

Research Interest

AI for Healthcare, Human Motion Analysis, Multimodal Sensor Data Analysis, Personalized Clinical Decision Support System

Education

- Aug 2025 – **Ph.D. in Industrial Engineering**, *University of Illinois Urbana-Champaign*, Champaign, Illinois, USA, *GPA 4.00/4.00*
Present
Expected Graduation: May 2029
- Sep 2022 – **M.Eng. in Computer Science**, *Huazhong University of Science and Technology*, Wuhan, Hubei, China, *Overall Ranking 1/133*
June 2025
Graduating with distinction
- Sep 2018 – **B.Eng. in Computer Science**, *Huazhong University of Science and Technology*, Wuhan, Hubei, China, *GPA 3.87/4.00*
June 2022
Graduating with distinction

Research Experience

- March 2026 – **Integrating Clinical Domain Knowledge with Physiological Measurements for Personalized Clinical Decision-Making and Treatment Recommendation for Pediatric Neuromuscular Conditions**, *Project Leader*
Present
 - Constructed an end-to-end clinically interpretable framework that integrates clinical domain knowledge (criteria) with physiological measurements, and proposed an access-controlled multi-agent collaboration paradigm to support accurate clinical decision-making and personalized treatment recommendation
 - Conducted experiments on a real-world clinical dataset with 200 children, providing personalized clinical insights
 - One pioneering work was accepted at the Humansys 2026 workshop conference (Pending Publication)
- Jun 2026 – **Human Motion Foundation Representation through Cross-Modality Knowledge Transfer**, *Project Leader*
Present
 - Developed a knowledge transfer paradigm across multiple sensing modalities (e.g., EMG, Motion Capture, IMU, Vibration)
 - Formulated a mathematical representation of human motion and extracted shared knowledge from the biomechanical perspective
 - Verifying the idea on the motion capture and IMU modalities

- Sep 2025 – **EnviroGait: Smartglasses-Based Gait Analysis System for Walking Asymmetry and Balance Assessment with Environmental Awareness**, *Core Project Member*
- Presented *EnviroGait*, a smartglasses-based gait analysis system that integrates eye gaze, 3D environmental reconstruction, and head-mounted IMU data to achieve real-world, environment-aware assessment of walking asymmetry and balance
 - Conducted experiments with synchronized smartglasses and motion-capture ground-truth data, achieving 87.6% classification accuracy and calculating 7 gait asymmetry/balance parameters
- Jan 2025 – **MotionDecipher: LLM-Assisted Clinical Interpretation of Human Motion Signals for Efficient Gait Analysis**, *Project Leader*
- Introduced *MotionDecipher*, a novel framework bridging the semantic gap between motion data and clinical interpretations, and generating accurate gait analysis reports
 - Proposed *Human Motion Tokenizer* component that converts motion signals into domain-specific tokens for time- and frequency-informed gait interpretation
 - Constructed *Hybrid Context Constructor* to determine the optimal demonstration-based prompt for In-Context Learning inference
 - Deployed *MotionDecipher* at a certified gait clinic, collected data from 122 patients, and achieved 0.91 *BERTScore* (13% and 20% improvement over GPT-5 and Google Gemini 3 baselines, respectively)
 - One paper was accepted at the Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies (IMWUT) journal/Ubicomp 2027 Conference (Pending Publication)

Research Interns

- Sep 2024 – **Institute of Software, Chinese Academy of Sciences**, *AI Algorithm Engineer*, Beijing, China
- May 2025 Develop a specialized domain knowledge Q&A Agent for chip developers and users to streamline prototype construction time
- Jun 2024 – **Fortune Global 500 Tech Company**, *AI Algorithm Engineer*, Shenzhen, China
- Sep 2024
- Developed an LLM Agent-based intelligent summarization algorithm and an automated multi-classification process using RAG technique
 - The algorithm was successfully deployed company-wide and actively used by over 200,000 employees, receiving high praise from the company's leadership

Honors & Awards

- 2025 Bradley Mottier Innovation Challenge Competition, **Champaign (1st Place), Captain**
- 2024 **(School Level) Academic Excellence Award** (The highest individual honor for graduate students, only 2 out of 20,085 candidates received this distinction)
- 2024 (School Level) Technology Innovation Scholarship
- 2024 **(National Level) The 6th CHINA Graduate AI Innovation Competition, First Prize (Top 1%), Captain**
- 2024 **(National Level) The 19th "Challenge Cup" National College Student Curricular Academic Science and Technology Works Competition, First Prize, (Top 1%)**
- 2024, 2023 **(National Level) National Scholarship** (Ranked Top 0.2% among all graduates)
- 2023 **(National Level) The 18th "Challenge Cup" National College Student Curricular Academic Science and Technology Works Competition, Grand Prize, (Top 0.5%), Captain**

2023, 2022 **(National Level)** China Graduate Network Innovation Competition, **First Prize, (Top 0.5%), Captain**

2023 (School Level) Merit graduate

2023 (School Level) Zhixing Scholarship

2025, 2022 (School Level) Graduation Design of Distinction

2024, 2023, 2022 (School Level) Top Prize Scholarship

Selected Publications & Preprints

- [1] **Mingrui Ma**, Tian Tan, Jinsi Guo, Jessica Rose, and Yiwen Dong. MotionDecipher: LLM-Assisted Clinical Interpretation of Human Motion Signals for Efficient Gait Analysis, Proc. ACM Interact. Mob. Wearable Ubiquitous Technol., Vol. 10, No. 4, Article 245. (Pending Publication) <https://doi.org/10.1145/3857982>
- [2] **Mingrui Ma**, Muyu Yang, Kylie Clewes, Evan Lowe, Jessica Rose, and Yiwen Dong. CausalGait: Towards Personalized Gait Interpretation via Causality-Informed Knowledge Graphs, HumanSys '26: Proceedings of the 4th International Workshop on Human-Centered Sensing, Modeling, and Intelligent Systems, Pages 99-104 (Pending Publication) <https://doi.org/10.1145/3842436.3843806>
- [3] **Mingrui Ma**, Lansheng Han, and Chunjie Zhou. Btad: A binary transformer deep neural network model for anomaly detection in multivariate time series data. Advanced Engineering Informatics, 56:101949, 2023. <https://doi.org/10.1016/j.aei.2023.101949>
- [4] **Mingrui Ma**, Lansheng Han, and Chunjie Zhou. Research and application of artificial intelligence based webshell detection model: A literature review, 2024. <https://arxiv.org/abs/2405.00066>
- [5] **Mingrui Ma**, Lansheng Han, and Chunjie Zhou. Research and application of transformer based anomaly detection model: A literature review, 2024. <https://arxiv.org/abs/2402.08975>

Academic Service

Oct 2026 **The 4th International Workshop on Human-Centered Sensing, Modeling, and Intelligent Systems (HumanSys 2026)**, *Social Media Chair*, ACM

Nov 2024 – **"Computers and Electrical Engineering" (JCR Q2, IF 4.0)**, *Reviewer*, Elsevier
Present

Oct 2024 – **"Neurocomputing" (JCR Q2, IF 5.5)**, *Reviewer*, Elsevier
Present

Sep 2024 – **"International Journal of Intelligent Systems" (JCR Q1, IF 5.0)**, *Honorary Reviewer*, WILEY
Present

Jul 2024 – **"IEEE Transactions on Knowledge and Data Engineering (TKDE)" (JCR Q1, CCF-A, IF 8.9)**, *Reviewer*, IEEE
Present

Jul 2024 – **"International Journal of Machine Learning and Cybernetics" (JCR Q2, IF 3.1)**, *Reviewer*, Springer
Present

Jul 2023 – **"IEEE Transactions on Intelligent Transportation Systems (TITS)" (JCR Q1, IF 7.9)**, *Reviewer*, IEEE
Present

May 2023 – "Applied Intelligence" (JCR Q2, IF 3.4), *Reviewer*, Springer
Present

■ Invention Patents

1. **Method and System for Automated Gait Motion Analysis and Clinical Report Generation**, *U.S. Patent App. No. 64/026,713*, Primary Inventor
2. **A Method, Device, and System for Evidence Generation Based on Multivariate Collaborative Analysis**, *CN Patent App. No. 2024031901604420*, Primary Inventor
3. **A Normalized Log Generation Method Based on the Entropy Increase Principle**, *CN Patent App. No. 2023112102142270*, Primary Inventor
4. **A Method for Multidimensional Graph Tensor Fusion Representation and Embedding of Codes**, *CN Patent App. No. 2023052300567880*, Primary Inventor

■ Skills

Programming languages Python, C/C++, Go, PHP, Matlab

Frameworks & Tools PyTorch, TensorFlow, Qt, LaTeX