Runjiao Bao

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EDUCATION

Beijing Institute of Technology Sep 2023 - Jun 2026 (Expected)
Master Candidate in Control Engineering GPA: 84.7/100
Core Courses: Optimal and Robust Control, Linear Algebra in Automatic Control, Image Acquisition and Processing

Jilin University Sep 2019 - Jun 2023
Bachelor Degree in Automation GPA: 3.51/4.0
Core Courses: Automatic Control Principles, Modern Control Theory, Linear Algebra, Signals and Systems, Robotics

PUBLICATIONS

First-Author Publications

- **R. Bao**, J. Wang, S. Wang*, et al. **Geodesic-Based Path Planning for Port Transfer Robots on Riemannian Manifolds**. *Expert Systems with Applications*. (JCR Q1, IF: 7.5)
  DOI: 10.1016/j.eswa.2025.129706
- **R. Bao**, Y. Xu, S. Wang*, et al. **STGN: A Spatio-Temporal Graph Network for Real-time and Generalizable Trajectory Planning**. *IEEE Transactions on Automation Science and Engineering*. (Accepted, JCR Q1, IF: 6.3)
  DOI: 10.1109/TASE.2025.3614472
- **R. Bao**, Y. Xu, J. Xue, H. Yuan, L. Zhang, S. Wang*. **A Hierarchical Target Vehicle Pose Detection Framework in Ro-Ro Terminal Environment**. *IEEE Sensors Journal*. (JCR Q1, IF: 4.5)
  DOI: 10.1109/JSEN.2025.3574091
- **R. Bao**, Y. Xu, T. Niu, L. Zhang, H. Yuan, J. Si, S. Wang*. **Deep Reinforcement Learning-Based Trajectory Tracking Framework for 4WS Robot Considering Switch of Steering Modes**. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*. (Accepted, 2025)

Co-Author Publications

- Y. Xu, **R. Bao**, L. Zhang, S. Wang*, J. Wang. **Embodied intelligence in RO/RO logistic terminal: autonomous intelligent transportation robot architecture**. *Science China-Information Sciences*. (JCR Q1, IF: 7.6)
  DOI: 10.1007/s11432-024-4395-7
- L. Zhang, Y. Xu, J. Si, **R. Bao**, Y. An, S. Wang*, J. Wang. **Autonomous transfer robot system for commercial vehicles at Ro-Ro terminals**. *Expert Systems with Applications*. (JCR Q1, IF: 7.5)
  DOI: 10.1016/j.eswa.2025.128347
- G. Zhang, Z. Xing, Q. Yue, **R. Bao**, K. Liu, Y. Xia, S. Chai*. **A Multi-objective Real-time Trajectory Planning Framework for Human-machine Mixed Traffic Based on Self-attention Guided CNN-LSTM**. *IEEE Transactions on Intelligent Transportation Systems*. (JCR Q1, IF: 8.4)
  DOI: 10.1109/TITS.2025.3579233
- L. Zhang, Q. Cai, **R. Bao**, T. Niu, Y. Xu, J. Si, S. Wang*. **Dynamic Network Topology Analysis, Design, and Evaluation for Multi-Robot Vehicle Transfer in High-Density Storage Yards**. *IROS 2025*. (Accepted)
- H. Yuan, T. Niu, L. Zhang, **R. Bao**, J. Si, S. Wang*. **HFSENet: Hierarchical Fusion Semantic Enhancement Network for RGB-T Semantic Segmentation in Annealing Furnace Operation Area**. *IROS 2025*. (Accepted)

RESEARCH PROJECTS

Controllable Seismic Source Vehicle Advanced Driver Assistance System Development Mar 2025 – Jul 2025

- Developed an autonomous navigation system for complex off-road terrains using Bayesian learning-based graph search with adaptive sampling to identify traversable paths.

- Implemented terrain risk-aware RRT* algorithm combined with dynamic terrain flatness corridor and CiLQR methods for adaptive speed control in challenging environments.
- Built the complete software stack on Linux and ROS platforms for precise vehicle positioning and control.

Achievements:

Delivered 12 complete vehicle systems to the industrial partner (China Petroleum Group), generating cumulative value worth tens of millions of RMB. Generated cumulative value exceeding tens of millions RMB. Support the preparation of a manuscript on the developed autonomous navigation system, currently under review at IEEE Transactions on Industrial Electronics (T-IE).

Intelligent Inspection Robot for Annealing Furnace Areas Oct 2024 – Jan 2025

- Supported the on-site data collection and contributed to a novel RGB-T dataset for annealing furnace environments and developing an anomaly detection algorithm to identify operational hazards.
- Built a hierarchical multimodal tracker using DRL, which enabled the robot to autonomously select optimal steering configurations and execute precise tracking in complex and harsh conditions.
- Assisted in the system integration and deployment process, ensuring reliable operation under high-temperature and narrow space constraints.

Achievements:

Successfully deployed the robot for 6+ months of autonomous operation, effectively replacing manual labor in a hazardous environment. Supported the research that led to the acceptance of 2 papers at IROS 2025.

Multi-Robot System for Autonomous Vehicle Transfer at Roll-on/Roll-off Terminals Mar 2024 – Sep 2024

- Designed a hierarchical vehicle pose estimation framework by integrating Voxel-RCNN with an improved bounding box fitting algorithm to address point cloud sparsity and dynamic shape changes.
- Developed the core obstacle avoidance and local planning module for individual robots, enabling safe and efficient traversal in dynamic port environments.
- Developed real-time road network update mechanism using cloud scheduling data and multi-sensor perception.

Achievements:

Delivered a field-validated system that successfully met all accuracy and efficiency benchmarks for 15-unit mass production, demonstrating high reliability in real-world port operations. As a core technical contributor, won the National Gold Award in the China International College Students' Innovation Competition (2024). Generated significant research outcomes leading to 3 SCI Q1 journal papers and 1 top conference paper (IROS 2025).

SELECTED HONOURS & AWARDS

- **National Gold Award**, China International College Students' Innovation Competition (*2024*)
- **National Second Award**, China Postgraduate "Dual-Carbon" Innovation Competition (*2024*)
- **National Third Award**, China Postgraduate Robot Innovation and Design Competition (*2024*)
- **North China Division Second Award**, China Graduate Electronics Design Contest (*2024*)
- **Provincial Special Prize**, China's Innovation Challenge on Artificial Intelligence Application Scene (*2024*)

TECHNICAL SKILLS

- **Programming:** Python (Proficient), C++ (Intermediate), MATLAB (Experienced)
- **Tools & Platforms**: Linux (Shell), ROS 1/2, Gazebo, CoppeliaSim, Git, Docker, CMake, PyTorch
- **Robotics Areas**:
  Perception: LiDAR-based SLAM, 3D Point Cloud Processing
  Planning: Motion Planning, Trajectory Optimization (Nonliner Optimization & Geodesic-Based Optimization)
  Control: Optimal Control, DRL intelligent control
- **Language**: English (Fluent)