

# Yuxin (Louis) Liu

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Google Scholar: Link GitHub: Website

## RESEARCH SUMMARY

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I develop theory-driven, privacy-aware algorithms for learning and decision-making in social and information networks. My research lies at the intersection of economics and computation, with a focus on sequential social learning, information design, differential privacy, and influence maximization.

A central thread in my work studies how privacy perturbations reshape belief updating, herding behavior, and collective decision efficiency—bridging microeconomic theory with machine learning and algorithmic tools. My empirical and computational projects use large-scale social data (e.g., 5M-message WhatsApp network) to examine virality and behavioral responses in real-world environments.

In addition, I have developed strong interpersonal experience through cross-group and cross-cultural collaboration, working with interdisciplinary research teams across engineering, social science, and international academic environments. These experiences have strengthened my ability to communicate across disciplines, collaborate effectively in diverse teams, and contribute to collective problem-solving.

## TECHNICAL SKILLS

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**Programming:** Python, PyTorch, TensorFlow, NumPy, NetworkX, Git.

**Machine Learning/Algorithms:** Randomized algorithms, reinforcement learning, network optimization, transformers, LLM-based modeling, diffusion models.

**Privacy:** Differential Privacy (DP), DP mechanisms, DP on networks (node-DP, edge-DP, smooth sensitivity).

**Tools:** LaTeX, CVXPY, Mathematica, SQL, HPC clusters.

## EDUCATION

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**University of Pittsburgh** **2023 – 2026 (Expected)**  
*Ph.D., Industrial Engineering* *Pittsburgh, PA*

**Tianjin University** **2020 – 2023**  
*M.S., Systems Engineering* *Tianjin, China*

**Jilin University** **2016 – 2020**  
*B.A., Economics* *Jilin, China*

## RESEARCH EXPERIENCE

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**PhD Researcher — Privacy-Aware Learning & Network Algorithms** **2023–Present**  
*University of Pittsburgh (Advisor: Prof. M. Amin Rahimian)* *Pittsburgh, PA*

- Develop privacy-preserving algorithms for influence maximization using Influence-Sample DP (ISDP); derived tight sensitivity bounds and designed randomized mechanisms that achieve higher utility than classical node-/edge-DP approaches.
- Formulated a theoretical framework for privacy-aware sequential learning under smooth randomized response, proving accelerated information aggregation and characterizing conditions that reduce herding behavior.
- Built a scalable analysis pipeline for 5M+ WhatsApp messages, including cascade reconstruction (IC model), network inference, LLM-based message embeddings, and LLM-driven topic assignment for identifying harmful content diffusion patterns.

**Electronic Technology Information Research Institute of MIIT** **06/2021 – 08/2021**  
*Researcher (Data Analytics)* *Beijing, China*

- Processed and cleaned large-scale industry datasets; organized structured data tables to support quantitative analysis and modeling workflows.

- Developed statistical summaries and visual analytics dashboards to support technology policy evaluation and market trend monitoring.
- Produced analytical reports translating empirical findings into clear insights for senior researchers and decision-makers.

## SELECTED Research Work

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### Foundational AI, LLMs, and Adaptive Agent-Modeling

- Liu, Y., Garimella, K., Rahimian, A. **Structural Dynamics of Harmful Content Dissemination on WhatsApp**. *ICWSM 2026*.
  - \* Uses LLM-driven embeddings and multimodal features to characterize virality, diffusion height, and open-ended content dynamics.
- Liu, Y., Rahimian, A. **Privacy-Aware Sequential Learning**. *FORC 2025*.
  - \* Develops a model of adaptive belief updating and curiosity-driven learning under privacy noise.

### Working Papers Under Review

- Liu, Y., Rahimian, A., Yu, F. **Seeding with Differentially Private Network Information**. Under review at *INFORMS Journal on Computing*.
  - \* Introduces Influence-Sample DP for robust agent exploration and network-level discovery under constrained feedback.
- Rutter, T., Liu, Y., Rahimian, A. **Differential Privacy for Network Connectedness Indices**. Under review at *ACM Conference on Economics and Computation (EC 2026)*.
  - \* Develops an edge-adjacent differentially private mechanism for releasing network connectedness indices.
- Liu, Y., Rahimian, A. **Privacy-preserving Information Sharing in Oligopoly Competitions**. *Working in Progress*.
  - \* Characterizes when privacy noise and external signals jointly sustain voluntary disclosure under uncertain demand.

### Additional Peer-Reviewed Journal Articles

- Ma, J., Liu, Y., Zhao, L., Liang, W. (2024). Research on the mechanism and application of spatial credit risk contagion based on complex network model. *Managerial and Decision Economics*. Citations: 5 — Journal Impact Factor:  $\sim 2.7$
- Ma, J., Liu, Y.\*, Geng, L. (2023). Does green credit financing mode with cap-and-trade scheme really benefit all members? *Managerial and Decision Economics*. Citations: 4 — Journal Impact Factor:  $\sim 2.7$
- Ma, J., Chen, J., Liu, Y.\* (2022). Research on optimization of food supply chain considering product traceability recall and safety investment. *Managerial and Decision Economics*. Citations: 11 — Journal Impact Factor:  $\sim 2.7$
- Li, Y., Ma, J., Liu, Y.\* (2022). Study on the complexity of channel pricing game in showrooming O2O supply chain. *RAIRO – Operations Research*. Citations: 9 — Journal Impact Factor:  $\sim 2.1$

## CONFERENCE PRESENTATIONS

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**Structural Dynamics of Harmful Content Dissemination on WhatsApp** *ICWSM 2026; IC2S2 2024; Purdue Operations Conference 2024*.

**Privacy-Aware Sequential Learning** *TPDP 2024; AAI PPAI 2025; APS 2025; FORC 2025; INFORMS 2025*.

**Seeding with Differentially Private Network Information**. *AAAI PPAI 2025*.

Differential Privacy for Strategic Information Sharing and Learning. *WINE 2025*.

Privacy-preserving Information Sharing in Oligopoly Competitions. *NET ECON 2026, IOE-ISyE-MS&E Rising Stars Workshop*.

Optimal Resolution Of A Data Sharing Trilemma: Statistical Power, Sample Complexity, And Privacy Budget. *PPPC 2026*.

## SELECTED HONORS & AWARDS

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Travel Grants: IOE-ISyE-MS&E Rising Stars Workshop 2026;AAAI PPAI 2025; APS 2025; FORC 2025; Purdue OR Conference 2024.

Merit Scholarship, Tianjin University (2020–2021, 2022–2023).

Merit Scholarship, Jilin University (2016–2020).

National Prize, China Graduate Mathematical Modeling Contest (2021).

## PROFESSIONAL SERVICE

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Conference Reviewer: NeurIPS, ICLR, AISTATS, WWW.

Journal Reviewer: Omega, IEEE TCNS, IEEE TSIPN, FGCS, Physica A, AMC, IEEE TNSE, BDMA.

## PROFESSIONAL REFERENCES

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### **M. Amin Rahimian**

Assistant Professor, Department of Industrial Engineering  
University of Pittsburgh  
Supervisor and Dissertation Advisor  
Email: rahimian@pitt.edu

### **Kiran Garimella**

Assistant Professor, School of Communication and Information  
Rutgers University  
Research Collaborator  
Email: kg766@rutgers.edu

### **Fang-Yi Yu**

Assistant Professor, Department of Systems Engineering and Operations Research  
George Mason University  
Research Collaborator  
Email: fangyiyu@gmu.edu