

# Xintong Zhang

<https://www.linkedin.com/in/xintongzhang2027/> · [xz405@duke.edu](mailto:xz405@duke.edu) · <https://zxt1234567.github.io/>

## EDUCATION

**Duke Kunshan University (DKU) & Duke University Dual Degree**

Class of 2027

**Major: Applied Mathematics and Computational Sciences**

Kunshan, China

- GPA: 3.98/4.0
- Courses: Principles of Machine Learning, Algorithm Design and Analysis, Operating System, Discrete Math for Computer Science, Computer Architecture, Computer Organization and Programming, Linear Algebra, Probability, Calculus, Physics

## RESEARCH EXPERIENCE

**LLMs Meet Formal Methods for Robot Swarms: Reliable, Explainable and Efficient Human-in-the-loop Planning in Unknown Environments (Science Robotics: In Preparation)**

April 2025-Now

*Fourth Author*

Beijing/Kunshan, China

- Supervisor: Prof. Meng Guo, Peking Uni.
- Overview: Propose a hierarchical framework that integrates Large Language Models (LLMs) for open-world reasoning with formal methods to enable reliable, explainable, and human-in-the-loop task planning for heterogeneous multi-robot systems in dynamic and unknown environments. The system leverages temporal logic for mission specification, human verification for correctness guarantees, and a cloud-edge-end architecture to support scalable and adaptive coordination.
- Contribution: Design a mixed-integer linear programming (MILP)-based task allocation algorithm using optimization solvers to ensure efficient subtask assignment under temporal constraints. Develop structured prompt templates for LLM-based subtask generation and reasoning. Participate in physical hardware experiments, including the deployment and integration of planning algorithms on physical UAV and UGV platforms, enabling real-world validation of the proposed planning framework.
- Acquired Expertise: Human-Robot Interaction, MILP-based optimization for task allocation, structured prompt engineering for LLM reasoning, integration and deployment of algorithms onto physical UAV and UGV platforms.

**CoCoPlan: Adaptive Coordination and Communication for Multi-robot Systems under Continual Temporal Tasks (RAL: Accepted)**

Jan 2025-August 2025

*Leading Author*

Beijing/Kunshan, China

- Supervisor: Prof. Meng Guo, Peking Uni.
- Overview: Propose CoCoPlan, a collaborative framework addressing communication-aware task planning for multi-robot systems under intermittent connectivity constraints. The framework focuses on joint optimization of communication events and task allocation, ensuring robustness in unknown environments.
- Contribution: Propose an active-communication task planning framework, combining tree-search methods and nonlinear iterative optimization to ensure non-intermittent communication events and optimal task execution. Formulate a flexible objective function, enabling robust performance across diverse environmental distributions. Validate in large-scale 2D/3D high-fidelity simulations, demonstrating real-world applicability in dynamic scenarios.
- Acquired Expertise: LOS-aware topology optimization, intermittent protocol development, BnB based optimization, incremental search strategies, centralized and decentralized tree search algorithms, integration and deployment of algorithms onto physical UAV and UGV platforms.

**DEXTER-LLM: Dynamic and Explainable Coordination of Multi-Robot Systems in Unknown Environments via Large Language Models (IROS: Accepted)**

Dec 2024-March 2025

*Second Author*

Beijing/Kunshan, China

- Supervisor: Prof. Meng Guo, Peking Uni.
- Overview: Propose DEXTER-LLM, a framework integrating LLMs with MILP optimization for dynamic task planning and coordination for heterogeneous multi-robot systems in unknown environments.
- Contribution: Design a versatile task coordination framework for heterogeneous multi-robot systems in open and unknown environments, which is generalizable, verifiable, explainable and scalable. Integrate LLMs and the model-based task planner, which paves the way for new applications in open world automated task planning.
- Acquired Expertise: LTL formalization, LLM-Driven Coordination, Human-Robot Interaction, Optimization

**SLEI3D: Simultaneous Large-scale 3D Exploration Inspection and Interaction via Heterogeneous Fleets under Limited Communication (TASE: Accepted)**

June-Dec 2024

*Third Author*

Beijing/Kunshan, China

- Supervisor: Prof. Meng Guo, Peking Uni.
- Overview: Propose SLEI3D, a framework for large-scale 3D exploration, inspection, and interaction using heterogeneous robotic fleets (UAVs/UGVs) under limited Line-of-Sight (LOS) communication, which addressed challenges of dynamic task allocation and intermittent communication in unknown environments.
- Contribution: Formulate the novel problem formulation of simultaneous exploration and inspection under limited communication for heterogeneous robotic fleets. Propose the multi-layer and multi-rate coordination framework that

simultaneously co-optimizes the collaborative exploration task, the inspection task and the inter-robot communication; Perform the extensive large-scale simulations that validate the performance of the proposed framework for autonomous exploration and inspection in practical scenes.

- Acquired Expertise: ROS, Rviz Simulation, Blender Modeling, Coordination Strategy design, Intermittent Communication.

## **PUBLICATION**

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J. Chen, Y. Zhu, A. Zhuo, Xintong Zhang, S. Zhang, G. Wen, X. Dong, M. Guo, Z. Li, “LLMs Meet Formal Methods for Robot Swarms: Reliable, Explainable and Efficient Human-in-the-loop Planning in Unknown Environments,” (Science Robotics: In Preparation)

- Homepage: <https://trio-pku.github.io/DEXTER-LLM-Plus/>

Xintong Zhang, J. Chen, Y. Zhu, B. Luo and M. Guo, “CoCoPlan: Adaptive Coordination and Communication for Multi-robot Systems under Continual Temporal Tasks,” (RA-L: Accepted)

- Homepage: [CoCoPlan: Adaptive Coordination and Communication for Multi-robot Systems in Dynamic and Unknown Environments](#)

Y. Zhu\*, J. Chen\*, X. Zhang, M. Guo and Z. Li, “DEXTER-LLM: Dynamic and Explainable Coordination of Multi-Robot Systems in Unknown Environments via Large Language Models,” (IROS: Accepted)

- Homepage: <https://texm.github.io/DEXTER-LLM/>

J. Chen, Y. Zhu, X. Zhang, B. Luo and M. Guo, “SLEI3D: Simultaneous Large-scale 3D Exploration Inspection and Interaction via Heterogeneous Fleets under Limited Communication,” (TASE: Accepted)

- Homepage: [SLEI3D: Simultaneous Exploration and Inspection via Heterogeneous Fleets under Limited Communication](#)

## **ADDITIONAL INFORMATION**

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**Skills:** ROS (Robot Operating System), Linux, Git, Python, C++, Robot Hardware (Motive, Crazyfly UAV, Tello UAV, SCOUT UGV), Basic Knowledge of Machine Learning, Video Editing