

Zhefan Xu

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EDUCATION

Carnegie Mellon University

Doctor of Philosophy, Mechanical Engineering
Minor, Machine Learning
Advisor: Professor Kenji Shimada
GPA: 3.92/4.0

Pittsburgh, PA
May 2025 (Expected)

Carnegie Mellon University

Master of Science, Mechanical Engineering
GPA: 3.96/4.0

Pittsburgh, PA
May 2021

University of Pittsburgh

Bachelor of Science, Mechanical Engineering (Joint program with degree)
GPA: 3.98/4.0

Pittsburgh, PA
May 2019

Sichuan University

Bachelor of Engineering, Mechanical Engineering
GPA: 3.93/4.0

Chengdu, China
May 2019

SKILLS

Programming Languages: C++, Python, ROS, PyTorch, TensorFlow, Matlab, Java.
Robotics: Path Planning, Trajectory Optimization, Object Detection, SLAM, VIO.
Machine Learning: Machine Learning, Deep Learning, Reinforcement Learning.

RESEARCH EXPERIENCE

Autonomous Robotic Inspection for Tunnel Construction Sites

Computational Engineering and Robotics Lab (CERLAB) at CMU
Project Team Leader

Pittsburgh, PA
Sept. 2021 - Sept. 2023

- Led the team to successfully complete autonomous inspection flights in a large tunnel construction site for TOPRISE CO., LTD and Obayashi Corporation in Otaru, Japan.
- Developed an autonomous inspection framework including planning, perception, and 3D reconstruction for tunnel shape measurement using the unmanned aerial vehicles.

Lightweight UAV Dynamic Obstacle Detection and Tracking

Computational Engineering and Robotics Lab (CERLAB) at CMU
Project Team Leader

Pittsburgh, PA
Jan. 2023 - Jul. 2023

- Developed a lightweight 3D dynamic obstacle detection algorithm by ensemble multiple efficient but low-accuracy detectors for small UAVs, exceeding benchmark results.

Efficient UAV Navigation using Vision-aided Planning and Mapping

Computational Engineering and Robotics Lab (CERLAB) at CMU
Project Team Leader

Pittsburgh, PA
May. 2022 - Dec. 2022

- Designed the vision-aided trajectory optimization with the proposed dynamic map to achieve safe navigation in dynamic environments using a customized quadcopter.

Supermarket Misplaced Products Detection with Deep Learning

CyLab Biometric Center at CMU
Research Assistant

Pittsburgh, PA
May 2020 - Oct. 2020

- Implemented and trained the RetinaNet and the Mask R-CNN in PyTorch using the mmdetection codebase on the Walmart shelf dataset to detect products on the shelf and achieved over 0.9 mAP and outperformed our previous segmentation model.

Robotic Exploration and Mapping of Dynamic Environments

Computational Engineering and Robotics Lab (CERLAB) at CMU
Project Team Member

Pittsburgh, PA
Sept. 2019 - May 2021

- Developed a novel autonomous exploration algorithm for the unmanned aerial vehicle in dynamic environments which outperforms the state-of-the-art planners.

PUBLICATIONS	Heuristic-based Incremental Probabilistic Roadmap for Efficient UAV Exploration in Dynamic Environments [pdf] 2023 <u>Zhefan Xu*</u> , Christopher Suzuki*, Xiaoyang Zhan, Kenji Shimada Submitted to <i>IEEE International Conference on Robotics and Automation (ICRA)</i> 2024.
	Quadcopter Trajectory Time Minimization and Robust Collision Avoidance via Optimal Time Allocation [pdf] 2023 <u>Zhefan Xu</u> , Kenji Shimada Submitted to <i>IEEE International Conference on Robotics and Automation (ICRA)</i> 2024.
	Onboard dynamic-object detection and tracking for autonomous robot navigation with RGB-D camera [pdf] 2023 <u>Zhefan Xu*</u> , Xiaoyang Zhan*, Yumeng Xiu, Christopher Suzuki, Kenji Shimada <i>IEEE Robotics and Automation Letters (RA-L)</i> 2023.
	A Vision-Based Autonomous UAV Inspection Framework for Unknown Tunnel Construction Sites With Dynamic Obstacles [pdf] 2023 <u>Zhefan Xu</u> , Baihan Chen, Xiaoyang Zhan, Yumeng Xiu, Christopher Suzuki, Kenji Shimada <i>IEEE Robotics and Automation Letters (RA-L)</i> 2023.
	A real-time dynamic obstacle tracking and mapping system for UAV navigation and collision avoidance with an RGB-D camera [pdf] 2023 <u>Zhefan Xu*</u> , Xiaoyang Zhan*, Baihan Chen, Yumeng Xiu, Chenhao Yang, Kenji Shimada <i>IEEE International Conference on Robotics and Automation (ICRA)</i> 2023.
	Vision-aided UAV Navigation and Dynamic Obstacle Avoidance using Gradient-based B-spline Trajectory Optimization [pdf] 2023 <u>Zhefan Xu</u> , Yumeng Xiu, Xiaoyang Zhan, Baihan Chen, Kenji Shimada <i>IEEE International Conference on Robotics and Automation (ICRA)</i> 2023.
	DPMPC-Planner: A real-time UAV trajectory planning framework for complex static environments with dynamic obstacles [pdf] 2022 <u>Zhefan Xu</u> , Di Deng, Yiping Dong, Kenji Shimada <i>IEEE International Conference on Robotics and Automation (ICRA)</i> 2022.
	Autonomous UAV Exploration of Dynamic Environments Via Incremental Sampling and Probabilistic Roadmap [pdf] 2021 <u>Zhefan Xu</u> , Di Deng, Kenji Shimada <i>IEEE Robotics and Automation Letters (RA-L)</i> with ICRA presentation 2021.

TEACHING EXPERIENCE	Introduction to Deep Learning (CMU 11-785) <i>School of Computer Science</i> at CMU Pittsburgh, PA Teaching Assistant Jan. 2020 - May 2020
	<ul style="list-style-type: none"> • Led two recitations and developed presentation slides on Convolutional Neural Networks and statistics visualization in PyTorch Tensorboard. • Mentored five project teams specializing in robotics and computer vision applications, with a focus on Generative Adversarial Networks (GAN).

ACADEMIC SERVICES	Academic Journal and Conference Reviewer: IEEE RA-L, ICRA, IROS, CASE, ROBIO.
	Academic Conference Volunteer: <i>IEEE/RSJ International Conference on Intelligent Robots and Systems</i> , 2023 Detroit, MI <ul style="list-style-type: none"> • Conference registration and human arrow.