Jingtian Yan

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Education

Carnegie Mellon University (CMU), Pittsburgh, PA **Sep 2024 – present**
Ph.D. in Robotics | Advisors: Dr. Jiaoyang Li, Dr. Stephen F. Smith *Overall GPA: 4.0/4.0 – Major GPA: 4.0/4.0*

Carnegie Mellon University (CMU), Pittsburgh, PA **Sep 2021 – May 2023**
Master of Science in Electrical and Computer Engineering *Overall GPA: 4.0/4.0 – Major GPA: 4.0/4.0*

Zhejiang University (ZJU), Zhejiang, China **Sep 2016 – Jun 2020**
Bachelor of Engineering in Automation *Overall GPA: 3.87/4.0 — Major GPA: 3.96/4.0*

Experience

Carnegie Mellon University (CMU), Pittsburgh, PA **May 2023 – May 2024**
Research Assistant, Robotics Institute | Supervisor: Dr. Jiaoyang Li *Pittsburgh, PA*
Funded by the Manufacturing Futures Institute (MFI), CMU

- Developing multi-agent planning algorithms, building simulations, and deploying these algorithms for mobile robots in an autonomous assembly factory

Selected Publications

- **Yan, Jingtian**, Shuai Zhou, He Jiang, Stephen F. Smith, and Jiaoyang Li, "From Discrete Plans to Real-World Execution: A World-Model-Driven Framework for Execution-Aware Multi-Agent Path Finding." Under review at IEEE Transactions on Robotics, 2026. arXiv:2511.21886
- **Yan, Jingtian**, Stephen F. Smith, and Jiaoyang Li. "WinkTPG: An Execution Framework for Multi-Agent Path Finding Using Temporal Reasoning." IEEE Transactions on Automation Science and Engineering 23, (2026): 9162-9175
- **Yan, Jingtian**, Zhifei Li, William Kang, Kevin Zheng, Yulun Zhang, Zhe Chen, Yue Zhang, Daniel Harabor, Stephen F. Smith, and Jiaoyang Li, "Advancing MAPF Toward the Real World: A Scalable Multi-Agent Realistic Testbed (SMART)." IEEE Robotics and Automation Letters 11, no. 6 (2026): 7428-7435
- **Yan, Jingtian**, Zhifei Li, William Kang, Stephen F. Smith, and Jiaoyang Li, "Analyzing Planner Design Trade-Offs for MAPF Under ADG-Based Realistic Execution." Proceedings of the International Conference on Automated Planning and Scheduling (ICAPS) 36, no. 1 (2026): 435-439
- **Yan, Jingtian** and Jiaoyang Li, "Multi-agent Motion Planning for Differential Drive Robots Through Stationary State Search." AAAI Conference on Artificial Intelligence (AAAI), 2025, 39(22): 23360-23368.
- **Yan, Jingtian** and Jiaoyang Li, "Multi-Agent Motion Planning With Bézier Curve Optimization Under Kinodynamic Constraints." IEEE Robotics and Automation Letters 9, no. 3 (2024): 3021-3028
- **Yan, Jingtian**, Xingqiao Lin, Zhongqiang Ren, Shiqi Zhao, Jieqiong Yu, Chao Cao, Peng Yin, Ji Zhang, and Sebastian Scherer. "MUI-TARE: Cooperative Multi-Agent Exploration With Unknown Initial Position." IEEE Robotics and Automation Letters 8, no. 7 (2023): 4299-4306

Awards

Best System Demonstration Award International Conference on Automated Planning and Scheduling (ICAPS)

Projects

Execution-Aware Multi-Agent Path Finding with Learned World Models **Jun 2025 – Jun 2026**
Research Assistant | Advisor: Dr. Jiaoyang Li, Dr. Stephen F. Smith *CMU, Pittsburgh, PA*

- Developed ExecTimeNet, a learned world model that predicts the real-world execution time and kinodynamic state of discrete multi-agent path-finding (MAPF) actions.
- Proposed REMAP and ESADG to incorporate execution-time estimates into planning and optimize post-planning execution schedules, reducing simulated delays by up to 40%.
- Evaluated the framework in high-fidelity simulations with up to 300 agents and on physical robots, reducing real-world execution time by up to 15.3%.

An Execution Framework for Multi-Agent Path Finding Using Temporal Reasoning **Jun 2024 – Jun 2025**

Research Assistant | Advisor: Dr. Jiaoyang Li, Dr. Stephen F. Smith *CMU, Pittsburgh, PA*

- Developed a kinodynamic speed-profile optimization module (kTPG) that refines high-level multi-agent path-finding (MAPF) solutions into execution-feasible schedules while respecting collision-free and precedence constraints.
- Designed and implemented the windowed-execution framework (WinkTPG) that incrementally refines agent speed plans during runtime using a sliding-window mechanism, thereby managing uncertainty and improving robustness in large-agent scenarios.
- Conducted large-scale simulation experiments (up to 1,000 agents) to evaluate execution quality and runtime performance, demonstrating speed-profile generation in 1 s and solution quality improvements up to 51.7% over baselines.

SMART: A scalable multi-agent realistic testbed **Jun 2024 – May 2025**

Research Assistant | Advisor: Dr. Jiaoyang Li, Dr. Stephen F. Smith *CMU, Pittsburgh, PA*

- Developed **SMART**, a scalable and modular testbed for evaluating multi-agent planning and execution frameworks under realistic simulation and physical environments.
- Designed a dual-backend architecture integrating **ARGoS3** for large-scale, CPU-parallel experiments and **Isaac Sim** for high-fidelity kinodynamic execution.
- Established a benchmarking suite and standardized interfaces to enable evaluation of multi-agent planning and coordination algorithms.
- Collaborated with interdisciplinary teams to deploy SMART on physical robots and support the demonstration of state-of-the-art planning systems.

Multi-Agent Motion Planning using Non-constant Motion **Sep 2023 – May 2024**

Research Assistant | Supervisor: Dr. Jiaoyang Li *CMU, Pittsburgh, PA*

- Developing a multi-agent motion planner, aimed at coordinating hundreds of agents, with a focus on surpassing current state-of-the-art methods in terms of scalability and solution quality
- Designed an incremental partial expansion method to speed up the search process
- Introduced an optimization-based method to improve solution quality, ensuring the trajectories have smooth speed profile while guaranteeing the completeness of the method
- Developing a time window mechanism to support lifelong path-finding task

Multi Agent Path Finding and Robust Execution in Autonomous Factory **Jun 2023 – Jan 2024**

Research Assistant | Supervisor: Dr. Jiaoyang Li *CMU, Pittsburgh, PA*

- Building a multi-agent path planning and execution system for mobile robots in an autonomous assembly factory
- Developed a multi-agent path planner, based on Conflict-Based Search (CBS), to create collision-free paths for mobile robots handling kit transportation. Incorporated the Action Dependency Graph to ensure the robust and reliable execution of these plans
- Created an assembly factory simulation environment using Gazebo, which is used for testing and evaluating the performance of the algorithms
- Collaborating with other teams to integrate and deploy this system on real robots

Multi-Agent Motion Planning with Bézier Curve Optimization **Mar 2023 – Sep 2023**

Research Assistant | Supervisor: Dr. Jiaoyang Li *CMU, Pittsburgh, PA*

- Developed PSB, a multi-agent motion planner used to address the challenge in path planning for a large team of agents, fully accounting for their kinodynamic capabilities
- Proposed a planner framework that merges search-based and optimization-based methods to generate trajectories with smooth speed profiles executable by controllers
- Enhanced planning runtime efficiency by designing a dominance check mechanism to eliminate redundant symmetry nodes and implementing a cache mechanism for reusing results from the optimization-based method
- Achieved up to 49.79% improvements in terms of solution cost compared to existing methods within the domains of traffic intersection coordination and grid map navigation

Multi-agent Exploration with Unknown Initial Pose **Jun 2022 – Aug 2022**

Student Researcher | Supervisors: Dr. Sebastian Scherer, Dr. Ji Zhang *CMU, Pittsburgh, PA*

- Built a multi-agent autonomous system designed for exploring unknown environments where global pose estimation of agents is challenging
- Devised a framework to enable multi-agent exploration in environments with unknown initial relative poses. Integrated a map merge module to merge sensor inputs and determine relative poses between agents using sensor data association. Employed a hierarchical multi-agent planner to plan paths for unknown environmental perception
- Proposed an adaptive merge module that plans paths for agents to actively increase the robustness of the map merge module. This approach balanced the exploration efficiency with map merge robustness
- Designed a sub-map-based global planner that plans the global paths for those agents whose relative pose is confirmed by map merge module

- Realized up to 50% improvement in exploration efficiency compared to other state-of-the-art methods within complex, highly realistic simulation environments

Isaac Sim Simulation Environment Development **Jun 2022 – Aug 2022**

Student Researcher | Supervisor: Dr. Ji Zhang *CMU, Pittsburgh, PA*

- Built a 3D simulation environment for autonomous navigation and exploration tasks using NVIDIA Isaac Sim
- Provided autonomous navigation modules such as collision avoidance, terrain traversability analysis, waypoint following, and more, along with a suite of visualization tools
- Implemented and tested TARE planner and FAR planner at this simulation environment

3D CT Images Segmentation **Jul 2020 – Jun 2021**

Research Assistant | Supervisor: Dr. Chunhui Zhao *ZJU, Hangzhou, China*

- Conducted research on a 3D CT image segmentation algorithm aimed at improving early detection of ovarian cancer
- Developed a multi-scale graph learning U-Net (MGLU-Net) for ovarian tumor segmentation
- Designed the graph convolutional module that learns both the local characteristics and the global structure of the tumors, aiming to handle the polycentric distribution of the ovarian tumors and the size variation problem
- Achieved better performance than the state-of-the-art methods on the real ovarian CT image dataset and Sliver07 challenge dataset

Monocular Visual-Inertial Odometry **Jul 2019 – Jun 2020**

Student Researcher | Supervisor: Dr. Jianke Zhu *ZJU, Hangzhou, China*

- Conducted research on the monocular visual-inertial state estimator algorithm
- Implemented a Fully Convolutional Neural (FCN) Network for road semantic segmentation, addressing the challenge of transformation estimation in environments with moving cars and similar lanes
- Evaluated using KITTI Visual Odometry dataset, showing superior performance over VINS-Mono in certain sequences

Service

Reviewer:

- IEEE Transactions on Robotics (T-RO)
- IEEE Transactions on Automation Science and Engineering (T-ASE)
- AAAI Conference on Artificial Intelligence (AAAI)
- IEEE Robotics and Automation Letters (RA-L)
- IEEE International Conference on Robotics and Automation (ICRA)
- IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)

Teaching and Mentorship

Teaching Assistant

- Introduction to Robot Learning (16-831) Fall 2026
- Multi-Robot Planning and Coordination (16-891) Spring 2026

Undergraduate Research Mentorship at CMU

- Zhenting (Jerry) Liu, Computer Science 2025–Present
- William Kang, Computer Science 2024–Present
- Zhifei Li, Computer Science 2024–2025

Technical Skills

Programming Languages: C++ | C | Python | MATLAB | LaTeX
Software & Tools: ROS & ROS2 | Linux | Git | CPLEX | TensorFlow | PyTorch | OpenCV