

Cheng Xin

email: cx122@rutgers.edu || phone: +1 (610) 597-1901 || website: jackal092927.github.io

Bio: Cheng Xin is a postdoctoral researcher, advised by Dr. Jie Gao, in the computer science department at Rutgers University, with publications in top-tier AI and computational geometry conferences including **NeurIPS, ICML, CVPR, SOCG**. His research focuses on the intersection of **computational topology, geometry, machine learning, and artificial intelligence**. Dr. Xin earned his Ph.D. in Computer Science from Purdue University, advised by Dr. Tamal Dey, where his doctoral research centered on **topological data analysis and graph representations learning**. His work explores innovative approaches to data representation and analysis, seeking to uncover hidden patterns and structures in complex datasets. His recent projects include developing topological frameworks for **interpretable AI**, advancing **AI for Science** through **generative AI** techniques, and contributing to the DL3DV benchmark for **3D/video generation**. Through his research, Dr. Xin develops novel mathematical frameworks and algorithms that leverage the power of topology and geometry to enhance machine learning and AI models. By bridging the gap between theoretical foundations and practical applications, he delivers robust and reliable AI solutions that both address real-world challenges and drive business impact across scientific domains and industry applications.

RESEARCH & EDUCATION

- | | |
|--|---------------------|
| Department of Computer Science, Rutgers University | Oct 2023 – Present |
| <ul style="list-style-type: none">Postdoctoral Researcher, Advisor: Prof. Jie GaoDeveloping topological frameworks for interpretable AI and graph neural networksExploring non-Euclidean representations for machine learning.Contributing to large-scale datasets for 3D/video generation | |
| Department of Computer Science, Purdue University | Aug 2020 – Aug 2023 |
| <ul style="list-style-type: none">Ph.D. in Computer Science, Advisor: Prof. Tamal K. DeyDissertation: Decomposition and Stability of Multiparameter Persistence Modules | |
| Department of Computer Science and Engineering, The Ohio State University | Jan 2017 – Aug 2020 |
| <ul style="list-style-type: none">Ph.D. in Computer Science, Advisor: Prof. Tamal K. DeyDeveloped generalized persistence algorithms for multiparameter persistence modules | |
| Department of Computer Science, Lehigh University | Jan 2014 – May 2016 |
| <ul style="list-style-type: none">M.S. in Computer Science, Advisor: Prof. Xiaolei HuangThesis: Machine Learning Techniques for Cervigram Image AnalysisResearch Focus: Medical image analysis, machine learning applications | |
| Tongji University, Shanghai, China | Sep 2009 – Jul 2013 |
| <ul style="list-style-type: none">B.Eng. in Software Engineering | |

INVITED TALKS

- “Understanding through Shape of Data: Topological Data Analysis for Interpretable AI,” Management Science and Information Systems Department Colloquium, Rutgers University, October 2024
- “Exploring Representations Beyond Euclidean Geometry,” John Hopcroft Center (JHC) Seminar, Shanghai Jiao Tong University, June 2024
- “Generalized persistence algorithm for decomposing multi-parameter persistence modules,” Applied Algebraic Topology Network Seminar, July 2020
- “Multiparameter Persistence and Its Applications,” Theory Seminar, Department of Computer Science, Rutgers University, November 2023

HONORS AND REWARDS

- The first place winner of 2017 Microsoft’s college code competition at The Ohio State University
- The first place winner of 2015 Microsoft’s college code competition at Lehigh University
- Third Prize of 2013 Tongji coding competition
- Third Prize Scholarship of Tongji University

TEACHING EXPERIENCE

- Teaching Assistant of undergraduate course, Data Structures and Algorithms, 2023 spring (200 students)
- Teaching Assistant of graduate course, Computational Geometry, 2020 fall (30 students)

SKILLS

- Python, Pytorch, Spark, Keras, Java, C, C++, MATLAB, R

INTERESTS

- Climbing, Hiking, GO

PUBLICATIONS

- [1] Shahrzad Haddadan, **Cheng Xin**, and Jie Gao. “Maximizing Coalitional Rank Improvement in a Social Network”. In: under review of AAAI. 2026.
- [2] **Cheng Xin**, Fan Xu, Xin Ding, Jie Gao, and Jiaxin Ding. “TopInG: Topologically Interpretable Graph Learning via Persistent Rationale Filtration”. In: *the 42nd International Conference on Machine Learning (ICML)*. 2025.
- [3] Chengyuan Deng, Jie Gao, Kevin Lu, Feng Luo, and **Cheng Xin**[†]. “Johnson-Lindenstrauss Lemma Beyond Euclidean Geometry”. In: under review of NeurIPS. 2025.
- [4] Chengyuan Deng, Jie Gao, Kevin Lu, Feng Luo, Hongbin Sun, and **Cheng Xin**[†]. “Neuc-MDS: Non-Euclidean Multidimensional Scaling Through Bilinear Forms”. In: *Advances in Neural Information Processing Systems (NeurIPS)*. Vol. 37. 2024, pp. 121539–121569. **(Main contributions: define problem and theoretical framework, main theorem proofs and paper writing)**.
- [5] Shahrzad Haddadan, **Cheng Xin**, and Jie Gao. “Optimally Improving Cooperative Learning in a Social Setting”. In: *Proceedings of the 41st International Conference on Machine Learning (ICML)*. Vol. 235. Proceedings of Machine Learning Research. PMLR, 21–27 Jul 2024, pp. 17148–17188.
- [6] Lu Ling, Yichen Sheng, Zhi Tu, Wentian Zhao, **Cheng Xin**, Kun Wan, Lantao Yu, Qianyu Guo, Zixun Yu, Yawen Lu, et al. “DI3dv-10k: A large-scale scene dataset for deep learning-based 3d vision”. In: *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*. 2024, pp. 22160–22169.
- [7] Simon Zhang, **Cheng Xin**, and Tamal K. Dey. “Expressive Higher-Order Link Prediction through Hypergraph Symmetry Breaking”. In: *Transactions on Machine Learning Research* (2024). ISSN: 2835-8856.
- [8] **Cheng Xin**. “Decomposition and Stability of Multiparameter Persistence Modules”. Thesis. Purdue University Graduate School, 2023. DOI: 10.25394/PGS.23848995.v1.
- [9] **Cheng Xin**, Soham Mukherjee, Shreyas N. Samaga, and Tamal K. Dey. “GRIL: A 2-parameter Persistence Based Vectorization for Machine Learning”. In: vol. 221. Proceedings of Machine Learning Research. PMLR, 28 Jul 2023, pp. 313–333.
- [10] Tamal K. Dey and **Cheng Xin**[†]. “Generalized persistence algorithm for decomposing multiparameter persistence modules”. In: *Journal of Applied and Computational Topology* 6.3 (Sept. 2022), pp. 271–322. ISSN: 2367-1734. DOI: 10.1007/s41468-022-00087-5. **(Main contributions: algorithm design, theoretical framework and most theorem proofs, and most of the paper writing)**.
- [11] Tamal K. Dey and **Cheng Xin**[†]. *Rectangular Approximation and Stability of 2-parameter Persistence Modules*. 2021. arXiv: 2108.07429 [cs.CG]. **(Main contributions: most theorem proofs, algorithm design, and most of the paper writing)**.
- [12] Tamal K. Dey and **Cheng Xin**[†]. “Computing Bottleneck Distance for 2-D Interval Decomposable Modules”. In: *34th International Symposium on Computational Geometry (SoCG)*. Vol. 99. Leibniz International Proceedings in Informatics (LIPIcs). 2018, 32:1–32:15. **(Main contributions: algorithms design, theoretical framework and main theorem proofs, and most of the paper writing)**.
- [13] Tao Xu, Han Zhang, **Cheng Xin**, Edward Kim, L. Rodney Long, Zhiyun Xue, Sameer Antani, and Xiaolei Huang. “Multi-feature based benchmark for cervical dysplasia classification evaluation”. In: *Pattern recognition* 63 (2017), pp. 468–475.
- [14] Tao Xu, **Cheng Xin**^{*}, L. Rodney Long, Sameer Antani, Zhiyun Xue, Edward Kim, and Xiaolei Huang. “A New Image Data Set and Benchmark for Cervical Dysplasia Classification Evaluation”. In: *Machine Learning in Medical Imaging*. Cham: Springer International Publishing, 2015, pp. 26–35. ISBN: 978-3-319-24888-2.

[†] indicates authors are alphabetically ordered; ^{*} represents co-first author.

INDUSTRIAL EXPERIENCE

Electronic Arts, Redwood City, CA, USA
 ■ Machine Learning Scientist Intern, Big Data Group

May 2018 – Aug 2018

- Large-scale Machine Learning Models on Spark
- Graph Learning on relational database, attributes evaluation and selection, dataset compression

Amazon, Seattle, Washington, USA

May 2015 – Aug 2015

- Software Development Engineer Intern, AWS Infrastructure Group
 - Data management system for network messages supporting receiving, parsing, storing, and retrieving messages

Koal, Shanghai, China

Jul 2013 – Dec 2013

- Development Engineer, Platform Group
 - Fullstack Engineer: designed and implemented back-end database, business logic, interfaces, front-end UI

Microsoft, Shanghai, China

Jul 2012 – Nov 2012

- Developer Support Intern, Database Business Intelligence Group
 - Troubleshooting cases of SQL Server problems

REFERENCES

- **Dr. Jie Gao**
Professor of Computer Science Department, Rutgers University
email: jg1555@cs.rutgers.edu
- **Dr. Tamal K. Dey**
Professor of Computer Science Department, Purdue University
email: tamaldey@purdue.edu
- **Dr. Feng Luo**
Professor of Department of Mathematics, Rutgers University
email: fluo@math.rutgers.edu

*