Xueqi Cheng

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Summary of Qualification

- Extensive knowledge and research experience in geometric deep learning, network analysis, computational social science, and large language models (LLMs).
- Application of machine learning algorithms, resilience analysis of complex systems, and smart city.
- Systematic problem-solving ability for flexible problem settings and excellent communication skills.

Education

Vanderbilt University — Nashville, TN
M.S. in Computer Science — *Aug. 2023 – May. 2025*

Vanderbilt University — Nashville, TN
M.S. in Critical Infrastructure System Engineering — *Aug. 2021 – Aug. 2023*

University of Michigan — Ann Arbor, MI
M.S.E. in Civil Engineering (Structures) — *Aug. 2018 – Dec. 2019*

Southwest Jiaotong University (SWJTU) — Chengdu, China
B.S. in Civil Engineering (Bridge Engineering) — *Sep. 2014 – Jul. 2018*

Technical Skills

General: Geometric deep learning, network analysis, computational social science, large language models
Programming Languages: Python, Matlab, C++, SQL, LaTex
Tools & Framework: Numpy, Pandas, PyTorch, PyG, NetworkX, Scikit-learn, Tableau
Operation System: Ubuntu, MacOS, Windows

Selected Research Experiences

Network and Data Science (NDS) Lab — Aug. 2023 – present
Ph.D. student, Computer Science Department — *Vanderbilt University*

- Dissertation: Edge-centric Analytics in Networks
- Advisor: Dr. Tyler Derr
  - **Project I: Edge Classification on Graphs: New Directions in Topological Imbalance (WSDM'25)**
    - Identify a previously unexplored topological imbalance issue in edge classification and propose a metric, Topological Entropy (TE), to assess the extent of topological imbalance in edges' local subgraphs.
    - Pioneer an algorithmic solution, TopoEdge, that involves novel reweighting and data synthetic technique, aiming to reinforce the training efficacy and alleviate the imbalance.
    - The proposed TopoEdge helps the backbones that are not explicitly designed for edge classification tasks achieve SOTA performance on real-world datasets.
  - **Project II: A Comprehensive Analysis of Social Tie Strength: Definitions, Prediction Methods, and Future Directions (Submitted to ICWSM'25 and released on Arxiv)**
    - Summarize the mainstream practices for assigning tie strength labels and develop 7 standardized definitions using the pseudo label techniques.
    - Analyze the correlation between tie strength pseudo-labels and the resilience of strong/weak ties from the perspective of tie dissolution.
    - Conduct comprehensive experiments on tie strength prediction methods across numerous settings.
    - Propose improvement strategies based on experiments to highlight multiple future research directions.
  - **Project III: Evaluating the Evolutionary Impact of Social Ties in Cohesive Subgroup (Ongoing)**
    - Examine the impact of social ties by first formulating hypotheses using foundational random graph models and then testing them with a unique Twitter dataset to understand the impact of following and unfollowing relationships in the formation of cohesive subgroups in social networks.
    - Understand societal vulnerabilities by evaluating the risks posed by social media and state-controlled platforms worldwide in shaping polarization dynamics.

- Provide insights into the mechanisms of polarization and how governments or organizations might address these issues, balancing stability with fairness and freedom in online experiences.

* **Project IV: RAG-Enhanced LLM-Integrated Social Network Simulation System (Ongoing)**
  - Develop the social network simulator that integrates the understanding of social ties' types, intensity, and evolutionary impacts, leveraging LLM agents and retrieval-augmented generation (RAG) technology for enhanced modeling.
  - Test the quality of simulated social networks by examining key social network characteristics, including power-law distribution, clustering coefficients, and small-world phenomenon.
  - Explore key computational social science questions including collective decision-making, collaborative learning, and online influence, and also conduct classical network analysis research, including node classification and link prediction.

Baroud Research Group (BRG) Aug. 2021 – May. 2023
Ph.D. student, Civil and Environmental Engineering Department *Vanderbilt University*

- Research topics: Machine learning, network modeling, resilience assessment
- Advisor: Dr. Hiba Baroud

Resilient and Efficient Structures Laboratory (RESLab) Jan. 2019 – Dec. 2019
M.S. student, Department of Civil and Environmental Engineering *University of Michigan, Ann Arbor*

- Research topics: Performance-based wind engineering
- Advisor: Dr. Seymour M.J. Spence

Employment

Southwest Jiaotong University Chengdu Design Institute Co., Ltd. Jul. 2016 – Aug. 2016
Research Engineer Intern, Team of Bridge Design *Chengdu, China*

- Research topics: VR technology, bridge conceptual design
- Advisor: Dr. Wei He

Publications and Preprints

1. **Xueqi Cheng**, Yu Wang, Yunchao Liu, Yuying Zhao, Charu C. Aggarwal, and Tyler Derr. "Edge Classification on Graphs: New Directions in Topological Imbalance." In Proceedings of the 18th ACM International Conference on Web Search and Data Mining (WSDM) (2025).

2. **Xueqi Cheng**. "Edge-centric Analytics in Networks" In Proceedings of the 18th ACM International Conference on Web Search and Data Mining (WSDM) (2025).

3. **Xueqi Cheng**, Catherine Yang, Yuying Zhao, Yu Wang, Hamid Karimi, and Tyler Derr. "A Comprehensive Analysis of Social Tie Strength: Definitions, Prediction Methods, and Future Directions." arXiv preprint arXiv:2410.19214 (2024).

4. Yu Wang, Tong Zhao, Yuying Zhao, Yunchao Liu, **Xueqi Cheng**, Neil Shah, and Tyler Derr. "A Topological Perspective on Demystifying GNN-Based Link Prediction Performance." International Conference on Learning Representations (ICLR) (2024).

5. Yi Zhang, Yuying Zhao, Zhaoqing Li, **Xueqi Cheng**, Yu Wang, Olivera Kotevska, Philip S. Yu, and Tyler Derr. "A Survey on Privacy in Graph Neural Networks: Attacks, Preservation, and Applications." IEEE Transactions on Knowledge and Data Engineering (TKDE) (2024).

6. Yuying Zhao, Yu Wang, Yunchao Liu, **Xueqi Cheng**, Charu C. Aggarwal, and Tyler Derr. "Fairness and diversity in recommender systems: a survey." ACM Transactions on Intelligent Systems and Technology (TIST) (2023).

7. **Xueqi Cheng**, Yan Zhang, Sining Lu, Yinqiao Zhu, and Wei He. "Urban Bridge Conceptual Design Based on Virtual Reality Graphic Engine." In *IABSE Symposium Report*, vol. 108, no. 1, pp. 74-75. International Association for Bridge and Structural Engineering, 2017.

Symposiums and Workshops

1. **Xueqi Cheng**. Urban Bridge Conceptual Design Based on Virtual Reality Graphic Engine. International Association for Bridge and Structural Engineering (IABSE) Symposium, presentation, 2017.

Scholarships and Awards

- Engineering Graduate Fellowship from Vanderbilt University 2023 - present
- Vanderbilt University IBM Ph.D. Fellowship 2021 - present
- National Encouragement Scholarship 2015, 2016
- Merit Student of SWJTU 2015, 2016
- Best Debater in Freshman Debate Competition held by the School of Civil Engineering, SWJTU 2014

Guest Lectures

- **Intro to PyTorch and PyG**
  CS 4352/5352: Social Network Analysis at Vanderbilt University, Oct. 2023

Academic Services

- **Organizer**
  - Publicity Chair: The 5th International Workshop on Machine Learning on Graphs (MLoG) at WSDM'24
- **Program Committee**
  - The 5th International Workshop on Machine Learning on Graphs (MLoG) at WSDM'24
  - IEEE BigData: The 7th Workshop on Graph Techniques for Adversarial Activity Analytics (CTA3'23)
- **Reviewer/ Sub Reviewer** KDD'25, IEEE Big Data' 25, ICWSM'24, WSDM'24, AAAI'24, WWW'24, SDM'24, GTA3'24, TKDD'24, KDD'24

Extracurricular Activities

- **President**, University Student Entrepreneurship Incubation Association of SWJTU Jun. 2016 – May. 2017
- **Volunteer Teacher**, Tuoxin Primary School, Anhui, China Jun. 2015 – Aug. 2015

Teaching

- **TA** for CS 3892/5892: Project in Data-Centric AI at Vanderbilt University Aug. 2024 – Dec. 2024
- **TA** for CS 4352/5352: Social Network Analysis at Vanderbilt University Aug. 2023 – Dec. 2023
- **TA** for CE 2200: Statics at Vanderbilt University Jan. 2023 – May. 2023
- **TA** for CE 3205: Structural Design at Vanderbilt University Jan. 2022 – May. 2022
- **TA** for CE 3200: Structural Analysis at Vanderbilt University Aug. 2021 – Dec. 2021