ZHU (ELLEN) WANG

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RESEARCH INTERESTS

Multimodal representation learning and optimization for deep neural networks, with applications to scientific and technical domains such as patent analysis and medical imaging.

EDUCATION

University of Illinois Chicago, Chicago, IL 2025
Ph.D., Computer Science
Advisor: Sathya N. Ravi, Isabel Cruz (deceased)
Thesis: Semantic-driven Multimodal Learning: Gradient-based Methods and Applications

University of Pittsburgh, Pittsburgh, PA 2015
M.S., Information Science. Advisor: Paul Munro

Northeastern University, China 2012
B.Mgt., Information Management and System. Advisor: Zhuchao Yu

RESEARCH EXPERIENCE

Postdoctoral Fellow, Northwestern University 02/2025 - present
Supervisor: Prof. Brian Uzzi
Visualizing Innovation: Multimodal Analysis of Scientific Evolution

Research Assistant, AIOpt Lab, University of Illinois at Chicago 2022 - 2025
Multimodal representation learning and applications

Research Assistant, ADVIS Lab, University of Illinois at Chicago 2016 - 2021
Applying deep learning methods on ontology matching; Data management and analytics for public health

Research Assistant, PICSO Lab, University of Pittsburgh 2014 - 2016
Scholarly knowledge discovery and link predictions for junior scholars

Research & Data science Intern, CCCIS, Chicago, IL 05/2022 - 08/2022
Vehicle damage prediction via computer vision foundation models and knowledge graphs

PUBLICATIONS

Bold *indicates my name.* * *indicates a student I mentor.*

MANUSCRIPTS UNDER REVIEW:

[u1] Improving Training-free Open-vocabulary Segmentation using Diffused Cuts
Zhu Wang, Harsh Mishra*, Sathya N. Ravi

[u2] Utilizing 2D Attention-Based Models for Memory Efficient 3D Reconstruction
Raj Mehta*, Jason Alan Sulskis, **Zhu Wang**, Sathya N. Ravi

[u3] Inventive Problem Solving with LLMs: A Benchmark for TRIZ Reasoning
Zhu Wang, Brian Uzzi

Peer-Reviewed Journal/Conference Papers:

[J1] Targeted Unlearning Using Perturbed Sign Gradient Methods With Applications on Medical Images
*Transactions on Machine Learning Research (***TMLR), 2025.**
George Nahass*, **Zhu Wang**, Homa Rashidisabet, Won Hwa Kim, Sasha Hubschman, Jeffrey C Peterson, Ghasem Yazdanpanah, Chad A Purnell, Pete Setabutr, Ann Q Tran, Darvin Yi, Sathya N. Ravi

[c1] **DesignCLIP: Multimodal Learning with CLIP for Design Patent Understanding**
*Proceedings of the 2025 Conference on Empirical Methods in Natural Language Processing (***Findings of EMNLP 2025).**
Zhu Wang, Homaira Huda Shomee*, Sathya N. Ravi, Sourav Medya

[c2] **From Heart to Words: Generating Empathetic Responses via Integrated Figurative Language and Semantic Context Signals**
*The 63rd Annual Meeting of the Association for Computational Linguistics (***Findings of ACL 2025).**
Gyeongeun Lee*, **Zhu Wang**, Sathya N. Ravi, Natalie Parde

[c3] **A Survey on Patent Analysis: From NLP to Multimodal AI**
*The 63rd Annual Meeting of the Association for Computational Linguistics (***ACL 2025).**
Homaira Huda Shomee*, **Zhu Wang**, Sathya N. Ravi, Sourav Medya

[c4] **Optimizing Neural Network Training and Quantization with Rooted Logistic Objectives**
*The 28th International Conference on Artificial Intelligence and Statistics (***AISTATS 2025).**
Zhu Wang, Praveen Raj Veluswami*, Harsh Mishra*, Sathya N. Ravi

[c5] **IMPACT: A Large-scale Integrated Multimodal Patent Analysis and Creation Dataset for Design Patents**
*Thirty-eighth Conference on Neural Information Processing Systems (***NeurIPS 2024).**
Homaira Huda Shomee*, **Zhu Wang**, Sathya N. Ravi, Sourav Medya

[c6] **Implicit Differentiable Outlier Detection Enable Robust Deep Multimodal Analysis**
*Thirty-seventh Conference on Neural Information Processing Systems (***NeurIPS 2023).**
Zhu Wang, Sourav Medya, Sathya N. Ravi
TL;DR: An end-to-end VLM framework incorporating explicit knowledge graphs and OOD-detection.

Peer-Reviewed Workshop Papers & System Reports:
[w1] **EmpatheticFIG at WASSA 2024 Empathy and Personality Shared Task: Predicting Empathy and Emotion in Conversations with Figurative Language**
*Workshop on Computational Approaches to Subjectivity, Sentiment, & Social Media Analysis at (***ACL 2024).**
Gyeongeun Lee*, **Zhu Wang**, Sathya N. Ravi, Natalie Parde

[w2] **Contextualized Structural Self-supervised Learning for Ontology Matching**
*The 18th International Workshop on Ontology Matching (***OM@ISWC 2023).**
Zhu Wang

[w3] **Analysis of the impact of covid-19 on education based on geotagged twitter**
*Workshop on Modeling and Understanding the Spread of COVID-19 (***SIGSPATIAL 2020).**
Zhu Wang, Isabel Cruz

[w4] **Predictive analytics using text classification for restaurant inspections**
*Workshop on Smart Cities and Urban Analytics (***SIGSPATIAL 2017).**
Zhu Wang, Booma Sowkarthiga Balasubramani, Isabel Cruz

[s1,2] **AgreementMakerDeep Results for OAEI 2021, 2022**
*The 16th/17th International Workshop on Ontology Matching (***OM@ISWC 2021, 2022).**
Zhu Wang, Isabel Cruz

TEACHING EXPERIENCE

Guest Lecturer, University of Illinois Chicago, 2019 – 2024

- Introduction to Data Science - Topics on data preprocessing and exploratory data analysis
- Introduction to Machine Learning - Topics on Decision Trees and Regression Models

- Data and Web Semantics - Topics on Ontology Engineering
- Deep Learning for Computer Vision - Topics on Vision-Language Models

Teaching Assistant, University of Illinois Chicago, 2016 – 2024
Course list: Program Design I, Program Design II, Introduction to Data Science, Introduction to Machine Learning, Database Systems, Data and Web Semantics

☺ MENTORING EXPERIENCE

PhD Students:

- Gyeongeun Lee (UIC CS) - Empathetic detection and response generation
- Homaira Huda Shomee (UIC CS) - Multimodal patent analysis
- George Nahass (UIC Medical School) - Medical imaging
- Jihae Choi (Northwestern Management) - AI for business

Master CS students (UIC): Praveen Raj Veluswami, Harsh Mishra, Raj Mehta
Undergraduate CS Students (UIC): Yiming Wang, Angela Xu, Jenny Vuong, Brian Wilk, Rasleen Dhaliwal

INVITED TALKS & POSTER

Rooted Logistic Loss for Efficient Multimodal Learning with Quantization and Pruning
Multimodal Artificial Intelligence Workshop 2024, TTIC, August 2024
Integrating Semantic Insights in Gradient Based Multimodal Learning
University of Chicago, December 2023
Accelerated Neural Network Training with Rooted Losses
2023 Conference on the Mathematical Theory of Deep Neural Networks, November 2023
Multimodal Representation Learning and Applications
NICO, Northwestern University, November 2023
Multimodal Representation Learning
University of Chicago, October 2023
Differentiable Outlier Detection Enable Robust Deep Multimodal Analysis
Midwest Machine Learning Symposium 2023, May 2023

ACADEMIC SERVICES

Conference Reviewer/Program Committee member: AISTATS 23 &24 &25, NeurIPS 23 &24 &25, ICLR 24 &25 &26, ICML 24 &25, ECCV 24, MICCAI 24 &25, AAAI 25, SDM 25, ICCV 25, WACV 26, CVPR 26
Guest Editor/Journal Reviewer: Special issue on Ontology Matching and Machine Learning of the Semantic Web Journal, Journal of Social Computing

AWARDS & HONORS

Graduate Student Council Travel Award, University of Illinois at Chicago	2018, 2023
Graduate SIS Scholarship, University of Pittsburgh	2015
National Undergraduate Scholarships, Northeastern University, China	2008-2012