

Cheng Xin

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

Bio: Cheng Xin is a postdoctoral associate of the computer science department at Rutgers University. 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, where his doctoral research centered on topological data analysis and graph representations. His work explores innovative approaches to data representation and analysis, seeking to uncover hidden patterns and structures in complex datasets. Through his research, Dr. Xin aims to develop novel algorithms and techniques that leverage the power of topology and geometry to enhance machine learning and AI models. By bridging the gap between these disciplines, he strives to create more efficient, interpretable, and robust models for a wide range of applications.

EDUCATION

Purdue University, West Lafayette, Indiana, USA

- Ph.D. in Computer Science Aug 2020 – Aug 2023
 - Adviser: Prof. Tamal K. Dey
 - Focus: Topological data analysis, Graph representation learning
 - Thesis: Decomposition and Stability of Multiparameter Persistence Modules

The Ohio State University, Columbus, Ohio, USA

- Ph.D. in Computer Science Aug 2016 – Aug 2020
 - Adviser: Prof. Tamal K. Dey
 - Focus: Computational topology, Topological data analysis

Lehigh University, Bethlehem, Pennsylvania, USA

- M.S. in Computer Science Jan 2014 – May 2016
 - Advisor: Prof. Xiaolei Huang
 - Thesis: Machine Learning Techniques for Cervigram Image Analysis

Tongji University, Shanghai, China

- B.Eng. in Software Engineering Sep 2009 – Jul 2013

PROFESSIONAL EXPERIENCE

Department of Computer Science, Rutgers University

- Postdoctoral Researcher, Advisor: Prof. Jie Gao Oct 2023 – Present

Department of Computer Science, Purdue University

- Research Assistant, Advisor: Prof. Tamal K. Dey Aug 2020 – Aug 2023
- Teaching Assistant: Computational Geometry, Data Structures and Algorithms

Department of Computer Science and Engineering, The Ohio State University

- Research Assistant, Advisor: Prof. Tamal K. Dey Jan 2017 – May 2020

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)

INDUSTRIAL EXPERIENCE

Machine Learning Scientist Intern, Big data group

- Electronic Arts, Redwood City, CA, USA May 2018 – Aug 2018
 - Feature evaluation and selection. Compressed tables, indices, and attributes in databases.

Software Development Engineer Intern, AWS infrastructure group

- Amazon, Seattle, Washington, USA May 2015 – Aug 2015
 - Built BGP monitoring protocol messages management tools for receiving, parsing, storing, retrieving BMP messages.

Develop Engineer, Platform group

- Koal, Shanghai, China Jul 2013 – Dec 2013
 - Big Data Process: data collection, data preparation and preprocessing, Chinese phrase identification and analysis.
 - Designed and managed Database; designed and implemented back-end features and interfaces, front-end webpage UI.

Developer Support Intern, Database business intelligence group

- Microsoft, Shanghai, China Jul 2012 – Nov 2012
 - Studied basic theories and designs about the SQL Server, including relational engine and storage engine.
 - Used trouble shooting tools for dealing with problem cases in practice.

SKILLS

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

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

PUBLICATIONS

- [1] Soham Mukherjee, Shreyas N. Samaga, Cheng Xin, Steve Oudot, and Tamal K. Dey. *D-GRIL: End-to-End Topological Learning with 2-parameter Persistence (under review)*. 2025.
- [2] Fan Xu, Cheng Xin, Xin Ding, Jie Gao, and Jiaxin Ding. *TopInG: Topologically Interpretable Graph Learning via Persistent Rationale Filtration (under review)*. 2025.
- [3] 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.
- [4] 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.
- [5] 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.
- [6] Cheng Xin. “Decomposition and Stability of Multiparameter Persistence Modules”. Thesis. Purdue University Graduate School, 2023. DOI: 10.25394/PGS.23848995.v1.
- [7] Cheng Xin, Soham Mukherjee, Shreyas N. Samaga, and Tamal K. Dey. “GRIL: A 2-parameter Persistence Based Vectorization for Machine Learning”. In: *Proceedings of 2nd Annual Workshop on Topology, Algebra, and Geometry in Machine Learning (TAG-ML)*. Vol. 221. Proceedings of Machine Learning Research. PMLR, 28 Jul 2023, pp. 313–333.
- [8] 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.
- [9] Tamal K. Dey and Cheng Xin. *Rectangular Approximation and Stability of 2-parameter Persistence Modules*. 2021. arXiv: 2108.07429 [cs.CG].
- [10] Tamal K. Dey and Cheng Xin. *Computing Bottleneck Distance for Multi-parameter Interval Decomposable Persistence Modules*. 2019. arXiv: 1803.02869 [cs.CG].
- [11] 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.
- [12] 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.
- [13] 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: *International Workshop on Machine Learning in Medical Imaging*. Springer. 2015, pp. 26–35.

TALKS

- Understanding through Shape of Data: Topological Data Analysis for Interpretable AI, MSIS Seminar, Rutgers University, Oct. 2024
- Exploring Representations Beyond Euclidean Geometry, JHC Seminar, Shanghai Jiao Tong University, June 2024
- Generalized persistence algorithm for decomposing multi-parameter persistence modules, Applied Algebraic Topology Network Seminar, July 2020

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