

Jiaxuan Zhang

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EDUCATION

Southern University of Science and Technology (SUSTech)

Shenzhen, China

Bachelor of Engineering in *Robotics Engineering*

Sep.2023 – Jul. 2027 (Anticipated)

Nanyang Technological University (NTU)

Singapore

Exchange Program

Jan. 2026 – May 2026

PUBLICATION & PATENT

1. **Zhang, J.**, Leng, Y., Guo, Y., & Fu, C. (2025). Feature matching-based gait phase prediction for obstacle crossing control of powered Transfemoral prosthesis. *2025 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 11999-12004. <https://doi.org/10.1109/iros60139.2025.11247543>
2. Zhao, H.*, **Zhang, J.***, Song, W., Ding, P., & Wang, D. (2026). VLA²: Empowering vision-language-action models with an agentic framework for unseen concept manipulation. arXiv preprint.
3. **Zhang, J.**, Liu, R., Zhang, Y., Yang, Y. (2026). TraceFlow: Guiding Frozen Flow-Matching Robot Policies with Success and Failure Traces. (Submitted to *IEEE International Conference on Robotics and Automation [ICRA 2027]*)
4. Fu, C., **Zhang, J.**, Guo, Y., Ma, T., Shen, Q., Wang, G., & Luo, Z. (2026). A method, system and equipment for prosthesis control (China Patent No. CN 120585528 B). *China National Intellectual Property Administration*.

RELEVANT RESEARCH EXPERIENCE

TraceFlow: Guiding Frozen Flow-Matching Robot Policies with Success and Failure Traces Hong Kong, China

Lead contributor, supervised by Prof. Yanchao Yang from The University of Hong Kong

Jun. 2026 – Present

Overview: Developed an experience-guided action framework for frozen Flow-Matching robot policies, using success and failure traces to guide action generation without updating policy weights.

- ♦ Designed a bounded action guidance field for frozen $\pi_{0.5}$ Flow-Matching policies, retrieving comparable success and failure action windows to attract actions toward successful regions and repel them from failed ones.
- ♦ Developed TraceBank to store time-ordered state-action traces with terminal success/failure labels, enabling completed deployment rollouts to inform subsequent action guidance without updating policy weights.
- ♦ Evaluated TraceFlow on LIBERO, LIBERO-Plus (Long), and RoboMemArena, improving success rates by 1.45 and 1.27 percentage points on LIBERO and LIBERO-Plus (Long), respectively, with gains varying across RoboMemArena settings.
- ♦ Validated TraceFlow on three real-robot manipulation tasks, improving ordered success on the fruit-packing task from 21/50 with the frozen baseline to 39/50, and to 47/50 after one additional TraceBank stacking round.

Mem-Soul: Dynamic Long-Term Memory System for AI Agents

Singapore

Lead contributor, supervised by Prof. Ming Xie from NTU

Jan. 2026 – May 2026

Overview: Worked on a dynamic long-term memory system that models memory retrieval, writing, decay, and forgetting to improve over conventional static retrieval approaches.

- ♦ Modeled long-term memory as a continuous-time system, implementing dynamic Gaussian distributions, variable-K retrieval, and decay boundaries to represent memory formation and loss.
- ♦ Designed two memory update mechanisms (replace and filter-and-stitch) to process raw sensory input vs. structured semantic, action, and planning data separately.
- ♦ Built and open-sourced the Minimal Dynamic Gaussian Memory (MDGM) model along with its mathematical derivations and code to provide a lightweight baseline for memory research.
- ♦ Applied the memory framework to a Vision-Language-Action (VLA) guidance task, testing how stored historical experience influences downstream action generation.

VLA²: Empowering Vision-Language-Action Models with an Agentic Framework

Hangzhou, China

Major contributor, supervised by Prof. Donglin Wang from Westlake University

Jul. 2025 – Oct. 2025

Overview: Developed an agentic framework to enhance VLA model generalization on unseen concepts, implementing a mechanism that decomposes complex objects into visual atomic features for robust recognition in open-world settings.

- ♦ Diagnosed OOD generalization bottlenecks in baseline VLMs, laying the empirical foundation for building a novel cognitive-inspired agentic framework to transcend standard VLM benchmarks.
- ♦ Developed a multi-agent pipeline integrating VLMs, real-time web search, and structured memory retrieval to decompose novel, complex concepts into structure-guided visual atomic features.
- ♦ Inspired by early human cognitive learning, implemented a hierarchical cognitive retrieval module to dynamically store and structure seen/unseen representations, achieving zero-shot matching and continuous open-world generalization.

- ♦ Built an agentic pipeline with external retrieval augmentation and optimized query strategies to establish an evaluation framework, completing PoC validation that demonstrated improved OOD recognition over baseline VLMs.
- ♦ Contributed to the manuscript submitted to CoRL 2026, taking primary responsibility for drafting the methodology section and organizing the comprehensive analysis of experimental results.

ADDITIONAL RESEARCH EXPERIENCE

Human-Robot Collaborative Task Intention Decoding via BCI-AI Integration Shenzhen, China
Participant, supervised by Prof. Quanying Liu Oct. 2025 – Mar. 2026

Overview: Explored the integration of Brain-Computer Interfaces (BCI) and AI to decode task-level intentions from EEG signals, aiming to build a framework for natural human-robot interaction.

- ♦ Conducted research on existing EEG-based intention decoding methods and designed a module to map raw EEG time-series signals to structured task representations for downstream models.
- ♦ Built an interface between the BCI and the Visual-Language-Action (VLA) system, compressing continuous EEG signals into task-level tokens and aligning them with the VLA model’s input space.
- ♦ Collaborated on the integration and debugging of the VLA pipeline, and analyzed experimental results to verify the reliability and boundaries of EEG signals in expressing high-level intentions.

Optimization of Obstacle-Crossing Control Logic for Knee Prosthesis Shenzhen, China
Major contributor, supervised by Dr. Yixuan Guo and Prof. Chenglong Fu May 2024 – Apr. 2025

Overview: Developed a feature matching-based gait phase prediction method to enhance the obstacle-crossing capability of powered transfemoral prostheses in complex environments.

- ♦ Coordinated subjects and data collection personnel to execute experimental protocols, ensuring data integrity across various gait conditions and obstacle-crossing scenarios.
- ♦ Innovated a hybrid gait prediction framework combining parametric models with non-parametric Dynamic Time Warping (DTW), using DTW’s local accuracy while feeding network predictions into a global optimizer.
- ♦ Formulated a Genetic Neural Network Algorithm (GNNA) to jointly optimize estimation speed and neural network parameters, conducting iterative testing to ensure model stability.
- ♦ Authored the methodology and results sections of the paper “Feature Matching-Based Gait Phase Prediction for Obstacle Crossing Control of Powered Transfemoral Prosthesis,” which was accepted by IROS 2025 and awarded 2nd Place for Best Paper at the workshop.

Structural Design of Biomimetic Flexible Sheet-Stacked Electrostatic Motor Shenzhen, China
Participant, supervised by Prof. Hongqiang Wang Mar. 2024 – Mar. 2025

Overview: Designed a flexible electrostatic motor system mimicking human muscle behavior to achieve stable force output in liquid environments and complex mechanical constraints.

- ♦ Designed a spring-like outer frame inspired by human ribs and optimized internal tracks to keep the motor plates aligned under bending or tilting conditions.
- ♦ Optimized the liquid packaging structure to balance pressure across different orientations, and built a 3D-printed modular high-voltage testing platform to speed up experiments.
- ♦ Iterated the mechanical structures to reduce inner friction, helping the 150g system achieve a stable force output of around 50 N.

SKILLS

- ♦ AI Agent & Algorithmic Frameworks: Python, C/C++, PyTorch, ROS2, TensorFlow, LLaMA-Factory, MMDetection, MATLAB, Shell.
- ♦ Embodied AI Edge Platforms & Hardware: NVIDIA Jetson Kit (Orin/Nano), Raspberry Pi, Embedded C (STM32/Arduino), MuJoCo, SolidWorks, Fusion 360.
- ♦ Perception & Sensor Systems: Monocular & Stereo Depth Cameras, IMUs, EMG/EEG Sensors, Force/Motion-Capture Systems, HW/SW Integration & Debugging.

AWARDS

- ♦ Second-Class Scholarship & Science & Innovation Scholarship, SUSTech 2025
- ♦ 2nd Prize, National College Students Engineering Practice & Innovation Ability Contest 2025
- ♦ Gold Award, Shokz Excellence & Innovation Talent Summer School (Rank: 1/8) 2024
- ♦ 2nd Prize, National College Students Mechanical Innovation Design Competition 2024

EXTRACURRICULAR ACTIVITIES

- ♦ SUSTech Innovation & Intelligent Manufacturing Club | Competition Team Leader Mar. 2024 – Jan. 2026
- ♦ Symphony Orchestra & Jazz Big Band | Principal Trombonist Sept. 2023 – Present