Guide Robots?
Takahiro Miki, Robin Schmid, **Manthan Patel**, Turcan Tuna, Julia Richter, Julian Nubert, Joonho Lee, Matthias Müller, Marco Hutter
Under Review Science Robotics (2026)

DeFM: Learning Foundation Representations from Depth for Robotics
Manthan Patel, Jonas Frey, Mayank Mittal, Fan Yang, Alexander Hansson, Amir Bar, Cesar Cadena, Marco Hutter
Under Review T-RO (2026)

Vld: Visual language goal distance for reinforcement learning navigation
Lazar Milikic, **Manthan Patel**, Jonas Frey
Under Review (2026)

Glorie-slam: Globally optimized rgb-only implicit encoding point cloud slam
Ganlin Zhang, Erik Sandström, Youmin Zhang, **Manthan Patel**, Luc Van Gool, Martin R Oswald
arXiv Preprint (2024)

Design and implementation of path trackers for ackermann drive based vehicles
Adarsh Patnaik, **Manthan Patel**, Vibhakar Mohta, Het Shah, Shubh Agrawal, Aditya Rathore, Ritwik Malik et.al.
arXiv preprint (2020)