

# ZHU (ELLEN) WANG

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## ♥ RESEARCH INTERESTS

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Multimodal learning, graph learning and neural network optimization, with applications to innovation, scientific, and socio-technical systems.

## 🎓 EDUCATION

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**University of Illinois at Chicago, Chicago, IL** 2025

Ph.D., Computer Science

Advisors: Sathya N. Ravi, Isabel Cruz

Thesis: Semantic-driven Multimodal Learning: Gradient-based Methods and Applications

**University of Pittsburgh, Pittsburgh, PA** 2015

M.S., Information Science

**Northeastern University, China** 2012

B.Mgt., Information Management and System

## 📁 RESEARCH EXPERIENCE

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**Postdoctoral Fellow**, NICO, 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 01/2022 - 12/2024

Multimodal Representation Learning and Applications

**Research & Data science Intern**, CCC Intelligence Solutions, Chicago, IL 05/2022 - 08/2022

**Research Assistant**, ADVIS Lab, University of Illinois at Chicago 08/2016 - 10/2021

Knowledge Graph; Deep Ontology Matching; Machine Learning for Public Health

**Research Assistant**, PICSO Lab, University of Pittsburgh 12/2014 - 04/2016

Scholarly Knowledge Link Prediction

## ☰ PUBLICATIONS

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*Bold indicates my name. \* indicates the student(s) I mentor.*

### MANUSCRIPTS UNDER REVIEW:

[u1] **Improving Training-free Open-vocabulary Segmentation using Diffusion 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

### 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, Darwin Yi, Sathya N. Ravi

[c2] **Inventive Problem Solving with LLMs: A Benchmark for TRIZ Reasoning**

*The 64rd Annual Meeting of the Association for Computational Linguistics (Findings of ACL 2026)*.

**Zhu Wang**, Brian Uzzi

[c3] **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

[c4] **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).*

Gyeongun Lee\*, Zhu Wang, Sathya N. Ravi, Natalie Parde

[c5] **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

[c6] **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

[c7] **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

[c8] **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.

[c9] **Contextualized Structural Self-supervised Learning for Ontology Matching**

*The 18th International Workshop on Ontology Matching (OM@ISWC 2023).*

Zhu Wang

**Peer-Reviewed Workshop Papers:**

[w10] **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).*

Gyeongun Lee\*, Zhu Wang, Sathya N. Ravi, Natalie Parde

[w11] **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

[w12] **Predictive analytics using text classification for restaurant inspections**

*Workshop on Smart Cities and Urban Analytics (SIGSPATIAL 2017).*

Zhu Wang, Booma Sowkarthiga Balasubramani, Isabel Cruz

[w13] **Research on scenarios management for testing decision-making behavior in decision simulation environment**

*International Conference on Systems and Informatics (ICSAI 2012).*

Zhu Wang, Zhuchao Yu, Yang Jiang, Xueying Hong

[s14,15] **AgreementMakerDeep Results for OAEI 2021, 2022**

*The 16th/17th International Workshop on Ontology Matching (OM@ISWC 2021, 2022).*

Zhu Wang, Isabel Cruz

☐ **TEACHING EXPERIENCE**

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Guest Lecturer, University of Illinois at Chicago,

08/2019 – 04/2024

- 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 at Chicago,

08/2016 – 12/2024

**Course list:** Program Design I, Program Design II, Introduction to Data Science, Introduction to Machine Learning, Database Systems, Data and Web Semantics

Teaching Assistant, University of Pittsburgh, **Course:** Data Mining

2015

## ☺ MENTORING EXPERIENCE

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### PhD Students:

- Gyeongun 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 management

**Master CS students (UIC):** Praveen Raj Veluswami, Harsh Mishra, Raj Mehta, Giovanni Vaccarino, Nicolo Vacis (co-advise on master thesis)

**Undergraduate CS Students (UIC):** Yiming Wang, Angela Xu, Jenny Vuong, Brian Wilk, Rasleen Dhaliwal, Daksh Soni, Manav Malik, Sai Chittala

## 🗣 INVITED TALKS & POSTER

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### **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**

The University of Chicago Pritzker School of Medicine, 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, May 2023

## 👥 ACADEMIC SERVICES

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**Conference Reviewer/Program Committee member:** AISTATS 23 - 25, NeurIPS 23 - 25, ICLR 24 - 26, ICML 24 - 26, 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

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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

## References

**Prof. Sathya N. Ravi**

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University of Illinois Chicago  
Email: sathya@uic.edu  
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**Prof. Sourav Medya**

Assistant Professor, Department of Computer Science  
University of Illinois Chicago  
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Phone: 312-996-2307

**Prof. Brian Uzzi**

Richard L. Thomas Professor, Kellogg School of Management  
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