

Akash Patel

Postdoctoral Researcher – Robotics & Artificial Intelligence

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Employment History

Postdoctoral Researcher (full-time, 40 hrs/week, paid) | Luleå University of Technology, Sweden **Dec 2025 – Present**

Department of Computer Science, Electrical and Space Engineering — Robotics & Artificial Intelligence Group

- Prepare and deliver lectures, tutorials, seminars, and laboratory sessions for accredited Master's- and PhD-level courses in Advanced Robotics, Robotics, and Artificial Intelligence; design coursework, set and mark assignments and examinations, and conduct viva-voce assessments.
- Supervise PhD candidates and Master's thesis students in robotic autonomy, advising on research planning, experimental design, scientific writing, and dissemination of results.
- Conduct independent and collaborative scholarly research on autonomous navigation, semantic perception, and field robotics for operation in GPS-denied and subterranean environments, with the primary aim of publishing original results in peer-reviewed international journals indexed in Scopus and Web of Science.
- Author research articles, present findings at academic seminars and at national and international conferences, and serve as a peer reviewer for international robotics journals and conferences.
- Prepare competitive grant and project proposals for European Union and Swedish national funding bodies, including technical work-package design, research planning, budget development, and consortium coordination; manage externally funded projects by overseeing milestones, scientific deliverables, periodic reporting, and field-validation activities.
- Plan and lead complex international field-research campaigns for autonomous robotic systems, including expedition logistics and execution of mapping missions in challenging subsurface environments such as Icelandic lava tubes; build research collaborations with academic institutions and industrial partners.
- Attend departmental and faculty meetings, conferences, and seminars, and participate in curriculum review and academic planning for robotics programmes.

Doctoral Researcher (PhD Candidate) (full-time, 40 hrs/week, paid) | Luleå University of Technology, Sweden **Mar 2021 – Nov 2025**

Department of Computer Science, Electrical and Space Engineering — Robotics & Artificial Intelligence Group

- Held a paid full-time doctoral employment position at the university (employed as *doktorand* under Swedish higher-education law), with formal employment contract, regular salary, social insurance, and pension contributions.
- Prepared and delivered lectures, tutorials, seminars, and laboratory sessions for accredited Bachelor's- and Master's-level courses in Robotics and Artificial Intelligence (R7010E), including lectures for a Massive Open Online Course (MOOC) on robotic systems.
- Developed teaching materials including lecture slides, theoretical exercises, programming-based problem sets, and laboratory assignments; set, marked, and moderated coursework and examinations; advised students on academic and research matters during dedicated office hours.
- Supervised Master's thesis students and undergraduate research projects in mobile and aerial robotics, guiding experimental design, validation, field testing, and the development of novel control and navigation algorithms.
- Conducted independent doctoral research on exploration, autonomy, and navigation algorithms for robotic systems operating in GPS-denied environments, with end-to-end design, implementation, and field validation across mobile and aerial robotic platforms.

Employment History (continued)

- Authored research papers published in international peer-reviewed journals (including *IEEE Transactions on Robotics*, *Robotics and Autonomous Systems*, and *Journal of Intelligent & Robotic Systems*) and at major international conferences (*ICRA*, *IROS*, *IFAC World Congress*, *IEEE Aerospace*); presented findings as oral and poster presentations at international conferences.
- Led and coordinated work packages within European Commission– and industry-funded research projects, managing collaboration across academic and industrial partners, preparing technical proposals, overseeing scientific deliverables and periodic reporting, and supporting field deployment in underground mining test facilities.
- Attended departmental meetings, faculty seminars, and academic committees, and contributed to curriculum-related discussions for robotics-related courses.

R & D Intern (full-time, paid) | KUKA Systems Aerospace, Toulouse, France

Apr 2017 – Sep 2017

- Designed mechanical end-effector concepts for automated drilling and fastening operations on aircraft assembly lines, including conceptual layouts, kinematic analysis, and design reviews with senior engineers.
- Contributed to the design and integration of modular end-effector components for KUKA industrial robot systems, supporting prototype development and validation activities.

Education

Mar 2021 – Nov 2025

■ **Doctor of Philosophy (PhD), Robotics and Artificial Intelligence**

Luleå University of Technology, Luleå, Sweden.

Doctoral thesis: *Advanced Exploration and Navigation Autonomy for Robots in Complex GPS-denied Environments*.

Advisor: Prof. George Nikolakopoulos.

Sep 2018 – Jun 2020

■ **Master of Science (M.Sc.), Space Science and Technology**

Erasmus Mundus Joint Master Programme *SpaceMaster*.

Luleå University of Technology, Luleå, Sweden.

Master's thesis: *Design, Modelling and Control of a Space UAV for Mars Exploration*.

Aug 2014 – Jun 2018

■ **Bachelor of Technology (B.Tech.), Aerospace Engineering**

University of Petroleum and Energy Studies (UPES), Dehradun, India.

Research Publications

Journal Articles

- 1 **A. Patel** et al., "Towards field deployment of mavs in adaptive exploration of gps-denied subterranean environments," *Robotics and Autonomous Systems*, vol. 176, p. 104 663, 2024, ISSN: 0921-8890. <https://doi.org/10.1016/j.robot.2024.104663>.
- 2 **A. Patel**, S. Karlsson, B. Lindqvist, C. Kanellakis, A.-A. Agha-Mohammadi, and G. Nikolakopoulos, "Towards energy efficient autonomous exploration of mars lava tube with a martian coaxial quadrotor," *Advances in Space Research*, vol. 71, no. 9, pp. 3837–3854, 2023, Application of Artificial Intelligence in Tracking Control and Synchronization of Spacecraft, ISSN: 0273-1177. <https://doi.org/10.1016/j.asr.2022.11.014>.
- 3 **A. Patel**, B. Lindqvist, C. Kanellakis, A.-a. Agha-mohammadi, and G. Nikolakopoulos, "Ref: A rapid exploration framework for deploying autonomous mavs in unknown environments," *Journal of Intelligent & Robotic Systems*, vol. 108, no. 3, p. 35, 2023, ISSN: 1573-0409. 10.1007/s10846-023-01836-z.
- 4 M. A. V. Saucedo, **A. Patel**, T.-F. Blounas, C. Kanellakis, and G. Nikolakopoulos, "From entities to areas: A semantically driven clustering approach for area delimitation on 3d scene graphs," *Mechatronics*, vol. 117, p. 103 505, 2026. 10.1016/j.mechatronics.2026.103505.
- 5 B. Lindqvist, **A. Patel**, K. Löfgren, and G. Nikolakopoulos, "A tree-based next-best-trajectory method for 3-d uav exploration," *IEEE Transactions on Robotics*, vol. 40, pp. 3496–3513, 2024. 10.1109/TR0.2024.3422052.

- 6 M. A. Saucedo, **A. Patel**, C. Kanellakis, and G. Nikolakopoulos, "Eat: Environment agnostic traversability for reactive navigation," *Expert Systems with Applications*, vol. 244, p. 122 919, 2024, ISSN: 0957-4174. <https://doi.org/10.1016/j.eswa.2023.122919>.
- 7 A. Mukundan, **A. Patel**, B. Shastri, H. Bhatt, A. Phen, and H.-C. Wang, "The dvaraka initiative: Mars's first permanent human settlement capable of self-sustenance," *Aerospace*, vol. 10, no. 3, 2023, ISSN: 2226-4310. 10.3390/aerospace10030265.

Conference Proceedings

- 1 **A. Patel** et al., "A hierarchical graph-based terrain-aware autonomous navigation approach for complementary multimodal ground-aerial exploration," in *2025 IEEE International Conference on Robotics and Automation (ICRA)*, 2025, pp. 15 879–15 885. 10.1109/ICRA55743.2025.11128079.
- 2 **A. Patel**, M. A. V. Saucedo, C. Kanellakis, and G. Nikolakopoulos, "Stage: Scalable and traversability-aware graph based exploration planner for dynamically varying environments," in *2024 IEEE International Conference on Robotics and Automation (ICRA)*, 2024, pp. 5949–5955. 10.1109/ICRA57147.2024.10610939.
- 3 **A. Patel** et al., "Dronecom: Dynamic relay operations for network efficient communication in underground mines," in *2024 24th International Conference on Control, Automation and Systems (ICCAS)*, 2024, pp. 1206–1211. 10.23919/ICCAS63016.2024.10773079.
- 4 **A. Patel**, C. Kanellakis, A.-A. Agha-Mohammadi, and G. Nikolakopoulos, "Traversability aware graph-based subterranean exploration with unmanned aerial vehicles*," 2, 22nd IFAC World Congress, vol. 56, 2023, pp. 9263–9268. <https://doi.org/10.1016/j.ifacol.2023.10.072>.
- 5 **A. Patel**, C. Kanellakis, and G. Nikolakopoulos, "Multi agent coordination strategy for collaborative exploration of gps-denied environments," in *2023 IEEE International Conference on Robotics and Biomimetics (ROBIO)*, 2023, pp. 1–6. 10.1109/ROBIO58561.2023.10354634.
- 6 **A. Patel**, A. Banerjee, B. Lindqvist, C. Kanellakis, and G. Nikolakopoulos, "Design and model predictive control of a mars coaxial quadrotor," in *2022 IEEE Aerospace Conference (AERO)*, 2022, pp. 1–11. 10.1109/AERO53065.2022.9843799.
- 7 **A. Patel**, C. Kanellakis, and G. Nikolakopoulos, "Traversable frontiers based autonomous exploration strategy for deploying mavs in subterranean environments," in *2022 Eighth Indian Control Conference (ICC)*, 2022, pp. 260–265. 10.1109/ICC56513.2022.10093322.
- 8 **A. Patel**, B. Lindqvist, C. Kanellakis, and G. Nikolakopoulos, "Fast planner for mav navigation in unknown environments based on adaptive search of safe look-ahead poses," in *2022 30th Mediterranean Conference on Control and Automation (MED)*, 2022, pp. 545–550. 10.1109/MED54222.2022.9837293.
- 9 V. K. Viswanathan, **A. Patel**, M. A. Saucedo, S. G. Satpute, C. Kanellakis, and G. Nikolakopoulos, "Spade: Towards scalable path planning architecture on actionable multi-domain 3d scene graphs," in *2025 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2025, pp. 17 510–17 517. 10.1109/IROS60139.2025.11246795.
- 10 M. A. Saucedo, **A. Patel**, A. Saradagi, C. Kanellakis, and G. Nikolakopoulos, "Belief scene graphs: Expanding partial scenes with objects through computation of expectation," in *2024 IEEE International Conference on Robotics and Automation (ICRA)*, 2024, pp. 9441–9447. 10.1109/ICRA57147.2024.10611352.
- 11 M. A. Saucedo, N. Stathouloupoulos, **A. Patel**, C. Kanellakis, and G. Nikolakopoulos, "Leveraging computation of expectation models for commonsense affordance estimation on 3d scene graphs," in *2024 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2024, pp. 9797–9802. 10.1109/IROS58592.2024.10802560.

Books and Chapters

- 1 **A. Patel**, A. Banerjee, A. Papadimitriou, and B. Lindqvist, "Chapter 4 - control of arws," in *Aerial Robotic Workers*, G. Nikolakopoulos, S. Sharif Mansouri, and C. Kanellakis, Eds., Butterworth-Heinemann, 2023, pp. 49–65, ISBN: 978-0-12-814909-6. <https://doi.org/10.1016/B978-0-12-814909-6.00010-X>.
- 2 **A. Patel**, S. Karlsson, B. Lindqvist, and A. Koval, "Chapter 7 - exploration with arws," in *Aerial Robotic Workers*, G. Nikolakopoulos, S. Sharif Mansouri, and C. Kanellakis, Eds., Butterworth-Heinemann, 2023, pp. 109–127, ISBN: 978-0-12-814909-6. <https://doi.org/10.1016/B978-0-12-814909-6.00013-5>.

Technical Skills & Competencies

Research areas	Autonomous mobile and aerial robotics; SLAM and state estimation in GPS-denied environments; graph-based and sampling-based motion planning; semantic perception with vision language models; field robotics for underground inspection.
Programming	C++, Python, CSS, MATLAB, Bash, JavaScript/TypeScript.
Robotics & perception	ROS (ROS 1 and ROS 2), Gazebo simulation, Occupancy Mapping, vision language segmentation pipelines, hands on experience on robotics hardware during numerous field deployments.
DevOps & tooling	Docker (multi-architecture, including NVIDIA Jetson AGX Orin), Git/GitHub, GitLab CI, NVIDIA CUDA, Linux system administration; React, Three.js, WebSockets for robot tele-operation interfaces.
Teaching & supervision	University-level teaching in robotics and artificial intelligence across lectures, tutorials, seminars, and laboratory classes; preparation of course materials, learning activities, and assessment tasks aligned with curriculum outcomes; marking and moderation of assignments and examinations; student consultation and academic mentoring; supervision and co-supervision of Master’s thesis students, undergraduate research projects, and doctoral candidates with guidance in research design, experimental methodology, technical writing, and dissemination of scholarly work.
Academic & languages	Peer review for international robotics conferences and journals; thesis supervision; competitive grant and project-proposal preparation; field-trial leadership. Languages: English (full professional proficiency), Hindi (native), Gujarati (native), Swedish (basic).