Sitong Zhang

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PROFILE

Over 6 years of experience in **Machine Learning**, with a focus on **Deep Learning (DL)** and **Deep Reinforcement Learning (DRL)** algorithms. Extensive programming experience, including **Python, C#, Java, and C++**. Proven ability to translate **theoretical AI concepts into practical applications**, with a focus on solving complex **decision-making problems**, as demonstrated through work on UAV autonomous navigation and real-time indoor positioning systems. Track record of successful collaborations and publications in high-impact journals, showcasing strong **research English writing skills and teamwork abilities**.

SKILLS

Programming: Python (6 years, proficient in Python ML libraries), C# (4 years), C++ (3 years), Java (1 year).

Development Tools & Platforms: Unity, Android Studio, Git, Gazebo, ROS, Ubuntu.

Data Visualization: OriginLab, DataGraph.

Language: English (Fluent, IELTS Band 7), Mandarin (native).

EDUCATION

Harbin Engineering University **Harbin, China**

- Ph.D. in Information and Communication Engineering Sep. 2018 – Jan. 2024

  Research Interests: Deep Reinforcement Learning (DRL), Autonomous Navigation, Unmanned Aerial Vehicle (UAV).

  Authored 13 peer-reviewed publications including 9 journal articles and 4 conference articles.

- B.E. in Information and Communication Engineering (Outstanding Graduate) Sep. 2014 – Jun. 2018

WORK EXPERIENCE

Centre for Intelligent Multidimensional Data Analysis Limited **Hong Kong**

Postdoctoral Fellow Feb. 2024 – Jul. 2024

Project: AI-Driven Intelligent Indoor Positioning Mobile Application

- Proposed a Convolutional Neural Network (CNN)-self-attention-based algorithm for the indoor positioning system.
- Collaborated with cross-functional teams to develop an innovative Android application that integrates AI algorithms, providing real-time multi-floor user location visualization and improving indoor navigation efficiency.
- Worked closely with customers to align product features with specific business needs, successfully translating complex technical requirements into tangible outcomes.

PERSONAL PROJECTS

Deep Reinforcement Learning (DRL)-based Unmanned Aerial Vehicle (UAV) Navigation

- Optimized real-time obstacle avoidance by developing an advanced DRL algorithm for UAV autonomous navigation, enhancing performance in dynamic environments.
- Spearheaded the simulation and implementation of AI-driven environments using Python, C#, Unity, and ML-Agents Toolkit, streamlining real-time decision-making for autonomous agents.
- Source code: https://github.com/RealZST/TD3-based_UAV_Collision_Avoidance

Hybrid DRL for UAV Long Trajectory Planning

- Innovated a hybrid human-in-the-loop DRL algorithm for UAV motion planning, reducing replanning time for obstacle avoidance and significantly enhancing long-distance navigation efficiency.
- Modeled the simulated environment using Python, C++, Robot Operating System (ROS), and Gazebo, creating realistic sensory systems and UAV flight control.
- Source code: https://github.com/RealZST/DRL-based_UAV_Motion_Planning

SELECTED HONORS

- Outstanding Graduate, Harbin Engineering University, 2018.
- Honorable Mention in Interdisciplinary Contest in Modeling (ICM), 2016.
- Second Prize in China Undergraduate Mathematical Contest in Modeling, 2015.

VOLUNTEER EXPERIENCE

The 12th International Collegiate Snow Sculpture Contest Jan. 2020

Volunteer with the University of Technology Sydney Team

The International Marine Vehicle Design and Construction Invitational Contest 2019 Aug. 2019

Volunteer with the Cardiff University Team

SELECTED PUBLICATIONS

[1] **Sitong Zhang**, Yibing Li, Qianhui Dong. Autonomous navigation of UAV in multi-obstacle environments based on a Deep Reinforcement Learning approach. Applied Soft Computing, 2022. **(SCI Q1, IF=8.7)**

This paper introduces a Deep Reinforcement Learning (DRL)-based method for unmanned aerial vehicles (UAVs) navigation in dynamic, multi-obstacle settings, utilizing the Twin Delayed Deep Deterministic Policy Gradients (TD3) algorithm. The approach develops the two-stream Actor-Critic network to extract environmental features from spatial and temporal aspects. Simulation results demonstrate successful autonomous UAV navigation in the environments with moving obstacles.

[2] **Sitong Zhang**, Yibing Li, Fang Ye, Xiaoyu Geng, Zitao Zhou, Tuo Shi. A Hybrid Human-in-the-Loop Deep Reinforcement Learning Method for UAV Motion Planning for Long Trajectories with Unpredictable Obstacles. Drones, 2023. **(SCI Q2, IF=4.8)**

This paper proposes a collision-avoidance method for the real-time navigation of unmanned aerial vehicles (UAVs) in complex environments with unpredictable obstacles. We firstly develop a Human-in-the-Loop DRL (HL-DRL) training module for map-less obstacle avoidance and secondly establish a global-planning module that generates a few points as waypoint guidance. Moreover, a novel goal-updating algorithm is proposed to integrate the HL-DRL training module with the global-planning module by adaptively determining the to-be-reached waypoint. Simulation results demonstrate that the proposed method can adapt to changes in environments with short replanning time and prevent the UAV from getting stuck in maze-like environments.

[3] **Sitong Zhang**, Yibing Li, Qian Sun, Fang Ye. QoS maximization scheduling of multiple UAV base stations in 3D environment. Internet of Things, 2023. **(SCI Q1, IF=5.9)**

This paper proposes a local-based scheduling algorithm for UAV base stations (UAV-BSs) that aims to maximize service quality. It achieves a balance between the flying and serving statuses of UAV-BSs while considering factors such as energy constraints, height optimization, UAV cooperation, and recharging.

[4] **Sitong Zhang**, Yibing Li, Yuan Tian, Zitao Zhou, Xiaoyu Geng, Tuo Shi. Dynamic Redeployment of UAV Base Stations in Large-Scale and Unreliable Environments. Internet of Things, 2023. **(SCI Q1, IF=5.9)**

This paper proposes a novel deployment framework with the objective of maximizing the quality of communication service by dynamically deploying UAV base stations (UAV-BSs). The proposed framework employs a decentralized approach, allowing UAV-BSs to locally adjust their locations and rapidly respond to changes in the number of UAV-BSs and distribution of ground users.

[5] Yibing Li, **Sitong Zhang**, Fang Ye, Tao Jiang, Yingsong Li. A UAV path planning method based on deep reinforcement learning. 2020 IEEE USNC-CNC-URSI North American Radio Science Meeting (Joint with AP-S Symposium). IEEE, 2020.

This paper introduces a DRL-based UAV path planning method using the Deep Deterministic Policy Gradient (DDPG) algorithm for autonomous decision-making in a 3D environment. Besides, to avoid obstacles, the concepts of connected area and threat function are proposed and adopted in the reward shaping.

[6] Yibing Li, **Sitong Zhang**, Jie Chen, Tao Jiang, Fang Ye. Multi-UAV cooperative mission assignment algorithm based on ACO method. 2020 International Conference on Computing, Networking and Communications (ICNC). IEEE, 2020.

This paper presents a multi-UAV cooperative mission assignment algorithm using ant colony optimization, aimed at effectively solving complex, multi-parameter, NP-hard problems in UAV cooperative combat fields.