

# MIHIR VINAY KULKARNI

Researcher at the [Norwegian University of Science and Technology \(NTNU\)](#)

[mihirk284@gmail.com](mailto:mihirk284@gmail.com) | +(47)93933035 | [GitHub](#) | [Google Scholar](#)

## EDUCATION

---

**Ph.D. Engineering Cybernetics**

*January 2022 - August 2025*

Norwegian University of Science and Technology

Department of Engineering Cybernetics

**M.S. Computer Science and Engineering**

*August 2020 - December 2021*

University of Nevada, Reno

Department of Computer Science and Engineering

(GPA: 3.875/4.0)

**B.E. Mechanical Engineering**

*August 2016 - July 2020*

Birla Institute of Technology and Science, Pilani (Goa Campus)

Department of Mechanical Engineering

(GPA: 8.66/10)

## JOURNAL PUBLICATIONS

---

- G. Malczyk, **M. Kulkarni** and K. Alexis, “**Semantically-Driven Deep Reinforcement Learning for Inspection Path Planning**,” IEEE Robotics and Automation Letters. Available at <https://doi.org/10.1109/LRA.2025.3575331>.
- **M. Kulkarni**, W. Rehberg and K. Alexis, “**Aerial Gym Simulator: A Framework for Highly Parallelized Simulation of Aerial Robots**,” IEEE Robotics and Automation Letters. Available at <https://doi.org/10.1109/LRA.2025.3548507>.
- 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. Available at <https://doi.org/10.48550/arXiv.2207.04914>.
- 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. Available at <https://www.science.org/doi/abs/10.1126/scirobotics.abp9742>.
- 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. Available at <https://doi.org/10.1007/s10514-022-10064-7>.
- 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. Available at <https://doi.org/10.55417/fr.2022011>.

## CONFERENCE PUBLICATIONS

---

- 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. Available at: <https://doi.org/10.48550/arXiv.2509.11793>.
- 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. Available at: <https://doi.org/10.1109/IROS58592.2024.10802694>.
- M. Kulkarni and K. Alexis. **“Reinforcement Learning for Collision-free Flight Exploiting Deep Collision Encoding”**. IEEE International Conference on Robotics and Automation (ICRA) 2024. Available at <https://doi.org/10.48550/arXiv.2402.03947>.
- 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*. Available at <https://doi.org/10.48550/arXiv.2311.03838>.
- M. Kulkarni and K. Alexis, **“Task-driven Compression for Collision Encoding based on Depth Images”**. International Symposium on Visual Computing (ISVC) 2023. Available at <https://doi.org/10.48550/arXiv.2309.05289>.
- 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. Available at <https://doi.org/10.48550/arXiv.2307.11522>.
- M. Dharmadhikari, P. De Petris, H. Nguyen, M. Kulkarni, N. Khedekar and K. Alexis, **“Man-hole Detection and Traversal for Exploration of Ballast Water Tanks using Micro Aerial Vehicles”**, International Conference on Unmanned Aircraft Systems (ICUAS) 2023, Available at <https://doi.org/10.1109/ICUAS57906.2023.10156214>.
- 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.
- 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. Available at <https://doi.org/10.1109/ICUAS54217.2022.9836115>.
- 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. Available at <https://doi.org/10.1109/ICRA46639.2022.9812401>. *Winner - Outstanding Deployed Systems Paper Award*.
- 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. Available at <https://doi.org/10.1109/ICRA48506.2021.9561999>.
- M. Kulkarni, H. Nguyen, and K. Alexis, **“The Reconfigurable Aerial Robotic Chain: Shape and Motion Planning”**. IFAC World Congress, 2020. Available at <https://doi.org/>

## WHITEPAPERS

---

- M. Mittal et. al. “Isaac Lab: A GPU Accelerated Simulation Framework For Multi-Modal Robot Learning”. Available at: <https://research.nvidia.com/publication/2025-09-isaac-lab-gpu-accelerated-simulation-framework-multi-modal-robot-learning>.
- M. Dharmadhikari et. al. “The Unified Autonomy Stack: Toward a Blueprint for Generalizable Robot Autonomy”. Available at: [https://ntnu-arl.github.io/unified\\_automony\\_stack/report/UnifiedAutonomyStack-Outline/](https://ntnu-arl.github.io/unified_automony_stack/report/UnifiedAutonomyStack-Outline/)

## BOOK CHAPTERS

---

- **Mihir Kulkarni**, Brady Moon, Sebastian Scherer, Kostas Alexis, “**Aerial Field Robotics**”, Encyclopedia of Robotics. Available at [https://doi.org/10.1007/978-3-642-41610-1\\_221-1](https://doi.org/10.1007/978-3-642-41610-1_221-1).

## TALKS AND LECTURES

---

- PX4 Developer Summit 2025 - **From Pixels To Propellers: Sim2Real Control and Vision-based Navigation**. [Link](#)
- Invited Lecture - WPI RBE-595-F02-ST: **Reinforcement learning for control and navigation of aerial robots**
- Learning-oriented Simulation for Aerial Robots, SSCI 2025 - **Tutorial: Aerial Gym 2.0: Isaac Gym-based Massively Parallelized Simulation for Efficient Aerial Robot Learning**

## AWARDS AND ACHIEVEMENTS

---

- Best Paper Award IEEE ICAR 2023
- Outstanding Deployed Systems Paper Award IEEE ICRA 2022
- Certificate of Special Recognition United States Senate (2021)
- Winner - Prize Round DARPA Subterranean Challenge (2021)

## OPEN SOURCE CONTRIBUTIONS

---

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

## PROGRAMS, INTERNSHIPS AND EXPERIENCE

---

Nordic Probabilistic AI School.

*June 2023*

Google Summer of Code 2020, OpenRobotics.

*May 2020 - September 2020*

Visiting Scholar, Autonomous Robots Lab, University of Nevada, Reno.

*June 2019 - January 2020*

Summer Research Intern, CSIR-CEERI Pilani, India.

*May 2018 - July 2018*

## TECHNICAL SKILLS AND PROFICIENCIES

---

**Programming Languages** - C, C++, Python

**Mechanical Design** - SOLIDWORKS, PTC Creo, Autodesk Fusion 360

**Proficient in ROS, ROS 2, Gazebo Classic and (Ignition) Gazebo**

**Experienced in mechanical design, hardware and sensor integration and full-stack autonomy integration for high-performance mobile robotic platforms.**

## PRINT AND DIGITAL MEDIA

---

- Multiple features in IEEE Spectrum - Video Friday
  - Reinforcement Learning for Collision-free Flight Exploiting Deep Collision Encoding. <https://www.youtube.com/watch?v=gPrT21sbpTY>
  - Autonomous Teamed Exploration of Subterranean Environments using Legged and Aerial Robots. <https://spectrum.ieee.org/video-friday-perseverance-autonomy>
  - Semantically-enhanced Deep Collision Prediction for Autonomous Navigation using Aerial Robots. <https://spectrum.ieee.org/video-friday-resilient-bugbots>.
- Featured in The Washington Post Magazine “The Pentagon’s \$82 Million Super Bowl of Robots” <https://www.washingtonpost.com/magazine/2021/11/10/darpa-robot-competition/>.
- Featured in the Teknisk Ukeblad article “Seier for NTNU-basert robotmiljø: Bedre enn både Nasa og MIT” <https://www.tu.no/artikler/seier-for-ntnu-basert-robotmiljo-bedre-enn-ba-de-nasa-og-mit/513808>.
- GazeboSim Community: GSOC 2020: Sensor Data Visualisation <https://community.gazebosim.org/t/gsoc-2020-sensor-data-visualization/638>.
- BITS R&D Post: Thesis at The University of Nevada, Reno <https://bitsrnd.wordpress.com/2020/04/21/mihir-kulkarnis-thesis-at-university-of-nevada-reno/>.

## JOURNALS AND CONFERENCES REFEREED

---

**Journals:** IEEE RA-L, IEEE RAM, IJRR, IEEE T-RO, IEEE T-FR

**Conferences:** IEEE ICRA, IEEE/RSJ IROS, IEEE ICUAS, IEEE ICAR

## POSITIONS OF RESPONSIBILITY

---

**Chief Coordinator, Aerodynamics Club, BITS Pilani**

*March 2018 - May 2019*

**Sub-Coordinator, Electronics and Robotics Club, BITS Pilani**

*April 2018 - May 2019*

**Electronics Team Lead, Hyperloop India**

*March 2018 - January 2019*

## TEACHING AND RESEARCH EXPERIENCE

---

**Graduate Research Assistant** - Department of CSE, UNR

*Jan 2021 - Dec 2021*

**Teaching Assistant** - Computer Programming (Department of CSE, BITS Pilani)

*Jan 2020 - May 2020*

**Instructor** - Intermediate Robotics (Center for Technical Education, BITS Pilani)

*Jan 2019 - May 2019*

**Instructor** - Introduction to Robotics (Center for Technical Education, BITS Pilani)

*Aug 2018 - Dec 2018*