Ruiqi Wang

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West Lafayette, IN, USA
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RESEARCH INTEREST

My research focuses on developing **adaptive human–robot systems that learn from and adapt to human-centered dynamics** to enable the seamless integration of robots into everyday life. I investigate adaptation mechanisms across three complementary dimensions: *capability heterogeneity* in human cognitive and operational characteristics; *state uncertainty* during interaction, such as cognitive load, fatigue, and attention; and *preference variability* that drives personalized robot behaviors. Spanning from *one-to-one human–robot interaction* at homes to *multi-human–multi-robot collaboration* in fields, my work aims to lay the foundation for a future where robots can naturally understand, adapt to, and collaborate with any human, in any context or situation.

Research Areas: Human-Robot Interaction, Human-in-the-Loop Reinforcement Learning, Multi-Agent Human-Robot Teaming, Foundation Models for Robotics

EDUCATION

Doctor of Philosophy in Computer and Information Technology *Aug. 2021 – May 2026 (expected)*
Purdue University, West Lafayette, IN, USA

- *Concentration*: Robotics and AI
- *Advisor*: Prof. Byung-Cheol Min
- *Dissertation*: "Adaptive Human-Robot Teaming and Interaction: Embracing Heterogeneity, Operational Dynamics, and Personalized Preferences"

Bachelor of Engineering in Robotics Engineering *Sept. 2016 – July 2020*
Beijing University of Chemical Technology (BUCT), Beijing, China

- *Thesis*: "Scene Recognition of Mobile Robot in Typical Home Environment"
- Recipient of Outstanding Undergraduate Thesis (ranked top 0.4% among all graduates in Beijing)

PUBLICATIONS

A chronological list is provided below, with a categorized list by research topic available on my homepage.

†: Equal contribution

Conference Papers

[C.9] **PRIMT: Preference-based Reinforcement Learning with Multimodal Feedback and Trajectory Synthesis from Foundation Models**
Ruiqi Wang†, Dezhong Zhao†, Ziqin Yuan†, Tianyu Shao, Guohua Chen, Dominic Kao, Sungeun Hong, Byung-Cheol Min
Advances in Neural Information Processing Systems (**NeurIPS**), San Diego, USA, December 2025.
Oral Presentation (Top 0.36%)

[C.8] **PrefMMT: Modeling Human Preferences in Preference-based Reinforcement Learning with Multimodal Transformers**
Dezhong Zhao†, **Ruiqi Wang**†, Dayoon Suh, Taehyeon Kim, Ziqin Yuan, Byung-Cheol Min, and Guohua Chen
IEEE/RSJ International Conference on Intelligent Robots and Systems (**IROS**), Hangzhou, China, October 2025.

[C.7] **Modeling and Evaluating Trust Dynamics in Multi-Human Multi-Robot Task Allocation**
Ike Obi, **Ruiqi Wang**, Wonse Jo, and Byung-Cheol Min
IEEE/RSJ International Conference on Intelligent Robots and Systems (**IROS**), Hangzhou, China, October 2025.

[C.6] **Personalization in Human-Robot Interaction through Preference-based Action Representation Learning**
Ruiqi Wang†, Dezhong Zhao†, Dayoon Suh, Ziqin Yuan, Guohua Chen, and Byung-Cheol Min
IEEE International Conference on Robotics and Automation (**ICRA**), Atlanta, USA, May 2025.

[C.5] **Adaptive Task Allocation in Multi-Human Multi-Robot Teams under Team Heterogeneity and Dynamic Information Uncertainty**
Ziqin Yuan†, **Ruiqi Wang**†, Taehyeon Kim, Dezhong Zhao, Ike Obi, and Byung-Cheol Min
IEEE International Conference on Robotics and Automation (**ICRA**), Atlanta, USA, May 2025.

[C.4] **Multi-Robot Cooperative Socially-Aware Navigation using Multi-Agent Reinforcement Learning**
Weizheng Wang, Le Mao, **Ruiqi Wang**, and Byung-Cheol Min
IEEE International Conference on Robotics and Automation (**ICRA**), Yokohama, Japan, May 2024.

[C.3] **Initial Task Allocation for Multi-Human Multi-Robot Teams with Attention-based Deep Reinforcement Learning**
Ruiqi Wang, Dezhong Zhao, and Byung-Cheol Min
IEEE/RSJ International Conference on Intelligent Robots and Systems (**IROS**), Detroit, USA, October 2023.

[C.2] **NaviSTAR: Socially Aware Robot Navigation with Hybrid Spatio-Temporal Graph Transformer and Preference Learning**
Weizheng Wang, **Ruiqi Wang**, Le Mao, and Byung-Cheol Min
IEEE/RSJ International Conference on Intelligent Robots and Systems (**IROS**), Detroit, USA, October 2023.

[C.1] **Feedback-efficient Active Preference Learning for Socially Aware Robot Navigation**
Ruiqi Wang, Weizheng Wang, and Byung-Cheol Min
IEEE/RSJ International Conference on Intelligent Robots and Systems (**IROS**), Kyoto, Japan, October 2022.

Journal Papers

[J.6] **PrefCLM: Enhancing Preference-based Reinforcement Learning with Crowdsourced Large Language Models**
Ruiqi Wang, Dezhong Zhao, Ziqin Yuan, Ike Obi, and Byung-Cheol Min
IEEE Robotics and Automation Letters (**RA-L**), vol. 10, no. 3, pp. 2486-2493, March 2025.

[J.5] **Cognitive Load-based Affective Workload Allocation for Multi-Human Multi-Robot Teams**
Wonse Jo, **Ruiqi Wang**, Baijian Yang, Dan Foti, Mo Rastgaar, and Byung-Cheol Min
IEEE Transactions on Human-Machine Systems (T-HMS), vol. 55, no. 1, pp. 23-36, February 2025.

[J.4] **Multimodal Audio-based Disease Prediction with Transformer-based Hierarchical Fusion Network**
Jinjin Cai[†], **Ruiqi Wang**[†], Dezhong Zhao, Ziqin Yuan, Victoria McKenna, Aaron Friedman, Rachel Foot, Susan Storey, Ryan Boente, Sudip Vhaduri, and Byung-Cheol Min
IEEE Transactions on Audio, Speech, and Language Processing (T-ASLP), vol. 33, pp. 1170-1182, February 2025.

[J.3] **Husformer: A Multi-Modal Transformer for Multi-Modal Human State Recognition**
Ruiqi Wang[†], Wonse Jo[†], Dezhong Zhao, Weizheng Wang, Baijian Yang, Guohua Chen, and Byung-Cheol Min
IEEE Transactions on Cognitive and Developmental Systems (T-CDS), vol. 16, no. 4, pp. 1374-1390, August 2024.

[J.2] **MOCAS: A Multimodal Dataset for Objective Cognitive Workload Assessment on Simultaneous Tasks**
Wonse Jo[†], **Ruiqi Wang**[†], Go-Eum Cha, Su Sun, Revanth Senthilkumaran[§], Daniel Foti, and Byung-Cheol Min
IEEE Transactions on Affective Computing (T-AFFC), vol. 16, no. 1, pp. 116-132, June 2024.

[J.1] **Initial Task Allocation in Multi-Human Multi-Robot Teams: An Attention-enhanced Hierarchical Reinforcement Learning Approach**
Ruiqi Wang, Dezhong Zhao, Arjun Gupte, and Byung-Cheol Min
IEEE Robotics and Automation Letters (RA-L), vol. 9, no. 4, pp. 3451-3458, April 2024.

Pre-print/Under Review

[P.2] **SafePlan: Leveraging Formal Logic and Chain-of-Thought Reasoning for Enhanced Safety in LLM-based Robotic Task Planning**
Ike Obi, L.N Vishnunandan Venkatesh, Weizheng Wang, **Ruiqi Wang**, Dayoon Suh, Temitope Ibrahim Amosa, Wonse Jo, and Byung-Cheol Min
arXiv preprint, arXiv:2503.06892, 2025.

[P.1] **REBEL: Rule-based and Experience-enhanced Learning with LLMs for Initial Task Allocation in Multi-Human Multi-Robot Teams**
Arjun Gupte[†§], **Ruiqi Wang**[†], L. N. Vishnunandan Venkatesh, Taehyeon Kim, Dezhong Zhao, and Byung-Cheol Min
arXiv preprint, arXiv:2409.16266, 2024.

AWARDS AND HONORS

– **Scholar Award** *2025*
NeurIPS 2025

– **Second Place, Graduate Student Poster Presentation Award** *2024*
Realizing the Digital Enterprise Research Impact Area, Purdue University

– **Graduate Travel Grants** *2025, 2023, 2022*
Purdue University

– **Daniel & Martina Lewis Graduate Scholarship** *2022*
Recognition for outstanding academic achievement, Purdue University

– **Outstanding Undergraduate Thesis Award** *2020*
Beijing Municipal Education Commission (top 0.4% among all graduates)

– **Second Place, IJCAI-2019 Eldercare Robot Challenge** *2019*
· Achieved as the only undergraduate team competing against graduate-level groups
· Champion, 'Searching for Missing Object' Section

– **Third Prize, RoboCup 2019 China Open @Home** *2019*
Home Service Robot League

– **Champion, Softbank Cup 2018 Robot Competition** *2018*
· Innovation Section (1st place among 16 teams)
· Second Prize, Field Robot Section

– **Outstanding Innovation and Technology Scholarship** *2018*
BUCT (top 1% of undergraduate cohort)

TEACHING EXPERIENCE

Course Instructor, Purdue University

– CNIT 175: Visual Programming *Fall 2025*
35 students · Midterm Course Evaluation: 4.6/5.0

Graduate Teaching Assistant, Purdue University

– CNIT 105: Introduction to C Programming *Fall 2024*
208 students · TA Evaluation: 4.5/5.0

– CNIT 355: Mobile Programming *Fall 2024*
30 students · TA Evaluation: 4.7/5.0

– CNIT 315: Systems Programming *Spring 2024*
91 students · TA Evaluation: 4.5/5.0

– CNIT 355: Software Development for Mobile Computers *Fall 2022*
15 students · TA Evaluation: 4.8/5.0

Undergraduate Teaching Assistant, BUCT

– Electromechanical Actuation Control *Fall 2020*
45 students

Instructor, Undergraduate Robot Innovation Center, BUCT

– Practice of Robot Operating System (ROS) *Fall 2019, Spring 2020*
20+ students per semester

RESEARCH MENTORING EXPERIENCE

Graduate Researchers and Visiting Scholars

- **Ziqin Yuan** *Fall 2024 – Fall 2025*
  Ph.D. Student, SMART Laboratory, Purdue University
  Research Focus: Generative AI for Robotics & Multi-Human Multi-Robot Teams
  Representative Outcome: ICRA'25
- **Dezhong Zhao** *Fall 2023 – Fall 2024*
  Visiting Scholar, SMART Laboratory, Purdue University
  Ph.D. Student, BUCT
  Research Focus: Preference Learning in Human-Robot Interaction & Multi-Human Multi-Robot Teams
  Representative Outcome: IROS'25
- **Weizheng Wang** *Fall 2022 – Spring 2023*
  Ph.D. Student, SMART Laboratory, Purdue University
  Research Focus: Social Robot Navigation
  Representative Outcome: IROS'23

Undergraduate Research Students

- **Arjun Gupte** *Spring 2023 – Present*
  B.S., Computer Engineering, Purdue University
  Honors: 2025 Class of Astronaut Scholarship;
  First Place, Oral Presentation, 2024 Fall Purdue Undergraduate Research Conference
- **Dayoon Suh** *Spring 2024 – Spring 2025*
  B.S., Data Science & Applied Statistics, Purdue University
  Honors: Mary-Ann Neel Computer Science Scholarship, 2024
  Next Position: M.S.E. in Robotics, Computer and Information Science, University of Pennsylvania
- **Revanth Krishna Senthilkumaran** *Spring 2022 – Fall 2022*
  B.S., Computer Engineering, Purdue University
  Honors: Third Place, Oral Presentation, 2022 Spring Purdue Undergraduate Research Conference
  Next Position: M.S. in Robotics, Robotics Institute, Carnegie Mellon University

GRANT PROPOSAL ASSISTANCE EXPERIENCE

- **Enabling Next-Generation HyFlex Field Laboratories through an Innovative Learner-In-The-Loop Multi-Robot System**
  National Science Foundation (NSF), Award #DRL-2418688, $900,000 (Sep 2024 – Aug 2027)
  Assisted in preparing technical sections on the human-robot interface and the proposal rebuttal.
- **FW-HTF-P: Interactive Multi-Human Multi-Remote-Robot Operations for Future Construction Field**
  National Science Foundation (NSF), Award #CMMI-2222838, $150,000 (Oct 2022 – May 2025)
  Contributed to proposal text on human-robot interaction methodologies.
- **CAREER: Adaptive Human Multi-Robot Systems**
  National Science Foundation (NSF), Award #IIS-1846221, $500,000 (Feb 2019 – Jan 2025)
  Supported preparation of annual reports and extension proposal documents.

SERVICE AND OUTREACH

Journal Reviewer

- *IEEE Robotics and Automation Letters* (RA-L)
- *IEEE Transactions on Audio, Speech, and Language Processing* (T-ASLP)
- *IEEE Transactions on Computational Social Systems* (T-CSS)
- *IEEE Transactions on Human-Machine Systems* (T-HMS)
- *Nature Scientific Reports*
- *The Journal of Supercomputing*

Conference Reviewer

- *IEEE International Conference on Robotics and Automation* (ICRA 2024, 2025, 2026)
- *IEEE/RSJ International Conference on Intelligent Robots and Systems* (IROS 2023, 2025)
- *ACM/IEEE International Conference on Human-Robot Interaction* (HRI 2025, 2026)
- *IEEE International Conference on Biomedical Robotics and Biomechatronics* (BioRob 2024)
- *International Symposium on Technological Advances in Human-Robot Interaction* (TAHRI 2024)

Educational Outreach

- **West Lafayette Jr./Sr. High School, West Lafayette, IN, USA** *Apr. 2025*
  One-day seminar on generative AI for robotics
  Impact: 23 students, 1 teacher
- **West Lafayette Jr./Sr. High School, West Lafayette, IN, USA** *Dec. 2023*
  One-day robotics seminar on human-robot interaction, multi-robot systems, and robot design
  Impact: 47 students, 1 teacher
- **West Lafayette Jr./Sr. High School, West Lafayette, IN, USA** *May 2023*
  Five-day hands-on robotics program with practical applications and experimental activities
  Impact: 15 students, 1 teacher
- **Macau Anglican College, Macau, China** *Dec. 2022*
  One-day workshop (virtual) on human-in-the-loop RL and affective robotics
  Impact: 20 students, 4 teachers