

Yu (Demi) Qin

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EDUCATION

Tulane University, *New Orleans, LA*

Ph.D. in Computer Science

Sep. 2018 – Dec. 2024

Dissertation Topic: *Metric Learning on Topological Descriptors*

Advisors: Prof. Brian Summa and Prof. Carola Wenk

GPA: 3.8/4.0

Chongqing University, *Chongqing, China*

B.S. in Computer Science

Aug. 2014 – Jun. 2018

Graduated top of the class (Rank 1/145)

GPA: 3.8/4.0

PROFESSIONAL EXPERIENCE

Tulane University

Advisors: Prof. Brian Summa, Prof. Carola Wenk

Sep. 2018 – Present.

Research Assistant

- Developed and deployed **large data analysis and visualization** techniques integrating machine learning and **Topological Data Analysis (TDA)**. Achieved 100x speed-up in data querying and classification across complex datasets. Published multiple first-author papers in top-tier venues (NeurIPS, IEEE VIS), including a Best Paper Award at IEEE VIS 2024.
- Implemented advanced machine learning models (**CNNs, GANs, GNNs**) to enhance shape and geometry extraction in large datasets. Improved efficiency and accuracy in applications like medical imaging, simulation data, graphs, and 3D shapes, supporting scalable and precise data analysis and visualization [[Slide](#)].

National Renewable Energy Laboratory (NREL)

Advisors: Graham Johnson, Dr. Kristi Potter

Jun. 2022 – Aug. 2024

Graduate Intern at Data, Analysis, and Visualization Group

- Developed an efficient method for detecting extreme climate events using TDA on time-series wind data. Reduced detection time from quadratic to linear complexity, resulting in a 10x increase in computational efficiency. Presented and published findings at EnergyVis 2023 [[Slide](#)] [[Video](#)].
- Transformed complex power system datasets into a computationally efficient topological framework. Enabled faster, more accurate analysis for managing power system reliability under stress conditions.

Hitachi America, Ltd.

Advisors: Dr. Frank Kloster, Dr. Chi Heem Wong

Jul. 2023 – Feb. 2024

Research Intern at IoT Edge Lab

- Developed dynamic production graphs using GNN to model complex supply chain networks in collaboration with Stanford University. Forecasted transactions, predicted inventory levels, and estimated Bill of Materials (BoM) [[Paper](#)].
 - Achieved a 6-50% improvement in production function inference and an 11-62% enhancement in transaction forecasting on real and synthetic data. Presented these findings at the [Stanford Graph Learning Workshop 2023](#) (invited talk); Stanford Causal Science Conference 2023 (oral).
 - Created an interpretable sequence prediction model using a custom **Recurrent Neural Network (RNN)** with an attention mechanism. Enhanced BoM estimations by improving accuracy and efficiency in product consumption forecasting.
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SELECTED RESEARCH PROJECTS

Rapid and Precise Topological Comparison with Merge Tree Neural Networks

[Website](#), [Paper](#)

Jun. 2023 – Mar. 2024

- Developed the first neural network model for merge tree comparison (MTNN) by integrating GNNs with a novel topological attention mechanism. Achieved a 100x speed-up over the previous state-of-the-art on benchmark datasets with an error rate below 0.1%, significantly advancing large-scale data analysis and visualization techniques. Published and awarded **Best Paper** at IEEE VIS 2024.

Scalable, Content-Based, Domain-Agnostic Search of Scientific Data through Concise Topological Representations

Website, Paper

Aug. 2021 – Sep. 2023

- Initiated the first approach for generating binary topological representations using **GANs** with domain-oblivious training. Reduced clustering time from hours to milliseconds while maintaining high quality. Enabled rapid interactive queries across diverse scientific data domains. Published at IEEE VIS 2021.

Quantifying Morphologic Phenotypes in Prostate Cancer-Developing Topological Descriptors for Machine Learning

Website, Paper

Sep. 2018 – Feb. 2023

- Developed machine learning models and **ResNet-based CNNs** for medical image classification. Improved the severity detection accuracy by 10%. Leveraged novel topological descriptors on whole-slide pathology images to detect previously unseen characteristics, enhancing diagnostic capabilities in medical research.
- Led the development of an advanced image annotation system [[Link](#)] for medical imaging. Integrated **DEACT** web UI framework and **Girder** data management platform. Developed a custom shape analysis plug-in, enhancing image annotation capabilities for comprehensive morphological analyses.

PUBLICATIONS (Full List)

- [1] **Yu Qin**, Brittany Terese Fasy, Carola Wenk, and Brian Summa. "Rapid and Precise Topological Comparison with Merge Tree Neural Networks," *IEEE Transactions on Visualization and Computer Graphics (IEEE VIS 2024)*. 🏆 [Best Paper Award](#)
- [2] Serina Chang, Zhiyin Lin, Benjamin Yan, Swapnil Bembde, Qi Xiu, Chi Heem Wong, **Yu Qin**, Frank Kloster, Xi Luo, Raj Palleti, and Jure Leskovec. "Learning production functions for supply chains with graph neural networks," *Under review*.
- [3] **Yu Qin**, Brittany Terese Fasy, Carola Wenk, and Brian Summa. "Visualizing Topological Importance: A Class-Driven Approach." *Topological Data Analysis and Visualization (TopoInVis)*, IEEE, 2023.
- [4] **Yu Qin**, Graham Johnson, and Brian Summa. "Topological Guided Detection of Extreme Wind Phenomena: Implications for Wind Energy." *Energy Data Visualization Workshop (EnergyVis)*, IEEE, 2023.
- [5] **Yu Qin**, Brittany Terese Fasy, Carola Wenk, and Brian Summa. "A domain-oblivious approach for learning concise representations of filtered topological spaces for clustering." *IEEE Transactions on Visualization and Computer Graphics (IEEE VIS 2021)*.
- [6] **Yu Qin**, Brittany Terese Fasy, Brian Summa, and Carola Wenk. "Comparing distance metrics on vectorized persistence summaries." *Topological Data Analysis and Beyond Workshop, NeurIPS 2020*.

SKILLS

Programming: Python (Pandas, NumPy, sklearn), C++ (OpenGL, OpenCV), Java, Julia, R, JavaScript

Machine Learning: PyTorch, TensorFlow, PyG (PyTorch Geometric)

Data Visualization: D3.js, React, Matplotlib, R Shiny, ParaView, ggplot, Power BI

Databases: MongoDB, MySQL, Amazon Redshift

Parallel Computing: OpenMP, MPI

Tools & Platforms: Anaconda, Git, Docker, AWS

SERVICES and AWARDS

- **Best Paper Award**, IEEE VIS 2024 (Top 1%)
- **Program Committee**, NeurReps at NeurIPS 2023 - 2024
- **GHC Scholar**, Grace Hopper Celebration 2023
- **Student Volunteer with Travel Fund**, IEEE VIS 2021 - 2023
- **Student Volunteer with Travel Fund**, NeurIPS) 2022
- **Mentor**, Women in Machine Learning (WiML) PhD Mentoring Program, 2022 - 2023
- **National Scholarship (China)**, 2017 (Top 0.2% Nationwide)