Cheng Xin

Postdoctoral Researcher · Rutgers University, Department of Computer Science

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BIO

Cheng Xin received his Ph.D. in Computer Science from Purdue University under the supervision of Dr. Tamal K. Dey, specializing in **topological data analysis** and **machine learning**. He is currently a postdoctoral researcher in the Computer Science Department at Rutgers University, advised by Dr. Jie Gao, with publications in top-tier conferences including **NeurIPS, ICML, CVPR, and SoCG**. His research focuses on creating **trustworthy, robust, and theoretically grounded AI systems** by developing mathematically rigorous foundations that bridge **topology, geometry, and machine learning**. His recent work includes **interpretable AI**, **non-Euclidean representation learning**, and **large-scale benchmarks for 3D/video generation**.

RESEARCH INTERESTS

`Topological Machine Learning` `Non-Euclidean Geometry in ML` `Multiparameter Persistence` `Interpretable AI` `AI for Science`

RESEARCH & EDUCATION

Rutgers University Department of Computer Science — Oct 2023 — Present

Postdoctoral Researcher, Advisor: Prof. Jie Gao

- Developing topological frameworks for **interpretable AI**: TopInG achieves improved prediction accuracy and interpretability on molecular benchmarks
- Led research on **non-Euclidean representation learning**: Neuc-MDS and Johnson-Lindenstrauss extensions with provable theoretical guarantees
- Contributing to large-scale benchmarks for **3D/video generation**: DL3DV-10K dataset
- Designing algorithms for **multi-agent learning** in social settings

Purdue University Department of Computer Science — Aug 2020 — Aug 2023

Ph.D. in Computer Science, Advisor: Prof. Tamal K. Dey

- Dissertation: Decomposition and Stability of Multiparameter Persistence Modules

The Ohio State University Department of Computer Science and Engineering — Jan 2017 — Aug 2020

Ph.D. in Computer Science, Advisor: Prof. Tamal K. Dey

- Developed generalized persistence algorithms for multiparameter persistence modules

Lehigh University Department of Computer Science — Jan 2014 — May 2016

M.S. in Computer Science, Advisor: Prof. Xiaolei Huang

- Thesis: Machine Learning Techniques for Cervigram Image Analysis
- Research Focus: Medical image analysis, machine learning applications

Tongji University Shanghai, China — Sep 2009 — Jul 2013

B.Eng. in Software Engineering

INVITED TALKS

"TopInG: Topologically Interpretable Graph Learning via Persistent Rationale Filtration"
Conference on Topological Data Analysis: Recent Developments and Applications, University of Missouri, November 2025

"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 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

TEACHING EXPERIENCE

Lecturer, Design and Analysis of Algorithms (graduate course, 45 students), 2025 Fall

Teaching Assistant, Data Structures and Algorithms (undergraduate, 200 students), 2023 Spring

Teaching Assistant, Computational Geometry (graduate, 30 students), 2020 Fall

PROFESSIONAL SERVICE

Area Chair, TAG-DS Workshop, 2026

Reviewer, ICML, ICLR, NeurIPS, SoCG

PUBLICATIONS

Machine Learning (NeurIPS, ICML, CVPR, TMLR)

`ICML 2025` **C. Xin**, F. Xu, X. Ding, J. Gao, J. Ding. "TopInG: Topologically Interpretable Learning via Persistent Rationale Filtration"

`NeurIPS 2025` C. Deng, J. Gao, K. Lu, F. Luo, **C. Xin**†. "Johnson-Lindenstrauss Lemma Beyond Euclidean Geometry"

`NeurIPS 2024` C. Deng, J. Gao, K. Lu, F. Luo, H. Sun, **C. Xin**†. "Neuc-MDS: Non-Euclidean Multidimensional Scaling Through Bilinear Forms"

`ICML 2024` S. Haddadan, **C. Xin**, J. Gao. "Optimally Improving Cooperative Learning in a Social Setting"

`CVPR 2024` L. Ling, ..., **C. Xin**, et al. "DL3DV-10K: A Large-Scale Scene Dataset for Deep Learning-Based 3D Vision"

`TMLR 2024` S. Zhang, **C. Xin**, T. K. Dey. "Expressive Higher-Order Link Prediction through Hypergraph Symmetry Breaking"

`ICML-W 2023` **C. Xin**, S. Mukherjee, S. N. Samaga, T. K. Dey. "GRIL: A 2-parameter Persistence Based Vectorization for Machine Learning"

Computational Geometry & Topology (SoCG, JACT)

`SoCG 2026` S. Mukherjee, S. N. Samaga, **C. Xin**, S. Oudot, T. K. Dey. "D-GRIL: End-to-End Topological Learning with 2-parameter Persistence"

`SoCG 2026` C. Deng, J. Gao, K. Lu, F. Luo, **C. Xin**. "Locality Sensitive Hashing in Hyperbolic Space"

`JACT 2022` T. K. Dey, **C. Xin**†. "Generalized persistence algorithm for decomposing multiparameter persistence modules"

`arXiv 2021` T. K. Dey, **C. Xin**†. "Rectangular Approximation and Stability of 2-parameter Persistence Modules"

`SoCG 2018` T. K. Dey, **C. Xin**†. "Computing Bottleneck Distance for 2-D Interval Decomposable Modules"

Medical Imaging & Pattern Recognition

`PR 2017` T. Xu, H. Zhang, **C. Xin**, et al. "Multi-feature based benchmark for cervical dysplasia classification evaluation"

`MLMI 2015` T. Xu, **C. Xin*** et al. "A New Image Data Set and Benchmark for Cervical Dysplasia Classification Evaluation"

*† authors alphabetically ordered · * co-first author*

INDUSTRIAL EXPERIENCE

Electronic Arts (EA) Machine Learning Scientist Intern — `May — Aug 2018`

Big Data Group · Redwood City, CA

- Large-scale machine learning on **Spark**
- Graph learning on relational database, attributes evaluation and selection, dataset compression

Amazon Software Development Engineer Intern — `May — Aug 2015`

AWS Infrastructure Group · Seattle, WA

- Data management system for network messages supporting receiving, parsing, storing, and retrieving

SKILLS

`Python` `PyTorch` `Spark` `Keras` `Java` `C` `C++` `MATLAB` `R`

REFERENCES

Confidential recommendation letters available via Interfolio Dossier Delivery.

Dr. Tamal K. Dey
Professor, Computer Science, Purdue University
`tamaldey@purdue.edu`

Dr. Jie Gao
Professor, Computer Science, Rutgers University
`jg1555@cs.rutgers.edu`

Dr. Feng Luo
Professor, Mathematics, Rutgers University
`fluo@math.rutgers.edu`