

Tan Runjia

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Robotics PhD candidate at NTU developing robot learning systems for industrial manipulation and everyday tasks. Hands-on experience in multimodal perception, reinforcement learning, visual servoing and physical robot integration using Python/C++ and ROS 1/2. Responsible for real-robot development and commissioning for Continental–NTU CorpLab’s A6 project (2022–2025), with current Desay SV Singapore collaboration on contact-guided cable assembly.

Education

Jan 2024–Present **Nanyang Technological University, Singapore**

Third-year PhD candidate, School of Mechanical and Aerospace Engineering.
Supervisor: Lyu Chen.

Jan 2021–Apr 2022 **Nanyang Technological University, Singapore**

M.Sc. in Computer Control and Automation, School of Electrical and Electronic Engineering.
GPA: 4.5/5.0.

Sep 2016–Jun 2020 **Hefei University of Technology, China**

B.Eng. in Automation, School of Electrical Engineering and Automation. GPA: 3.63/4.3; rank: 16/180.

Research and Engineering

2026 DR-TSLM: Multimodal Deictic Reference Resolution

- First-author research on grounding implicit object and destination references in speech and co-speech gestures. Aligned speech timestamps with video context and connected language reasoning with visual segmentation.
- Produced object masks and placement coordinates for downstream robot programs. DR-TSLM-3B achieved 0.92 accuracy on the temporal deictic reasoning component. Presented at CIS-RAM 2026.

2026 Cable Assembly and Contact-Guided Insertion | Desay SV Singapore

- Industry collaboration combining visual registration, force feedback and policy-learning experiments for connector insertion. The July records document Phase 1 two-end insertion and an automated HIL-SERL pipeline in simulation; separate laboratory work used a physical insertion fixture.
- Member of team MatrixX, which placed 7th in the Qualification Phase of the Intrinsic AI for Industry Challenge.

2026 Vision-Servoed Microdevice Injection

- Co-first-author research on a hardware-agnostic system using cameras, a microscope and micromanipulators for positioning, autofocus, centering and microdevice injection.
- In 30 agarose injection trials using two MOTE devices, the system reduced operating time by 47.2% relative to the reported human reference. Presented at ICRA 2026.

2022–2025 A6 Cobot with Adaptive aAGV | Continental–NTU Corporate Lab

- Responsible for physical-robot development, integration and commissioning, connecting collaborative manipulation with a Continental mobile platform for logistics tasks.
- Integrated a Franka Panda arm, Continental mobile base, RealSense D435 and Livox Mid-360 with computation, communications and control interfaces; connected language-based task decomposition with visual detection, grasp generation and execution.
- Implemented ROS 2 action interfaces between C++ and Python controllers and connected reinforcement learning to physical Franka reaching experiments; configured libfranka and MoveIt 2 control interfaces and performed hand–eye calibration.
- Developed human-guided tracking, pick-and-place integration and a template-capture application for the IEEE RA-L instance-detection project; planned shelf-unloading sequences and prepared robot demonstrations, visitor presentations and corporate-lab proposals.

2024 Long-Horizon Skill Learning for Robotic Manipulation

- First-author work combining scene understanding, a Fast Learner and a hierarchical Skill Library. Used language models to generate task sequences and control code, then extracted reusable skills from interaction history.
- Evaluated in Meta-World and physical manipulation demonstrations. Received the CIS-RAM 2024 Best Paper Award.

Work History

2022–Present

Nanyang Technological University, School of Mechanical and Aerospace Engineering

Research Associate and research internship experience

- See Research and Engineering for project responsibilities and outcomes, including the Continental–NTU Corporate Lab A6 programme.

2019 and 2020

Toycloud Technology Co., Ltd., Algorithm Department

Intern | Jun–Aug 2019 and Jun–Dec 2020

- Evaluated the iFLYTEK face-recognition engine by developing an API test application, deploying it on sample devices and measuring CPU and memory use to inform integration decisions.
- Expanded the face-recognition engine documentation for the Egg E9 product, recording API usage and implementation considerations for the software development team.
- Handed over the tested API workflow to the Android development team, explained integration requirements and supported implementation of the face-recognition functions.

Technical Skills

Programming and robotics software. Python, C/C++, MATLAB, ROS 1, ROS 2, MoveIt 2, libfranka and Linux; ROS action interfaces, C++/Python controller integration and system debugging; Java/Android and Qt application development.

Robot learning and multimodal AI. Research focus on physical reinforcement learning (Physical RL), multimodal large language models (MLLMs), vision–language–action (VLA) models and world-action models (WAMs); practical experience in reinforcement learning, human-in-the-loop policy experiments, language and gesture grounding, task planning and reusable robot skills.

Perception and grasping. OpenCV, RGB-D and point-cloud processing, camera and hand–eye calibration, open-vocabulary detection, segmentation, object localization and grasp-pose generation, including GGCNN-based handover.

Manipulation and control. Visual servoing, Cartesian robot control, compliant control including admittance control, force-feedback insertion, collision checking and motion replanning; grasping, pick-and-place and human–robot handover.

Physical systems and validation. Franka Panda and UR arms; mobile manipulator integration with Continental platforms, RealSense D435/L515 and Livox Mid-360; sensor/controller integration, real-robot commissioning and laboratory evaluation.

Earlier Research and Competition Projects

2021–2022	Human–Robot Interaction and Visual Handover: developed RGB-D visual servoing, object segmentation and grasp planning for human–robot handover with collision checking.
2020	Video Semantic Segmentation: implemented FCN, LSTM and 3D-convolution models for video segmentation and mask-wearing recognition in an award-winning undergraduate dissertation.
2019–2020	Ground-to-Air Robot Coordination: integrated visual navigation, DWM1000 positioning and sensors for a coordinated tracked-vehicle and drone system.
2019–2020	Sign Language Translator: developed a glove-and-smartwatch recognition concept using KNN and contributed to a national Challenge Cup third-prize project.
2018–2019	EEG-Controlled Wireless Video Car: implemented SSVEP signal processing and classification to map EEG input to wireless vehicle commands.
2018–2019	Visual Bionic Hexapod Robot: led gait and embedded-control development with MATLAB, C, Raspberry Pi/Python and Qt for an iCAN third-prize project.
2017	Book Sharing Tower: led the design of an RFID-based borrowing device and its business model, receiving an iCAN third prize.

Honors and Awards

2026	7th Place, Qualification Phase, Intrinsic AI for Industry Challenge Team MatrixX; collaboration with Desay SV Singapore.
2024	Best Paper Award, IEEE CIS-RAM Multi-modal LLM-enabled Long-horizon Skill Learning for Robotic Manipulation.
2020	Outstanding Graduate and Outstanding Undergraduate Graduation Project, Hefei University of Technology.
2019	Third Prize, 16th Challenge Cup National Undergraduate Academic Science and Technology Works Competition.
2018 and 2019	Automation 81 First-Class Scholarship, Hefei University of Technology (1/183 in each award record).
2019	School-level First Prize, 5th Internet Plus Innovation and Entrepreneurship Competition.
2019	Excellent completion, Provincial College Student Innovation and Entrepreneurship Training Program.
2018 and 2019	Merit Student and Second Prize Scholarship, Hefei University of Technology (top 15%).
2018	First Prize Scholarship, Hefei University of Technology (top 5%).
2017 and 2018	Third Prize, 11th and 12th iCAN International Contests of Innovation.
2018	Third Prize, 8th Science Popularization Creative Innovation Competition of 100 Universities in Anhui Province.
2018	Third Prize, 8th Industry Cup Science and Innovation Competition, Hefei University of Technology.
2017	Kewell Scholarship.

Publications

- [1] **DR-TSLM: Deictic Reference Resolution Via Temporal-Spatial Large Language Model for Human-Robot Interaction**
Runjia Tan, Shanhe Lou, Lan Yu, Xuesong Tian, Chen Lv
CIS-RAM 2026. Conference record
- [2] **An Autonomous and Hardware-Agnostic Vision-Servoed System for Microdevice Injection**
Yumin Zheng[†], Runjia Tan[†], Rui Jiao, Sunwoo Lee
ICRA 2026. [†] Equal contribution. Conference record
- [3] **LLM-augmented hierarchical reinforcement learning for human-like decision-making of autonomous driving**
Lin Li, Runjia Tan, Jianwu Fang, Jianru Xue, Chen Lv
Expert Systems with Applications, 294, 128736, 2025. Paper
- [4] **Large language model-enabled cognitive agent for self-aware manufacturing**
Shanhe Lou, Runjia Tan, Yanxin Zhou, Ziyue Zhao, Yiran Zhang, Chen Lv
Journal of Manufacturing Systems, 82, 1213–1226, 2025. Paper
- [5] **A Cognitive Digital Twin for Industry 5.0 Based on a Large Language Model Agent**
Shanhe Lou, Runjia Tan, Mengchu Zhou, Chen Lv
IEEE ICHMS, 223–228, 2025. Paper
- [6] **Personalized Disassembly Sequence Planning for a Human–Robot Hybrid Disassembly Cell**
Shanhe Lou, Runjia Tan, Yiran Zhang, Mengchu Zhou, Chen Lv
IEEE Transactions on Industrial Informatics, 20(9), 11372–11383, 2024. Paper
- [7] **Multi-modal LLM-enabled Long-horizon Skill Learning for Robotic Manipulation**
Runjia Tan, Shanhe Lou, Yanxin Zhou, Chen Lv
CIS-RAM 2024, 14–19. **Best Paper Award.** Paper
- [8] **Template-Based Category-Agnostic Instance Detection for Robotic Manipulation**
Zhongxu Hu, Runjia Tan, Yanxin Zhou, Junyang Woon, Chen Lv
IEEE Robotics and Automation Letters, 7(4), 12451–12458, 2022. Paper
- [9] **An Modeling Processing Method for Video Games Based on Deep Reinforcement Learning**
Runjia Tan, Jun Zhou, Haibo Du, Suchen Shang, Lei Dai
IEEE ITAIC, Chongqing, China, 2019. Paper