Cheng Guo

PhD Researcher in Robotics & Embodied Intelligence

Predictive Models • World Models • Robot Learning and Control

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Research Profile

I develop predictive models for embodied robot intelligence, enabling robots to anticipate human motion, environmental uncertainty, and the long-horizon consequences of their actions. My research combines physics-informed learning, uncertainty quantification, and world models, with applications to human motion understanding, robot planning in dynamic crowds, and humanoid loco-manipulation.

Education

Ph.D. in Computer Science 04/2023 – Present
University of Manchester & Italian Institute of Technology, Manchester, UK & Genoa, Italy

- **Supervisors:** Prof. Angelo Cangelosi and Dr. Arash Ajoudani.
- **Former Co-supervisors:** Dr. Daniele Pucci and Prof. Wei Pan.

M.Sc. in Mechatronics and Information Technology 04/2019 – 09/2021
Karlsruhe Institute of Technology, Karlsruhe, Germany

- Final grade: 1.8 (German grading scale; 1.0 highest).
- Thesis: *Investigation of Reoptimization Approaches for the Coordination of Heterogeneous Robotic Teams*
- **Supervisor:** Prof. Hohmann Soeren

B.Sc. in Mechatronics Engineering 09/2014 – 07/2018
Zhejiang University, Hangzhou, China

- GPA: 87 / 100.
- Thesis: *The Design of Robot-in-Pipe for Remote Image Recognition*
- **Supervisor:** Prof. Xuanyin Wang

Selected Publications

Published / Accepted

- Song, H., Yadav, R., **Guo, C.**, and Pan, W. *"SoraNav: Adaptive UAV Task-Centric Navigation via Zeroshot VLM Reasoning."* *IROS 2026.*
- **Guo, C.**, L'Erario, G., Romualdi, G., Leonori, M., Lorenzini, M., Ajoudani, A., Pucci, D. *"Physics-Informed Learning for Human Whole-Body Kinematics Prediction via Sparse IMUs."* *IROS 2025.*
- **Guo, C.**, Rapetti, L., Darvish, K., Grieco, R., Draicchio, F., Pucci, D. *"Online Action Recognition for Human Risk Prediction with Anticipated Haptic Alert via Wearables."* *Humanoids 2023.*

Under Review

- **Guo, C.**, Ni, M., Ajoudani, A., Cangelosi, A. *"LUCID: Latent-Skill Unified Control via Imagined Dynamics for Long-Horizon Humanoid Loco-Manipulation."* *Submitted to AAAI 2027.*
- **Guo, C.**, Ni, M., Liang, Z., Ling, Y., Hu, Y., Caprio, M., Pucci, D., Pan, W. *"CoCoNav: Conformal Control for Safe Robot Navigation in Crowds."* *Submitted to ICRA 2027.*
- Ni, M., **Guo, C.**, Zhang, H., Cangelosi, A., Pan, W. *"PhysTennis: A Differentiable-Physics Approach for Quadruped Robotic Tennis."* *Submitted to AAAI 2027.*
- Ni, M., **Guo, C.**, Qi, Q., Cangelosi, A., Pan, W. *"PAWS: Predictive Adaptive Whole-Body Safety for Cross-Embodiment Mobile Manipulation."* *Submitted to ICRA 2027.*

Workshop Paper

- **Guo, C.**, Rapetti, L., Darvish, K., Pucci, D. *"Online Human Action Recognition for NIOSH-based Risk Assessment."* *IROS 2022 Workshop.*
- **Guo, C.**, Liang, Z., Ling, Y., Hu, Y., Caprio, M., Pucci, D., Pan, W. *"ConformalNav: Adaptive Conformal Prediction for Safe Quadrupedal Social Navigation."* *15th UKACC Control Conference 2026.*

Book Contribution

- **Bayes AI Consortium** (106 co-authors, including **C. Guo**). *Bayesian Deep Learning.* *International collaborative book manuscript in preparation.*

Research Experience

Research Fellow 02/2022 – Present
Istituto Italiano di Tecnologia, Genoa, Italy

- Developed a hierarchical world-model framework that learns latent skills and plans through imagined dynamics for long-horizon humanoid loco-manipulation; first-author submission to AAAI 2027.
- Developed adaptive conformal prediction for uncertainty-aware human trajectory forecasting and risk-aware quadruped navigation in dynamic crowds; first-author submission to ICRA 2027.
- Developed a physics-informed learning framework for whole-body human kinematics prediction from sparse IMUs; first-author paper accepted at IROS 2025.
- Developed real-time learning-based human action recognition and risk assessment methods with wearable sensing, including anticipated haptic alerts; first-author paper at IROS 2022 workshop and Humanoids 2023.
- Implemented model-based human kinematics estimation from wearable sensors and ergonomics assessment algorithm for real-time human-robot collaboration; demonstrated for ErgoCub project.

Research Assistant 08/2021 – 01/2022
Forschungszentrum Informatik, Karlsruhe, Germany

- Modeled spring-damper and gearbox dynamics of robotic joints, simulated the models in ROS, and validated them on physical hardware using trajectory comparisons.

Practicum Research Intern 04/2020 – 08/2020
Institute für Anthropomatik und Robotik, KIT, Karlsruhe, Germany

- Improved UWB-based localization through simulation-based optimization and evaluated learning-based localization methods in simulation.

Research Intern 07/2017 – 01/2018
Bosch Power Tools (China) Co., Ltd, Hangzhou, China

- Modeled electrical-hammer impact dynamics and investigated design changes for improved mechanical performance.

Academic Service

Peer Reviewer: IEEE Transactions on Robotics (T-RO), IEEE Robotics and Automation Letters (RA-L), IEEE International Conference on Robotics and Automation (ICRA), IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), Conference on Robot Learning (CoRL), IEEE-RAS International Conference on Humanoid Robots (Humanoids), IEEE International Conference on Automation Science and Engineering (CASE), and IEEE International Conference on Robot and Human Interactive Communication (RO-MAN).

Technical Skills

Programming & Tools:	Python, C++, C, MATLAB, Simulink, Linux, Git, Docker
Robot Learning:	PyTorch, JAX, TensorFlow, Keras; reinforcement learning, world models, deep learning
Robotics Platforms:	ROS/ROS2, YARP, Isaac Gym, Gazebo, MuJoCo
Robotics Methods:	State estimation, planning & control, robot dynamics, numerical optimization, conformal prediction, differentiable physics, signal processing

Languages

Chinese (Native), English (Fluent), German (C1), Italian (Beginner)

Interests

Reading, Writing, Drawing, Skateboarding, Hiking