

Zhihao Xia

Postdoctoral Fellow

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RESEARCH INTERESTS

AI agents for scientific research; large language model post-training; domain-specific language model training; embodied intelligence; intelligent robotic systems; robotic manipulation.

EDUCATION

- **Fudan University** Sep. 2023 – Jun. 2026
Ph.D. in Computer Science and Technology
◦ Advisor: Prof. Dan Zhang, FCAE, FEIC, FASME, FCSME, SMIEEE
Shanghai, China
- **Fudan University** Sep. 2020 – Jun. 2023
M.Eng. in Mechanical
◦ Advisor: Prof. Dan Zhang, FCAE, FEIC, FASME, FCSME, SMIEEE
Shanghai, China
- **Anhui University** Sep. 2016 – Jun. 2020
B.Eng. in Mechanical Design, Manufacturing and Automation
◦ Advisor: Prof. Feng Xie
Hefei, China

RESEARCH EXPERIENCE

- **The Hong Kong Polytechnic University** Aug. 2026 – Present
Postdoctoral Fellow, Department of Mechanical Engineering
Hong Kong SAR, China
◦ Develop AI agents for scientific research, knowledge workflows, and domain-specific problem solving.
◦ Post-train and adapt large language models for specialized scientific and engineering domains.
◦ Advance embodied intelligence and intelligent robotic systems under the supervision of Prof. Dan Zhang.
- **Fudan University** Sep. 2023 – Jun. 2026
Ph.D. Student Researcher
Shanghai, China
◦ Conducted research on kinematic performance analysis, generative design, and learning-assisted synthesis of generalized parallel mechanisms.
◦ Participated in the founding team and served as a technical lead for Guanghua-0 (Dec. 2023 – Apr. 2024), Fudan University's first prototype general-purpose humanoid robot, and Guanghua-1 (Apr. 2024 – Dec. 2024), its first commercial general-purpose humanoid robot.
◦ Received the Chuangzhi Design Award for contributions to the Guanghua humanoid-robot development effort.
- **Fudan University** Sep. 2020 – Jun. 2023
Graduate Researcher
Shanghai, China
◦ Worked on humanoid robot design based on generalized parallel mechanisms, including humanoid-leg-inspired robotic structures.
◦ Published as first author in *Mechanism and Machine Theory* on a novel 6-DOF generalized parallel manipulator inspired by humanoid legs.
◦ Contributed to mechanism synthesis, structural analysis, and research dissemination through journal and conference publications.

PUBLICATIONS

1. **Zhihao Xia**, Xinhua Lao, Chunxu Tian, and Dan Zhang. "Mapping mechanical synthesis to a trainable task: A neural network approach for generalized parallel mechanisms." *Mechanism and Machine Theory* [CAS Q1, JIF 5.3], 219:106337, 2026.
2. **Zhihao Xia**, Yongheng Xing, Chunxu Tian, and Dan Zhang. "Advances in generalized parallel mechanisms: Coupling, configurable, and articulated designs." *Mechanism and Machine Theory* [CAS Q1, JIF 5.3], 218:106287, 2025.
3. **Zhihao Xia**, Chunxu Tian, Yongheng Xing, Jie Gu, Luquan Li, and Dan Zhang. "The novel synthesis method of decoupled generalized parallel mechanisms based on motion transmission." *Mechanism and Machine Theory* [CAS Q1, JIF 5.3], 210:106019, 2025.
4. **Zhihao Xia**, Chunxu Tian, Luquan Li, and Dan Zhang. "The novel synthesis of mechanisms for continuous origami based on the topological graph theory." *Mechanism and Machine Theory* [CAS Q1, JIF 5.3], 204:105857, 2024.
5. **Zhihao Xia**, Chunxu Tian, Luquan Li, and Dan Zhang. "The novel synthesis of origami-inspired mechanisms based on graph theory." *Mechanism and Machine Theory* [CAS Q1, JIF 5.3], 192:105547, 2024.

6. **Zhihao Xia**, Dan Zhang, Yanyu Chen, Chunxu Tian, Jian Liu, and Chenwei Wu. "A novel 6 DOFs generalized parallel manipulator design and analysis based on humanoid leg." *Mechanism and Machine Theory* [CAS Q1, JIF 5.3], 176:105029, 2022.
7. Chunxu Tian, **Zhihao Xia**, Luquan Li, and Dan Zhang. "The novel synthesis of reconfigurable generalized parallel manipulators with kinematic redundancy." *Mechanism and Machine Theory* [CAS Q1, JIF 5.3], 201:105748, 2024.
8. Yanyu Chen, **Zhihao Xia**, Jian Liu, and Chenwei Wu. "TSDet: End-to-End Method with Transformer for SAR Ship Detection." In *2022 International Joint Conference on Neural Networks (IJCNN)*, 1–8, 2022.
9. Jie Gu, Hongrun Gao, **Zhihao Xia**, Yirun Sun, Chunxu Tian, and Dan Zhang. "Self-Reconfiguration Planning for Deformable Quadrilateral Modular Robots." *arXiv preprint arXiv:2601.19496*, 2026.
10. Jie Gu, Yirui Sun, **Zhihao Xia**, Tin Lun Lam, Chunxu Tian, and Dan Zhang. "RhoMorph: Rhombus-shaped Deformable Modular Robots for Stable, Medium-Independent Reconfiguration Motion." *arXiv preprint arXiv:2601.19529*, 2026.
11. Yongheng Xing, Chunxu Tian, **Zhihao Xia**, Jie Gu, and Dan Zhang. "The novel synthesis of generalized parallel manipulators with 8R Kirigami-inspired configurable platform." *Mechanism and Machine Theory* [CAS Q1, JIF 5.3], 209:106003, 2025.
12. Luquan Li, Chunxu Tian, **Zhihao Xia**, and Dan Zhang. "Optimal design of a generalized single-loop parallel manipulator with RCM characteristic considering motion/force transmissibility." *Robotica* [CAS Q4, JIF 2.7], 43(3):851–867, 2025.
13. Luquan Li, Chunxu Tian, **Zhihao Xia**, and Dan Zhang. "Type synthesis of a class of parallel RCM manipulators based on concentric spherical surfaces geometric model." *Mechanism and Machine Theory* [CAS Q1, JIF 5.3], 209:106011, 2025.
14. Jie Gu, Tin Lun Lam, Chunxu Tian, **Zhihao Xia**, Yongheng Xing, and Dan Zhang. "MODUR: A Modular Dual-reconfigurable Robot." In *2025 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2025.
15. Jian Liu, Dan Zhang, Chunxu Tian, Weizhan Ma, and **Zhihao Xia**. "A virtual parallel model for the buffer landing of multi-legged landing gear." *Mechanism and Machine Theory* [CAS Q1, JIF 5.3], 200:105724, 2024.
16. Jie Gu, Tin Lun Lam, Chunxu Tian, **Zhihao Xia**, and Dan Zhang. "MOPARAS: A modular parallel spherical robot with position-adjustable connectors." In *International Conference on Intelligent Robotics and Applications*, 363–376, 2024.
17. Chunxu Tian, Luquan Li, **Zhihao Xia**, and Dan Zhang. "Graph synthesis of generalized parallel mechanisms with coupling sub-chains." In *International Conference on Intelligent Robotics and Applications*, 76–87, 2023.
18. Chunxu Tian, Luquan Li, **Zhihao Xia**, and Dan Zhang. "A Novel Class of (3+2)-DOF Reconfigurable Generalized Parallel Mechanisms with Kinematic Redundancy." In *IFTOMM World Congress on Mechanism and Machine Science*, 386–395, 2023.
19. Weizhan Ma, Dan Zhang, Jian Liu, Chunxu Tian, and **Zhihao Xia**. "Design and prototype validation of an active variable-diameter pipeline inspection robot." *Journal of Fudan University (Natural Science)* [JIF N/A, CAS N/A], 62(5):627–636, 2023.
20. Jian Liu, Dan Zhang, Yanyu Chen, **Zhihao Xia**, and Chenwei Wu. "Design of a class of generalized parallel mechanisms for adaptive landing and aerial manipulation." *Mechanism and Machine Theory* [CAS Q1, JIF 5.3], 170:104692, 2022.

SELECTED PATENTS AND PATENT APPLICATIONS

- 1st inventor A partially coupled six-DOF generalized parallel robotic leg mechanism. Chinese invention patent application, Application No. 202210156838.4, filed in 2022.
- 1st inventor A multifunctional amphibious-aerial unmanned vehicle. Chinese invention patent, Patent No. ZL 2021 1 0855517.9, authorized on Jun. 14, 2022.
- 2nd inventor An end-to-end SAR ship detection method and system. Chinese invention patent application, Application No. 202210185228.7, filed in 2022.
- 3rd inventor A multifunctional unmanned-aerial-vehicle parallel chassis. Chinese invention patent application, Application No. 202210086659.8, filed in 2022.
- 3rd inventor An electric-wire de-icing robot. Chinese invention patent application, Application No. 202111032923.1, filed in 2021.

SELECTED PROJECTS

- **Guanghua-1 General-Purpose Humanoid Robot Development** Apr. 2024 – Dec. 2024
Humanoid robot system integration, embodied intelligence, robotic mechanism design
 - Served as a technical lead in the founding team for Guanghua-1, Fudan University's first commercial general-purpose humanoid robot.
 - Supported the transition from the Guanghua-0 prototype to Guanghua-1 through mechanism design, system integration, testing, and research-to-engineering coordination.
- **NSFC-Funded Project on Learning-Assisted Mechanism Synthesis** 2023 – 2026
Grant No. 52305012; AI-enabled mechanism synthesis, generalized parallel mechanisms
 - Conduct research on mapping mechanism synthesis into trainable computational tasks for generalized parallel mechanisms.
 - Develop neural-network-assisted workflows for mechanism topology generation, evaluation, and design exploration; aligned with first-author research in *Mechanism and Machine Theory*.
- **NSFC-Funded Project on Generalized Parallel Mechanisms** 2020 – 2023
Grant No. 52150710538; mechanism synthesis, kinematic analysis, robotic structures
 - Participated in long-term research on generalized parallel mechanisms under the supervision of Prof. Dan Zhang.
 - Worked on type synthesis, structural optimization, and kinematic performance analysis, supporting outputs on humanoid-leg-inspired manipulators and mechanism synthesis.
- **Humanoid-Leg-Inspired Generalized Parallel Manipulator Design** 2019 – 2022
Mechanism design, structural optimization, robotics
 - Designed, analyzed, and optimized a novel 6-DOF generalized parallel manipulator inspired by humanoid leg structure.
 - This work led to a first-author publication in *Mechanism and Machine Theory*.
- **Generalized Parallel Mechanisms for Adaptive Landing and Aerial Manipulation** 2020 – 2021
Parallel mechanisms, robotic landing systems, mechanism analysis
 - Contributed to multifunctional landing gear mechanisms, adaptive landing methods, and generalized parallel mechanisms for aerial manipulation.
 - Supported the research that resulted in an *Mechanism and Machine Theory* publication and a related patent.

HONORS AND AWARDS

- **National Scholarship** 2025
Ministry of Education of the People's Republic of China
 - Awarded the 2025 National Scholarship for doctoral students.
- **First-Class Graduate Academic Scholarship** 2023
Fudan University
 - Awarded for outstanding master's academic performance in the 2022–2023 academic year.
- **First-Class Graduate Academic Scholarship** 2022
Fudan University
 - Awarded for outstanding master's academic performance in the 2021–2022 academic year.
- **Outstanding Graduate Award** 2020
Anhui University
 - Recognized as an outstanding graduate of the 2020 cohort.

ACADEMIC SERVICE

- Reviewer for *Journal of Mechanical Design*.
- Reviewer for *Chinese Journal of Mechanical Engineering*.
- Reviewer for *Mechanism and Machine Theory*.

TECHNICAL SKILLS

- **Computational Research:** Python-based scientific computing, MATLAB modeling, data analysis, reproducible research workflows, LaTeX
- **Mechanism and Robotics:** type synthesis and kinematic analysis of generalized parallel mechanisms, motion/force transmission analysis, robotic morphology design, humanoid robot system integration
- **AI Agents and Large Models:** scientific-research agents, LLM post-training, domain-specific model training, vision-language-action systems, embodied intelligence, intelligent manipulation
- **Simulation and Engineering Tools:** SolidWorks, ANSYS, AutoCAD for mechanism modeling, structural analysis, and prototype design
- **Research Practice:** academic writing, literature review, experimental design, patent drafting, peer review
- **Languages:** Chinese (native), English (CET-6)