Xin Wang

Postdoctoral Researcher in Industrialized Construction Innovation at National Renewable Energy Laboratory Mobile: (608) 698-8536 / E-mail: Xin.Wang@nrel.gov Website / LinkedIn / Google Scholar

EDUCATION

01/2020 - 06/2024	 Ph.D. in Civil Engineering, University of Wisconsin-Madison GPA: 4.0 / 4.0 Advisor: Zhenhua Zhu Dissertation Title: "Context-Aware Worker Intent Interpretation for Human-Robot Collaboration in Construction"
01/2020 - 05/2021	M.S. in Computer Science, University of Wisconsin-Madison GPA: 4.0 / 4.0
09/2012 - 06/2019	M.S. and B.S. in Civil Engineering, <i>Tongji University</i> GPA: 91.5 / 100 (M.S.), 4.74 / 5.0 (B.S.) Advisor: Hehua Zhu Dissertation Title: "Study on Serviceability Degradation Model of Shield Tunnel Through Data Mining Methods"

PROFESSIONAL POSITIONS

09/2024 – present	Postdoctoral Researcher, National Renewable Energy Laboratory (NREL)
07/2024 - 09/2024	Postdoctoral Researcher, University of Wisconsin-Madison (UW-Madison)

RESEARCH INTERESTS

- Human-Robot Interaction
- Construction Automation and Robotics
- Artificial Intelligence in Construction
- Building Decarbonization and Resilience

RESEARCH EXPERIENCE

09/2024 - present Industrializing Construction to Decarbonize Buildings, U.S. Department of Energy

Advised by Naveen Kumar Muthumanickam and Shanti Pless, NREL

- Investigate the effects of different HVAC systems and their installation methods on the building energy performance.
- Integrate different data types (e.g., cameras, sensors) into one high-fidelity simulation model of the entire construction process.
- Utilize robotics technologies to reach out to hot and uncomfortable cavities for performing a variety of retrofit tasks in distinct building types.

01/2020 – 08/2024 Hand Gesture Recognition for Human-Robot Collaboration in Construction, *Wisconsin* Alumni Research Foundation

Advised by Prof. Dharmaraj Veeramani and Prof. Zhenhua Zhu, UW-Madison

- Proposed a vision-based framework including worker detection and tracking, frame cropping, and gesture recognition, to capture and interpret the hand gestures of construction workers.
- Developed a wearable sensor-based system including data preprocessing, window sliding and gesture recognition, to facilitate the accurate classification of hand gestures.

• Integrated eye tracking and hand gesture recognition for human-robot collaboration in construction.

06/2022 – 07/2022 Transformer-based Segmentation for Recycling Materials in Construction, *VIMS/IAARC Datathon 2022 Competition*

Advised by Prof. Yin Li and Prof. Zhenhua Zhu, UW-Madison

- Evaluated three state-of-the-art transformer-based architectures on construction image segmentation tasks.
- Established an ensemble model utilizing the techniques of model soup and probability weighting for performance improvement.

09/2017 – 12/2019 Application of Information Technologies in Efficient Tunneling Boring Machine (TBM) Construction and Maintenance, *National Basic Research Program of China (973 Program)*

Advised by Prof. Hehua Zhu, Tongji University

- Utilized data mining methods including Long Short-Term Memory (LSTM) and clustering analysis to identify the different degradation patterns and predict the future performance of shield tunnels.
- Proposed an integrated data mining approach including data cleaning, partition of full tunneling cycles, feature extracting, and deep learning models, to perform real-time prediction of critical TBM operational parameters.

SELECTED JOURNAL PUBLICATIONS

Wang, X., Veeramani, D., Dai, F., Zhu, Z., 2024. Context-Aware Hand Gesture Interaction for Human-Robot Collaboration in Construction. Computer-Aided Civil and Infrastructure Engineering. DOI: 10.1111/mice.13202.

Wang, X., Han, W., Mo, S., Cai, T., Gong, Y., Li, Y., Zhu, Z., 2023. Transformer-Based Automated Segmentation of Recycling Materials for Semantic Understanding in Construction. Automation in Construction, DOI: 10.1016/j.autcon.2023.104983.

Wang, X., Han, W., Du, E., Dai, F., Zhu, Z., 2023. An Eye Gaze-Aided Virtual Tape Measure for Smart Construction. Canadian Journal of Civil Engineering, DOI: 10.1139/cjce-2023-0056.

Wang, X., Veeramani, D., Zhu, Z., 2023. Gaze-Aware Hand Gesture Recognition for Intelligent Construction. Engineering Applications of Artificial Intelligence, DOI: 10.1016/j.engappai.2023.106179.

Wang, X., Veeramani, D., Zhu, Z., 2022. Wearable Sensors-Based Hand Gesture Recognition for Human-Robot Collaboration in Construction. IEEE Sensors Journal, DOI: 10.1109/JSEN.2022.3222801.

Wang, X., Zhu, Z., 2021. Vision–Based Framework for Automatic Interpretation of Construction Workers' Hand Gestures. Automation in Construction, DOI: 10.1016/j.autcon.2021.103872.

Wang, X., Zhu, H., Zhu, M., Zhang, L., Ju, JW., 2021. An Integrated Parameter Prediction Framework for Intelligent TBM Excavation in Hard Rock. Tunneling and Underground Space Technology, DOI: 10.1016/j.tust.2021.104196.

Wang, X., Zhu, Z., 2021. Vision-based hand signal recognition in construction: A feasibility study. Automation in Construction, DOI: 10.1016/j.autcon.2021.103625.

Zhu, H., **Wang**, X., Chen, X., Zhang, L., 2020. Similarity Search and Performance Prediction of Shield Tunnel in Operation Through Time Series Data Mining. Automation in Construction, DOI: 10.1016/j.autcon.2020.103178.

SELECTED CONFERENCE PUBLICATIONS

Wang, X., Veeramani, D., Dai, F., Zhu, Z. Eye Gaze and Hand Gesture-Driven Human-Robot Interaction in Construction. In: 2024 CI & CRC Joint Conference, Des Moines, Iowa, Mar. 20-23, 2024.

Wang, X., Han, W., Mo, S., Cai, T., Gong, Y., Li, Y., Zhu, Z. Transformer-Based Semantic Segmentation for Recycling Materials in Construction. In: 2023 ASCE International Conference on Computing in Civil Engineering, Corvallis, Oregon, Jun. 25-28, 2023.

Wang, X., Han, W., Du, E., Dai, F., Zhu, Z. An Eye Tracking Based Virtual Tape Measure in Construction. In:

Transforming Construction with Reality Capture Technologies, Fredericton, New Brunswick, Canada, Aug. 23-25, 2022.

Wang, X., Veeramani, D., Zhu, Z. Integrated Sensor-Based Interface for Human-Robot Collaboration in Construction. In: 39th International Symposium on Automation and Robotics in Construction, Bogotá, Colombia, Jul. 13-15, 2022.

Wang, X., Zhu, Z. Vision-Based Recognition of Construction Worker's Hand Signals. In: CI & CRC Joint Conference, Arlington, Virginia, Mar. 9-12, 2022.

Wang, X., Zhu, Z. Wearable Sensor-based Hand Gesture Recognition of Construction Workers. In: 38th International Symposium on Automation and Robotics in Construction, Dubai, UAE, Nov. 2-4, 2021.

Wang, X., Zhu, M., Shen Y. Prediction of TBM Operational Parameters Using an Integrated Data Mining Framework. In: Proceedings of 11th Asian Rock Mechanics Symposium, Beijing, China, Oct. 21-25, 2021.

Wang, X., Zhu, Z. Hand Signal Recognition of Workers on Construction Sites using Deep Learning Networks. In: International Conference on Computing in Civil Engineering, Orlando, FL., Sep. 12-14, 2021.

ACHIEVEMENTS AND AWARDS

Best Paper Award Across All Tracks (~ 400 Papers) in CI & CRC Joint Conference (2024). American Society of Civil Engineers.

Scholarship for Student Research Grants Competition - Conference Presentation (2023, 2021). UW-Madison.

Best Academic Paper Award in TCRC Conference (2022). Canadian Society for Civil Engineering.

First Place in VIMS/IAARC Datathon 2022 Competition (2022). American Society of Civil Engineers.

Awards of Outstanding Undergraduate Graduates (2016). Tongji University.

International Exchange Scholarship for Undergraduate Students (2016). China Scholarship Council.

National Scholarship for Undergraduate Students (2015). Chinese Ministry of Education.

Awards of Outstanding Undergraduate Students (2015). Tongji University.

First-class Academic Scholarship (2013, 2015). Tongji University.

Honorable Mention in American Mathematical Contest in Modeling (2015). COMAP.

Second Prize in China Undergraduate Mathematical Contest in Modeling (2014). Chinese Ministry of Education.

TEACHING EXPERIENCE

Independent Instructor for CEE 159 Civil Engineering Graphics (Spring 2024). UW-Madison.

Co-Instructor for CEE 669 Spatial/Visual Sensing Construction (Spring 2023). UW-Madison.

Teaching Assistant for CS 220/319 Data Programming I (Spring 2022). UW-Madison.

COMPUTER SKILLS

Programming Languages: C/C++, MATLAB, R, Python, SQL, GAMS Deep Learning Libraries: Pytorch, TensorFlow, Keras, Numpy, OpenCV Construction-Related Software: AutoCAD, Revit, ABAQUS, Primavera, WinEst