Ding Gao

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EDUCATION

Donghua University **Shanghai, China**

Master of Engineering in Mechanical Engineering **Sep 2023 – June 2026**

- **GPA:** 3.93/4.0;
- **Graduate Thesis:** Digital Twin Modeling Method for Flexible Production Lines Based on Large Language Model Multi-Agent Systems

Nanjing Institute of Technology **Nanjing, China**

Bachelor of Engineering in Mechanical Engineering **Sep 2019 – June 2023**

- **GPA:** 3.77/4.0 (Last Two Years); **Major Rank:** 4/99;
- **Undergraduate Thesis:** Development of a 3-DOF Ball Screw Defect Detection Platform

RESEARCH INTERESTS

Robotics and Automation; Embodied AI; Robot Perception, Planning, and Control; Human-Robot Collaboration; Digital Twins and Cyber-Physical Manufacturing Systems

PUBLICATIONS (* Equal contribution; † Corresponding author.)

1. **Ding Gao***, Xiaojian Wen*, Jianhao Lv*, Jiahui Si, Cong Wang, and Jinsong Bao†. "Self-evolving digital twins in flexible manufacturing: A large language model-powered multi-agent approach." Digital Engineering, 10 (2026): 100099. doi: 10.1016/j.dte.2026.100099.
2. Jianhao Lv*, Jiahui Si*, Wenchao Li*, **Ding Gao***, and Jinsong Bao†. "Graph-driven Single-Robot Multi-Cognitive Agent System architecture for human-robot collaborative disassembly." Robotics and Computer-Integrated Manufacturing, 99 (2026): 103207. doi: 10.1016/j.rcim.2025.103207.
3. Jianhao Lv*, Jiahui Si*, **Ding Gao***, and Jinsong Bao†. "Historical visual question answering with large language model for Augmented Reality-assisted Human-Robot Collaboration." Journal of Manufacturing Systems, 83 (2025): 546-556. doi: 10.1016/j.jmsy.2025.10.005.

PATENTS

- Utility Model Patent, "A Prefabricated Component System Based on Conductive Concrete," (Patent No. CN212613158U).
- Invention Patent, "An Angle-Adjustable Stage and Its Use Method," (Patent No. CN113702385B).

RESEARCH EXPERIENCE

Graduate Research - LLM-Enabled Digital Twins for Flexible Manufacturing Automation **Donghua University, Shanghai, China**
Advisor: Prof. Jinsong Bao **Sep2023 - Jun 2026**

- Proposed a knowledge-behavior-geometry framework that used LLM-based agents to generate, coordinate, and reconfigure digital twin models in response to changing production tasks and system states.
- Developed a digital twin platform integrating interactive 3D models, real-time physical-virtual synchronization, event-driven agent tool calls, RAG-based manufacturing knowledge retrieval, and natural-language interaction.
- Evaluated the framework on a parts defect-monitoring and sorting line; experiments reported a 47% reduction in changeover and recovery time and a lower false-positive rate than conventional methods.

Research Assistant - Embodied AI Robotic System for Industrial Disassembly **Donghua University, Shanghai, China**
Advisor: Dr. Jiahui Si **Apr 2025 - Jun 2025**

- Developed a multimodal perception-decision-action system (VLA) for retired EV-battery disassembly, enabling voice-guided task planning and robotic tool-handling operations.
- Constructed a LangGraph-based agent integrated with a voice-specialized LLM for real-time task planning, tool selection, and human-robot interaction.
- Combined FastSAM and VLMs for scene understanding, Strategy of Mind prompting for grasp planning, and GraspNet with MCP tool calling to control a UR robot for collision-free tool pickup and delivery.

Undergraduate Thesis - 3-DOF Ball Screw Defect Detection Platform **Nanjing Institute of Technology, Nanjing, China**
Advisor: A/Prof. Fei Hao **Jan 2023 - Jun 2023**

- Designed a 3-DOF mechatronic platform for ball-screw defect detection, including load analysis, motor-torque calculations, and component selection.
- Produced 2D engineering drawings and 3D CAD/UG models, and conducted kinematic simulations of the platform.
- Developed an 8051-based controller for stepper-driven linear and arc motion and validated its circuit and control behavior through Proteus simulations.

Robotics Competition - National University Students Mobile Crane Robot Competition **Nanjing Institute of Technology, Nanjing, China**
Advisor: A/Prof. Fei Hao **Feb 2022 - Nov 2022**

- Led the development of a mobile crane robot for transporting and placing different objects along designated routes, including mechanical design, motion analysis, and system integration.
- Programmed an STM32-based control system for DC motors, encoder motors, servos, and robotic arms, coordinating multiple actuators through CAN bus communication for precise movement and manipulation.
- Developed a dynamic shortest-path algorithm and upgraded the actuation mechanism from a single- to triple-motor configuration, reducing total operation time from 4 min 32 sec to 3 min 15 sec.

PROFESSIONAL EXPERIENCE

BILIBILI **SHANGHAI, CHINA**
AI Agent Software Engineer **July 2026 - Present**

TESLA GIGAFACTORY **SHANGHAI, CHINA**
Full-Stack Development Intern | R&D Department **Sep 2025 - Jan 2026**

- Engineered an agentic harness using LangChain Deep Agents, incorporating TODO-based planning and specialized subagents to orchestrate multi-step analysis of Model 3 and Model Y user-feedback data.
- Developed an agent-driven data-processing workflow that recognized user intent, grouped records by request type, delegated clustering tasks to subagents, and synthesized their results into structured analytical outputs.
- Integrated agent outputs into an Angular/C# internal visualization platform, enabling R&D teams to identify critical issues, prioritize high-demand feature requests, and adjust product-development priorities based on data insights.

ABB ROBOT SUPER FACTORY **SHANGHAI, CHINA**
Software Development Intern - Robotics Application Software | R&D Department **Jul 2025 - Sep 2025**

- Developed an LLM-driven robotic task planner using Azure OpenAI and MCP, decomposing complex natural-language instructions into executable RAPID commands through Robot Web Services.
- Implemented parallel task coordination and execution-failure handling, enabling the planner to manage multi-step robot operations and respond to unsuccessful actions.
- Improved Tangram recognition under variable lighting through dynamic HSV parameter adjustment and developed a RAG-based AppStudio assistant for robot-function generation and technical knowledge retrieval.

BILIBILI **SHANGHAI, CHINA**
Software Development Intern **Jun 2025 - Jul 2025**

- Built an AI-assisted error-monitoring pipeline using NestJS scheduled jobs to capture JavaScript and unhandled rejection errors, analyze them with LLM agents, and store the results in MySQL.
- Developed a RAG-based diagnostic agent that retrieved relevant technical knowledge and generated structured JSON solutions for frontend visualization.

CAERULEAN AI INC. **VANCOUVER, CANADA**
Full-Stack Developer Intern (Remote) **Dec 2024 - Apr 2025**

- Architected a LangChain-based multi-agent system for an interactive virtual world, incorporating memory-augmented agents and RAG-enhanced contextual reasoning.
- Integrated the agent system into a browser-based Phaser environment, enabling agents to maintain contextual memory and support more coherent user-agent interactions.

SELECTED HONORS & AWARDS

- Excellence Award (National Second Place), 12th NVIDIA Sky Hackathon - Embodied AI Robot based on LLM Multi-Agent Systems, 2025.
- National First Prize, National University Students Mathematics Competition, 2023; Provincial First Prize, 2022; Provincial Third Prize, 2020.
- National First Prize, 6th National University Students Mobile Crane Robot Competition, 2022.
- Scholarships: Donghua University First-Class (Top 5%) (2x) and Second-Class (1x), 2023-2026; Nanjing Institute of Technology First-Class (Top 5%) (1x) and Second-Class (4x), 2020-2023.
- University Merit Student, 2022 and 2023; Outstanding Graduate Award, 2023.

SKILLS SUMMARY

- **Robotics and Automation:** Robot task planning and grasping, UR/ABB robot integration, RAPID/RWS, Multi-actuator control, CAN bus.
- **Embodied and Agentic AI:** LLM/VLM-based agents, Multi-Agent System, RAG, LangChain/LangGraph, Deep Agents, FastSAM, GraspNet.
- **Programming:** Python, JavaScript/TypeScript; familiar with C, C++, C#, MATLAB.
- **Software Development:** Git, React, Angular, Vue, Next.js, NestJS, Docker, Kubernetes, and Jenkins (CI/CD).
- **Embedded Systems and CAD:** STM32/8051, Keil MDK, Proteus, AutoCAD, SolidWorks and UG NX; familiar with ANSYS and Pro/E.
- **English:** IELTS 7.0 (Listening 7.5, Reading 8.0, Writing 6.0, Speaking 6.0).