

Yash Turkar

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RESEARCH INTERESTS

My research centers on utility-aware robot perception: understanding how the quality of visual data shapes downstream performance, and how robots can act to acquire more informative measurements. I am particularly interested in the perception–action loop for field robots in challenging environments, with an emphasis on active sensing, low-light vision, and robust visual navigation under real-world sensing constraints.

RESEARCH EXPERIENCE

Graduate Research Assistant, University at Buffalo, Buffalo, NY Jan 2022 – Present

Conducted research in perception & autonomy for field robots — VLM-based view planning, active low-light imaging, and mapping-quality metrics. Formulated hypotheses, designed controlled experiments and ablations, built reproducible evaluation pipelines, and validated results across simulation and field deployments.

Autonomy Intern - Skydio, San Mateo, CA Jan 2026 – May 2026

Developed and deployed learning-based perception algorithms for distribution pole detection and localization as part of the inspection and mapping team.

Intern — Autonomous Robotics (SLB), Houston, TX May 2023 – Aug 2023

Built a sensing-modality evaluation framework (LiDAR/RGB/thermal), validated on quadrupeds, yielding data-driven sensor/configuration recommendations for autonomous inspection.

Intern — Autonomous Robotics (SLB), Houston, TX May 2022 – Aug 2022

Benchmarked dense SLAM with mixed sim/field datasets for onshore inspection, improving robustness and frequency of inspection, deployed on quadruped robots in a proof-of-concept.

TEACHING EXPERIENCE

Instructor/Teaching Fellow, CSE 4/568 Robotics Algorithms Aug 2024 – Dec 2024

- Completely re-designed syllabus; created ROS-based programming assignments for 50+ students
- Taught first-principles autonomy. Material included kinematics, probabilistic algorithms for localization and mapping, planning, and navigation

Teaching Assistant, CSE 4/568 Robotics Algorithms Jan 2022 – Dec 2023

- Led weekly discussions; held office hours; graded exams
- Designed auto-graded assignments; maintained Piazza and course GitHub

EDUCATION

2022 - present PhD (Computer Science) at **University at Buffalo**
2021 - 2023 Master's (Computer Science) at **University at Buffalo**
2016 - 2020 Bachelor's (Computer Engineering) at **University of Mumbai**

SELECTED PUBLICATIONS

- [1] Y. **Turkar**, Y. Kim, and K. Dantu, “Active illumination control in low-light environments,” in *International Symposium on Experimental Robotics (ISER) 2025, Santa Fe, NM, USA*, Preprint arxiv:2506.06394.
- [2] P. Meshram, Y. **Turkar**, K. Singh, P. R. Masilamani, C. Adhivarahan, and K. Dantu, “Qal: A loss for recall–precision balance in 3d reconstruction,” in *IEEE/CVF Winter Conference on Applications of Computer Vision, WACV 2026*, Preprint at arXiv:2511.17824, 2026.
- [3] K. Singh, Y. Kim, Y. **Turkar**, and K. Dantu, “Cart: Context-aware terrain adaptation using temporal sequence selection for legged robots,” in *International Symposium of Robotics Research (ISRR) 2026 (Accepted)*, arXiv:2604.14344, 2026.
- [4] Y. **Turkar**, T. Chase Jr, C. Aluckal, and K. Dantu, “Learning visual information utility with pixer,” in *23rd Conference on Robots and Vision (CRV), 2026*, Preprint at arXiv:2409.13151, 2026.
- [5] Y. **Turkar** and K. Dantu, “Generating synthetic illumination variation from sparse co-located captures,” in *3rd Workshop on Synthetic Data for Computer Vision (SynData4CV), CVPR, 2026*.
- [6] Y. **Turkar**, P. Meshram, C. Aluckal, C. Adhivarahan, and K. Dantu, “Empir3d: A framework for multi-dimensional point cloud assessment,” in *23rd Conference on Robots and Vision (CRV), 2026*, arXiv preprint arXiv:2306.03660, 2026.
- [7] Y. **Turkar**, S. Sadeghi, and K. Dantu, “Lightning: Adaptive illumination control for robot perception,” (Under Review), 2026.
- [8] C. Aluckal, R. V. K. Lal, S. Courtney, Y. **Turkar**, Y. Dighe, Y. Kim, J. Gemerek, and K. Dantu, “Tera: A simulation environment for terrain excavation robot autonomy,” in *2025 IEEE International Conference on Simulation, Modeling, and Programming for Autonomous Robots (SIMPAR)*, IEEE, 2025, pp. 1–6.
- [9] K. N. Khan, A. Khalid, Y. **Turkar**, K. Dantu, and F. Ahmad, “Vrf: Vehicle road-side point cloud fusion,” in *Proceedings of the 22nd Annual International Conference on Mobile Systems, Applications and Services (MobiSys)*, 2024, pp. 547–560.
- [10] Y. Dighe, Y. Kim, S. Rajguru, Y. **Turkar**, T. Singh, and K. Dantu, “Kinematics-only differential flatness based trajectory tracking for autonomous racing,” in *2023 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, IEEE, 2023, pp. 1629–1636.

PROJECTS

Adaptive Illumination Control for Robot Perception

droneslab.github.io/LGTN

- Developed *Lightning*, a closed-loop illumination-control framework for robot perception that improves visual SLAM robustness in low-light and high-dynamic-range scenes.
- Introduced a Co-Located Illumination Decomposition (CLID) relighting model to separate ambient illumination from light contribution and synthesize physically consistent multi-intensity training data.
- Formulated an offline Optimal Intensity Schedule and distilled it into a real-time imitation-learned controller that selects discrete onboard light levels while balancing SLAM utility, power consumption, and temporal smoothness.

NightHawk: Active Illumination Control [ISER 25']

bit.ly/nithawk

- Active illumination and exposure control using Bayesian optimization and a feature-utility metric to boost feature detection and matching in low light.
- Implemented the event-triggered optimization loop, camera/light control, and M_{feat} ; field tests showed 47–197% gains in tracking/matching.
- Designed a ROS2-controlled 50W LED flood light for active illumination on low-light environments

Language-in-the-loop Culvert Inspection on the Erie Canal

bit.ly/vlsion

- Language-in-the-loop inspection pairing a VLM with viewpoint planning on a legged robot to inspect a 66 m culvert and capture targeted close-ups.
- Integrated VLM prompting, stereo-scale recovery, and a culvert-aware planner on Spot; designed the expert study showing ROI agreement over 80%.
- Designed a low-cost 3D printed pan-tilt camera gimbal controllable using ROS2

PIXER: Learning Visual Information Utility

bit.ly/pixfeat

- Lightweight model that predicts pixel-wise “featureness” and uncertainty to filter keypoints and improve visual odometry with fewer features.
- Designed the Bayesian learning pipeline and evaluation, reducing VO RMSE by $\sim 31\%$ with $\sim 49\%$ fewer features on Davis/KITTI-style data.

Empir3D: Multi-Dimensional Point Cloud Quality Assessment

bit.ly/emp3d

- Four-axis point-cloud quality framework (resolution, accuracy, coverage, artifacts) addressing limits of single-distance measures for 3D tasks.
- Implemented metrics and analysis tools and ran SLAM/completion case studies, showing complementary value beyond Chamfer/Hausdorff.

EARTH: Excavation Autonomy with Resilient Traversability and Handling

bit.ly/eaxth

- Autonomy framework for excavators integrating perception, planning, and hydraulic control, supported by the TERA simulator.
- Led perception and simulation components and integrated safe control/state-estimation modules.

Hex-Wife: Hex-rotor UAV Platform

yash.turkar.in/hex.html

- Low-cost hex-rotor UAV built for AUVSI SUAS 2019, used for autonomous flight tests and payload experiments in mapping/inspection.
- Airframe and avionics design; flight-stack and state-estimation integration; controller tuning; field validation.

SKILLS

Programming Languages	Python (OpenCV, Open3D, NumPy, Pandas, Torch, TensorFlow, PyTorch3D), CUDA, Java, SQL, C, C++, JAX
Robotics & Simulation	ROS, ROS2, Gazebo, NVIDIA Omniverse Isaac, Gibson-Env, Unity, PX4
Tools & Frameworks	MATLAB, CAD, LaTeX, Linux, Git, Docker, LXC, Rerun

REVIEWING

- IEEE International Conference on Robotics and Automation, ICRA (2024–Present)
- IEEE International Conference on Intelligent Robots and Systems, IROS (2025–Present)
- IEEE Robotics and Automation Letters, RA-L (2024–Present)

HONORS & AWARDS

- CSE Graduate Leadership Award, University at Buffalo (2022)
- Just Joe Sportsmanship Award, AUVSI SUAS (2019)

INVITED TALKS

- “Autonomous Robotics for Archaeology” IMPERO Summer School, Grosseto, Italy (Remote), June 2024
- “Excavation Autonomy with Resilient Traversability and Handling” MOOG-UB Workshop, University at Buffalo, NY, December 2024