

XIN SHEN

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Network analysis has always fascinated me, particularly clustering and link prediction, and I aspire to become a creative scholar in this field. I am passionate about developing algorithms that address various applications of graph analysis, including social and brain networks. My current journey of exploration revolves around the intersection of graph analysis, machine learning, and statistics, which requires a deep understanding of these fields. This is my [academic website](#).

EDUCATION

Uppsala University	Oct. 2022 – Estimated Oct. 2027
Ph.D. candidate specialized in Network Science	Uppsala, Sweden
Ningbo University	Aug. 2018 - Jun. 2022
Bachelor of Engineering, Computer Science and Technology	Zhejiang, China

PROJECTS

Explaining Uncertain Knowledge Graph Prediction

3rd Project of Ph.D. Research

Most research on uncertain networks uses synthetic datasets or simply assumes that edge probabilities are given without explaining where they come from. Protein-Protein interaction (PPI) networks are one of the few real-world settings where edge probabilities arise naturally. In this project, we explore whether explanation methods can respect that structure, and whether doing so produces better, more faithful explanations than ignoring it, through creating GNN-based predictor and counterfactual explanation method for uncertain networks.

Algorithms and Benchmarking in Uncertain Networks

2nd Project of Ph.D. Research

This project identifies two critical gaps. First, the effect of network structure and probability distributions on clustering results is unexplored, mainly for uncertain networks. Second, probabilistic networks can be clustered using algorithms for weighted networks, but it is not systematically understood how treating edge values as probabilities versus weights affects clustering performance. To address these gaps, we present a comprehensive benchmarking study to systematically evaluate and analyze the performance of both probabilistic and weighted clustering methods when applied to uncertain networks.

- Paper: *Clustering Uncertain Networks - structure, distributions, and the challenge of probabilistic ground truth* under reviewing

Clustering in Probabilistic Networks

1st Project of Ph.D. Research

This project focuses on three properties of probabilistic graph models. The first concerns spreading processes. This part of the project will be based on well-studied epidemic models, such as SIS and SIR, under the presence of uncertainty in the existence of the edges. The second property is resilience, that is, the ability of (a significant portion of) the graph to remain connected when nodes or edges are removed from it. The third property is modularity, that is, the extent to which the graph contains subgraphs having a high density and limited connectivity to vertices outside the subgraph.

- Abstract: Modularity for probabilistic networks accepted by [netsci2023](#) (regular talk)
- Abstract: Clustering social networks with uncertain edges following the possible worlds semantics accepted by [INSNA Sunbelt 2024](#)
- Paper: *On the accurate computation of expected modularity in probabilistic networks* published 2025

Core-Periphery Structures Detection Algorithm based on Influence Propagation Mechanism

Bachelor Thesis

This method assumes that each node can emit a certain degree of influence and propagate through the network, and then identify the nodes that has a greater influence on other nodes as the core nodes, and use the maximum influence chain to construct nodes pairing network to determine the core-periphery pairs.

PUBLICATION

Shen, X., Aliko, S., Han, Y., Skipper, J. I., & Peng, C. (2021). Finding core-periphery structures with node influences. *IEEE Transactions on Network Science and Engineering*, 9(2), 875-887.

Shen, X., Han, Y., Li, W., Wong, K. C., & Peng, C. (2021). Finding core-periphery structures in large networks. *Physica A: Statistical Mechanics and its Applications*, 581, 126224.

Shen, X., Magnani, M., Rohner, C., & Skerman, F. (2025). On the accurate computation of expected modularity in probabilistic networks. *Scientific Reports*, 15(1), 19062.

Shen, X., Calikus, E., Magnani, M., Rohner, C. (2026). Clustering Uncertain Networks - structure, distributions, and the challenge of probabilistic ground truth (under reviewing)

PROFESSIONAL REFERENCES

[Ece Calikus](#)

Job Title: Assistant
Professor
Uppsala University,
Sweden

[Christian Rohner](#)

Job Title: Professor
Uppsala University,
Sweden

[Matteo Magani](#)

Job Title: Professor
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China