East Lansing, MI
1-518-888-6111
cuizijun@msu.edu

Zijun Cui

Homepage
Google Scholar
LinkedIn

Education

Ph.D. Computer Systems Engineering, *Rensselaer Polytechnic Institute* — August, 2017 - December, 2022
M.S. Applied Mathematics, *Rensselaer Polytechnic Institute* — August, 2017 - December, 2022
M.S. Electrical Engineering and Computer Engineering, *Brown University* — August, 2015 - May, 2017
B.S. Modern Physics, *University of Science and Technology of China (USTC)* — August, 2011 - May, 2015

Research Interests

My research develops ***knowledge-augmented AI*** systems that integrate domain priors, from physical laws to symbolic reasoning, into deep learning pipelines. Core research areas include ***computer vision***, ***probabilistic graphical models***, and ***AI for Health***, with an emphasis on models that are interpretable, data-efficient, and deployable in real-world settings.

Experience

Assistant Professor. — August, 2024 – Present
DominoAI Lab, Michigan State University — *East Lansing, Michigan*

- Direct a research lab advancing knowledge-augmented deep learning, with a focus on embedding physical laws, symbolic reasoning, and domain priors into modern neural architectures.
- Lead projects spanning physics-informed computer vision [26], probabilistic graphical models [25], and AI for Health.
- Mentor undergraduate and graduate students and foster interdisciplinary collaborations bridging AI and applied sciences.

Postdoctoral Research Fellow. Advisor: Dr. Yan Liu. — March, 2023 – May, 2024
Melady Lab, University of Southern California — *Los Angeles, California*

- Developed physics-informed deep learning algorithms using causal models for time-series forecasting and urban transportation; published at NeurIPS [20] and TMLR [23].
- Developed interpretable deep learning methods for AI for Health, focusing on surgical skill assessment and cancer outcome prediction; published at MICCAI [12], AMIA [14, 22], AUA [18], npj Digital Medicine [21].

Visiting Research Scholar. IBM Thomas J. Watson Research Center — January, 2019 – August, 2019
Collaborators: K. Talamadupula, P. Kapanipathi, T. Gao — *Yorktown Heights, New York*

- Developed a knowledge-augmented deep learning algorithm for knowledge graph completion; published at AAAI [6].

Research Assistant. Advisor: Dr. Qiang Ji. — August, 2017 – December, 2022
Intelligent Systems Lab, Rensselaer Polytechnic Institute — *Troy, New York*

- Developed knowledge-augmented deep learning and probabilistic graphical model algorithms with applications mainly in computer vision; published at CVPR [4,5,10,18], NeurIPS [3], ECCV [9], IJCAI [7], UAI [8], and AAAI [1,6].

Publication

[26] Elkhan Ismayilzada, Yufei Zhang, **Zijun Cui**
"PAD-Hand: Physics-Aware Diffusion for Hand Motion Recovery". *Computer Vision and Pattern Recognition Conference (CVPR)*, 2026.

[25] Yinghuan Zhang, Yufei Zhang, Parisa Kordjamshidi, **Zijun Cui**
"Bayesian Network Structure Discovery Using Large Language Models". *Transactions on Machine Learning Research (TMLR)*, 2026.

[24] Yufei Zhang, **Zijun Cui**, Jeffrey O Kephart, Qiang Ji
"Diffusion-based 3D Hand Motion Recovery with Intuitive Physics". *International Conference on Computer Vision (ICCV)*, 2025.

[23] Zijun Cui*, Sam Griesemer, Sungyong Seo*, Joshua Hikida, and Yan Liu.
"Physics-Aware Spatiotemporal Causal Graph Network for Forecasting with Limited Data". *Transactions on Machine Learning Research (TMLR)*, 2025.

[22] Sajjad Shahabi, **Zijun Cui**, Ruishan Liu, Joseph Carlson, Yan Liu.
"DGSurv: Dynamic Graph-Based Multimodal Learning for Interpretable Cancer Survival Prediction". *American Medical Informatics Association (AMIA) Annual Symposium Proceedings*, 2025

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[21] **Zijun Cui** and Andrew J. Hung.
"Chatper 2: What is artificial intelligence, machine learning, and deep learning: terminologies explained". Artificial Intelligence in Urology, *Academic Press*, 2025. [Book Chapter Publication]

[20] Sam Griesemer, Defu Cao, **Zijun Cui**, Carolina Osorio, and Yan Liu.
"Sample-efficient Simulation-based Inference for Urban Travel Demand Calibration". *The Thirty-eighth Annual Conference on Neural Information Processing Systems (NeurIPS)*, 2024.

[19] **Zijun Cui**, Runzhuo Ma, Cherine H. Yang, Anand Malpani, Timothy N. Chu, Ahmed Ghazi, John W. Davis, Brian J. Miles, Clayton Lau, Yan Liu, and Andrew J. Hung.
"Capturing Relationships between Suturing Sub-skills to Improve Automatic Suturing Assessment". *npj Digital Medicine*, 2024

[18] Yufei Zhang, Jeffrey O. Kephart, **Zijun Cui**, and Qiang Ji.
"PhysPT: Physics-aware Pretrained Transformer for Estimating Human Dynamics from Monocular Videos". *Computer Vision and Pattern Recognition Conference (CVPR)*, 2024.

[17] Zijun Cui, Hanjing Wang, Tian Gao, Kartik Talamadupula, and Qiang Ji.
"Theory-guided Message Passing Neural Network for Probabilistic Inference". *Conference on Artificial Intelligence and Statistics (AISTATS)*, 2024.

[16] Zijun Cui, Runzhuo Ma, Cherine Yang, Yan Liu, and Andrew Hung.
"Automated Surgical Skill Assessment with Skill Inter-dependencies for Robotic Suturing". *American Urological Association (AUA)*, 2024. [Podium Session]

[15] Zijun Cui.
"AI+Science: Knowledge-augmented Deep Learning". *The Workshop for Women in Machine Learning (WiML)*, 2023. [Travel Funding Award]

[14] Emily Nguyen, **Zijun Cui**, Georgia Kokaraki, Joseph Carlson, and Yan Liu.
"Transferable and Interpretable Treatment Effectiveness Prediction for Ovarian Cancer via Multimodal Deep Learning". *American Medical Informatics Association (AMIA), 2023.*

[13] Yizhou Zhang, Loc Trinh, Defu Cao, **Zijun Cui**, and Yan Liu.
"Detecting Out-of-Context Multimodal Misinformation with interpretable neural-symbolic model". *arXiv preprint arXiv:2304.07633*.

[12] Loc Trinh, Tim Chu, **Zijun Cui**, Anand Malpani, Cherine Yang, Istabraq Delieh, Alvin Hui, Oscar Gomez, Yan Liu, and Andrew Hung.
"Self-supervised Sim-to-Real Kinematics Reconstruction for Video-based Assessment of Intraoperative Suturing Skills". *The 26th International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI), 2023.* [Oral Presentation]

[11] Zijun Cui, Tian Gao, Kartik Talamadupula, and Qiang Ji.
"Knowledge-augmented Deep Learning and its Applications: A Survey". *IEEE Transactions on Neural Networks and Learning Systems,* 2023 [Journal Publication]

[10] Zijun Cui, Chenyi Kuang, Tian Gao, Kartik Talamadupula, and Qiang Ji.
"Biomechanics-guided Facial Action Unit Detection through Force Modeling". *The IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, 2023.

[9] Chenyi Kuang, **Zijun Cui**, Jeffrey Kephart, and Qiang Ji.
"AU-aware 3D Face Reconstruction through Personalized AU-specific Blendshape Learning". *European Conference on Computer Vision (ECCV)*, 2022.

[8] Zijun Cui, Hanjing Wang, Tian Gao, Kartik Talamadupula, and Qiang Ji.
"Variational Message Passing Neural Network for Maximum-A-Posteriori (MAP) Inference". *38th Conference on Uncertainty in Artificial Intelligence (UAI)*, 2022. [UAI Scholarshop Award]

[7] Zijun Cui, Naiyu Yin, Yuru Wang, and Qiang Ji.
"Empirical Bayesian Approaches for Robust Constraint-based Causal Discovery under Insufficient Data". *31st International Joint Conference on Artificial Intelligence (IJCAI)*, 2022.

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[6] Zijun Cui, Pavan Kapanipathi, Kartik Talamadupula, Tian Gao and Qiang Ji.
"Type-augmented Relation Prediction in Knowledge Graphs". *35th AAAI Conference on Artificial Intelligence (AAAI)*, 2021.

[5] Tengfei Song, **Zijun Cui**, Yuru Wang, Wenming Zheng, and Qiang Ji.
"Dynamic Probabilistic Graph Convolution for Facial Action Unit Intensity Estimation". *IEEE International Conference on Computer Vision and Pattern Recognition (CVPR)*, 2021.

[4] Tengfei Song, **Zijun Cui**, Wenming Zheng, and Qiang Ji.
"Hybrid Message Passing with Performance-Driven Structures for Facial Action Unit Detection". *IEEE International Conference on Computer Vision and Pattern Recognition (CVPR)*, 2021.

[3] Zijun Cui, Tengfei Song, Yuru Wang, and Qiang Ji.
"Knowledge Augmented Deep Neural Networks for Joint Facial Expression and Action Unit Recognition". *34th Conference on Neural Information Processing Systems (NeurIPS)*, 2020.

[2] Zijun Cui and Qiang Ji.
"Blendshape-augmented Facial Action Units Detection". *Workshop on Differentiable Vision, Graphics, and Physics in Machine Learning at NeurIPS*, 2020.

[1] Zijun Cui, Yong Zhang, and Qiang Ji.
"Label Error Correction and Generation Through Label Relationships". *34th AAAI Conference on Artificial Intelligence (AAAI)*, 2020. [Highlight Presentation]

Award

- The Workshop for Women in Machine Learning (WiML) 2023 Travel Funding — October, 2023
- Allen B. Dumont Prize, Rensselaer Polytechnic Institute — May, 2023
- Conference on Uncertainty in Artificial Intelligence (UAI) Scholarship — June, 2022
- Rensselaer-IBM Artificial Intelligence Research Collaboration Scholarship — September, 2018 - December, 2022
- The first prize in the University Student Innovative Research Program, USTC — 2014
- The third prize for the Academic Excellent Students, USTC — 2014

Services

Area Chair	IEEE FG
Reviewer and Program Committee	CVPR, UAI, ECCV, ICLR, NeurIPS, KDD, AAAI
	IEEE Transactions on Affective Computing, IEEE TNNLS
Conference Coordinator	KDD'(23), Women in Machine Learning (WiML) 2023@NeurIPS,
	Women in Data Science (WiDS) Youth event 2024