

MIHIR KULKARNI

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PERSONAL INFORMATION

Full Name: Mihir Vinay Kulkarni

Nationality: Indian

Email: mihirk284@gmail.com

Languages: English, Marathi, Hindi, Norwegian (B1)



EDUCATION

- Ph.D. in Engineering Cybernetics** *January 2022 - August 2025*
Norwegian University of Science and Technology
Department of Engineering Cybernetics
Dissertation: [Vision-based Navigation for Aerial Robots: From Parallelized Simulation to Resilient Flight in Cluttered Environments.](#)
Advisors: [Prof. Dr. Kostas Alexis](#) (*supervisor*), [Prof. Dr. Davide Scaramuzza](#) (*co-supervisor*)
Committee: Prof. Dr. Georgia Chalvatzaki, Prof. Dr. Dimitrios Kanoulas, Prof. Dr. Damiano Varagnolo
- M.S. in Computer Science and Engineering** *August 2020 - December 2021*
University of Nevada, Reno
Department of Computer Science and Engineering
- B.E. in Mechanical Engineering** *August 2016 - July 2020*
Birla Institute of Technology and Science, Pilani (Goa Campus)
Department of Mechanical Engineering

EXPERIENCE

Researcher *Sep 2025 - Present*
Department of Engineering Cybernetics, NTNU *Trondheim, Norway*

- Building foundation control/navigation policies transferable across arbitrary aerial platforms.
- Contributed support for multirotor platforms for [NVIDIA Isaac Lab](#).
- Designed and fabricated [UniPilot](#), a hardware-software autonomy module for diverse platforms.
- Currently developing the [Unified Autonomy Stack](#), enabling autonomy across diverse platforms.

PhD Candidate *Jan 2022 - Aug 2025*
Department of Engineering Cybernetics, NTNU *Trondheim, Norway*

- Open-sourced methods to derive verifiable compressed representations from depth images.
- Contributed and field tested uncertainty-aware methods for GNSS-denied autonomous navigation.
- Created and open-sourced the [Aerial Gym Simulator](#) (*Stars: 661, Forks: 100*). Control and navigation policies bridging the sim2real gap can be trained in minutes.
- Developed and field tested [vision-driven RL policies](#) for navigation in densely cluttered environments.
- Experienced in training and deploying state- and exteroception-driven policies from sim2real.

Graduate Research Assistant *Jan 2021 - Dec 2021*
Department of Computer Science and Engineering, UNR *Reno, USA*

- Collaborated with a multi-disciplinary team of 50+ researchers across US and Europe for the [DARPA Subterranean\(SubT\) Challenge](#).
- Led the artifact detection sub-system for the SubT Challenge, correctly detecting the highest number of artifacts. Performed hardware customization and software integration for aerial and wheeled systems.
- Developed [COHORT](#) a heterogeneous multi-robot exploration path planning framework.

AWARDS AND ACHIEVEMENTS

1. **Winner – DARPA Subterranean Challenge** Final Event (USD 2mn prize) 2021
2. **Outstanding Deployed Systems Paper Award – IEEE ICRA** 2022
3. **Best Paper Award – IEEE ICAR** 2023
4. **Certificate of Special Congressional Recognition – United States Senate** 2021

JOURNAL PUBLICATIONS

1. G. Malczyk, M. Kulkarni and K. Alexis, “**Semantically-Driven Deep Reinforcement Learning for Inspection Path Planning**,” IEEE Robotics and Automation Letters. DOI.
2. M. Kulkarni, W. Rehberg and K. Alexis, “**Aerial Gym Simulator: A Framework for Highly Parallelized Simulation of Aerial Robots**,” IEEE Robotics and Automation Letters. DOI.
3. M. Tranzatto, M. Dharmadhikari, L. Bernreiter, M. Camurri, S. Khattak, F. Mascarich, P. Pfrendschuh, D. Wisth, S. Zimmermann, M. Kulkarni, V. Reijgwart, B. Casseau, T. Homberger, P. De Petris, L. Ott, W. Tubby, G. Waibel, H. Nguyen, C. Cadena, R. Buchanan, L. Wellhausen, N. Khedekar, O. Andersson, L. Zhang, T. Miki, T. Dang, M. Mattamala, M. Montenegro, K. Meyer, X. Wu, A. Briod, M. Mueller, M. Fallon, R. Siegwart, M. Hutter, K. Alexis, “**Team CERBERUS Wins the DARPA Subterranean Challenge: Technical Overview and Lessons Learned**”, Field Robotics. DOI.
4. M. Tranzatto, T. Miki, M. Dharmadhikari, L. Bernreiter, M. Kulkarni, F. Mascarich, O. Andersson, S. Khattak, M. Hutter, R. Siegwart, K. Alexis, “**CERBERUS in the DARPA Subterranean Challenge**” Science Robotics. DOI.
5. F. Mascarich, M. Kulkarni, P. de Petris, T. Wilson, K. Alexis, “**Autonomous Mapping and Spectroscopic Analysis of Distributed Radiation Fields using Aerial Robots**”, Autonomous Robots. DOI.
6. M. Tranzatto, F. Mascarich, L. Bernreiter, C. Godinho, M. Camurri, S. Khattak, T. Dang, V. Reijgwart, J. Loje, D. Wisth, S. Zimmermann, H. Nguyen, M. Fehr, L. Solanka, R. Buchanan, M. Bjelonic, N. Khedekar, M. Valceschini, F. Jenelten, M. Dharmadhikari, T. Homberger, P. De Petris, L. Wellhausen, M. Kulkarni, T. Miki, S. Hirsch, M. Montenegro, C. Papachristos, F. Tresoldi, J. Carius, G. Valsecchi, J. Lee, K. Meyer, X. Wu, J. Nieto, A. Smith, M. Hutter, R. Siegwart, M. Mueller, M. Fallon, K. Alexis, “**CERBERUS: Autonomous Legged and Aerial Robotic Exploration in the Tunnel and Urban Circuits of the DARPA Subterranean Challenge**”, Field Robotics. DOI.

CONFERENCE PUBLICATIONS

1. G. Malczyk, M. Kulkarni, K. Alexis “**Reinforcement Learning for Active Perception in Autonomous Navigation**”. IEEE International Conference on Robotics and Automation (ICRA) 2026. DOI.
2. E. Arza, W. Rehberg, P. Weiss, M. Kulkarni, K. Alexis “**Performance-guided Task-specific Optimization for Multirotor Design.**” *Under Review*. DOI.
3. M. Kulkarni, M. Dharmadhikari, N. Khedekar, M. Nissov, M. Singh, P. Weiss and K. Alexis, 2025. “**UniPilot: Enabling GPS-Denied Autonomy Across Embodiments**”. IEEE International Conference on Advanced Robotics (ICAR) 2025. DOI.
4. M. Harms, M. Kulkarni, N. Khedekar, M. Jacquet, K. Alexis. “**Neural Control Barrier Functions for Safe Navigation**”. IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2024. DOI.
5. M. Kulkarni and K. Alexis. “**Reinforcement Learning for Collision-free Flight Exploiting Deep Collision Encoding**”. IEEE International Conference on Robotics and Automation (ICRA) 2024. DOI.
6. M. Dharmadhikari, P. De Petris, M. Kulkarni, N. Khedekar, H. Nguyen, A.E. Stene, E. Sjøvold, K. Solheim, Bente Gussiaas, and Kostas Alexis. “**Autonomous Exploration and General**

- Visual Inspection of Ship Ballast Water Tanks using Aerial Robots.”**, IEEE International Conference on Advanced Robotics (ICAR) 2023. *Winner - Best Paper Award*. [DOI](#).
7. [M. Kulkarni](#) and K. Alexis, “**Task-driven Compression for Collision Encoding based on Depth Images**”. International Symposium on Visual Computing (ISVC) 2023. [DOI](#).
 8. [M. Kulkarni](#), H. Nguyen, and K. Alexis. “**Semantically-enhanced Deep Collision Prediction for Autonomous Navigation using Aerial Robots**”. IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2023. [DOI](#).
 9. M. Dharmadhikari, P. De Petris, H. Nguyen, [M. Kulkarni](#), N. Khedekar and K. Alexis, “**Manhole Detection and Traversal for Exploration of Ballast Water Tanks using Micro Aerial Vehicles**”, International Conference on Unmanned Aircraft Systems (ICUAS) 2023, [DOI](#).
 10. N. Khedekar, [M. Kulkarni](#) and K. Alexis, “**MIMOSA: A Multi-Modal SLAM Framework for Resilient Autonomy against Sensor Degradation**”, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2022. [DOI](#).
 11. P. De Petris, H. Nguyen, M. Dharmadhikari, [M. Kulkarni](#), N. Khedekar, F. Mascarich, and K. Alexis. “**RMF-Owl: A Collision-Tolerant Flying Robot for Autonomous Subterranean Exploration.**”, International Conference on Unmanned Aircraft Systems (ICUAS) 2022. [DOI](#).
 12. [M. Kulkarni](#), M. Dharmadhikari, M. Tranzatto, S. Zimmermann, V. Reijgwart, P. De Petris, H. Nguyen, N. Khedekar, C. Papachristos, L. Ott, R. Siegwart, M. Hutter, and K. Alexis, “**Autonomous Teamed Exploration of Subterranean Environments using Legged and Aerial Robots**”, IEEE International Conference on Robotics and Automation (ICRA) 2022. [DOI](#). *Winner - Outstanding Deployed Systems Paper Award*.
 13. P. De Petris, H. Nguyen, [M. Kulkarni](#), F. Mascarich and K. Alexis, “**Resilient Collision-tolerant Navigation in Confined Environments**”, 2021 IEEE International Conference on Robotics and Automation (ICRA), 2021. [DOI](#).
 14. [M. Kulkarni](#), H. Nguyen, and K. Alexis, “**The Reconfigurable Aerial Robotic Chain: Shape and Motion Planning**”. IFAC World Congress, 2020. [DOI](#).

BOOK CHAPTERS AND WHITE PAPERS

1. [M. Kulkarni](#) et. al. “**Aerial Field Robotics**”, Encyclopedia of Robotics. [DOI](#).
2. M. Mittal et. al. “**Isaac Lab: A GPU Accelerated Simulation Framework For Multi-Modal Robot Learning**”. [DOI](#).
3. M. Dharmadhikari et. al. “**The Unified Autonomy Stack: Toward a Blueprint for Generalizable Robot Autonomy**”. [Link](#).

SKILLS AND PROFICIENCIES

1. **AI/ML:** Deep Learning, Reinforcement Learning, Computer Vision
2. **Robotics:** SLAM, Path Planning, Multi-robot coordination, Field Robotics, Sim2Real Transfer, GNSS-denied navigation
3. **Robotics Middleware and Tools:** ROS, ROS 2, PX4
4. **Simulation:** NVIDIA Isaac Gym/Sim/Lab, Gazebo, Blender
5. **Programming:** Python, C++, PyTorch, NVIDIA Warp, Docker, CI/CD
6. **Mechanical:** SOLIDWORKS, PTC Creo, Autodesk Fusion, Onshape
7. **Hardware:** Rapid prototyping, PCB Design, Autopilot Systems
8. **Licenses:** Remote UAS Pilot - A1,A2,A3 (EASA)

TALKS AND LECTURES

1. **PX4 Developer Summit 2025** - “From Pixels To Propellers: Sim2Real Control and Vision-based Navigation”. [Link](#)
2. **Invited Lecture: Worcester Polytechnic Institute:** “Reinforcement learning for control and navigation of aerial robots”

3. **Tutorial: Learning-oriented Simulation for Aerial Robots, SSCI 2025** - “Aerial Gym 2.0: Isaac Gym-based Massively Parallelized Simulation for Efficient Aerial Robot Learning”

OPEN SOURCE CONTRIBUTIONS

1. **Unified Autonomy Stack** - a field-tested autonomy architecture commanding a diverse set of robots. [GitHub Website](#)
2. **Aerial Gym Simulator** - massively parallelized aerial robot simulator based on NVIDIA Isaac Gym. [GitHub Website](#).
3. **Semantically-enhanced Variational Autoencoder**. [GitHub](#).
4. **GSOC 2020: Sensor Data Visualization** - Open Robotics. [Link](#).
5. **Simulation Models** - Team CERBERUS - DARPA Subterranean Challenge Simulator. [GitHub](#).
6. **SuperMegaBot Simulator** - Team CERBERUS Roving Robot [GitHub](#).

PROGRAMS, INTERNSHIPS AND EXPERIENCE

1. Nordic Probabilistic AI School - ProbAI *June 2023*
2. Google Summer of Code 2020, Open Robotics *May 2020 - Sep 2020*
3. Visiting Scholar, University of Nevada, Reno *June 2019 - Jan 2020*
4. Summer Research Intern, CSIR-CEERI Pilani, India *May 2018 - July 2018*

MEDIA COVERAGE

1. **IEEE Spectrum**: Video Friday
 - (a) Reinforcement Learning for Collision-free Flight Exploiting Deep Collision Encoding. [Link](#)
 - (b) Autonomous Teamed Exploration of Subterranean Environments using Legged and Aerial Robots. [Link](#)
 - (c) Semantically-enhanced Deep Collision Prediction for Autonomous Navigation using Aerial Robots. [Link](#)
 - (d) DARPA SubT Finals: Robot Operator Wisdom. [Link](#)
2. **The Washington Post Magazine**: “The Pentagon’s \$82 Million Super Bowl of Robots”. [Link](#)
3. **Teknisk Ukeblad**: “Seier for NTNU-basert robotmiljø: Bedre enn både Nasa og MIT”. [Link](#)
4. **Gemini.no** “Vant 17 millioner med undergrunnsroboter”. [Link](#)
5. **GazeboSim Community**: GSOC 2020: Sensor Data Visualisation. [Link](#)
6. **BITS R&D**: Thesis at The University of Nevada, Reno. [Link](#)

ACADEMIC SERVICE

1. **Associate Editor**: IEEE/RSJ IROS (*2026*)
2. **Reviewer (Journals)**: RA-L, RAM, IJRR, T-RO, T-FR, IJRR
3. **Reviewer (Conferences)**: ICRA, IROS, ICUAS, ICAR

LEADERSHIP AND EXTRACURRICULAR ACTIVITIES

1. **Chief Coordinator**, Aerodynamics Club, BITS Pilani *Mar 2018 - May 2019*
2. **Sub-Coordinator**, Electronics and Robotics Club, BITS Pilani *Apr 2018 - May 2019*
3. **Electronics Team Lead**, Hyperloop India *Mar 2018 - Jan 2019*

TEACHING AND RESEARCH EXPERIENCE

1. **Teaching Assistant** - Computer Programming (BITS Pilani) *Jan 2020 - May 2020*
2. **Instructor** - Intermediate Robotics (CTE, BITS Pilani) *Jan 2019 - May 2019*
3. **Instructor** - Introduction to Robotics (CTE, BITS Pilani) *Aug 2018 - Dec 2018*