

# Yu (Demi) Qin

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## EDUCATION

**Tulane University**, New Orleans, LA

*Ph.D. in Computer Science*

2018 – 2024

Dissertation Topic: *Metric Learning on Topological Descriptors*

Advisors: [Prof. Brian Summa](#), [Prof. Carola Wenk](#)

GPA: 3.8/4.0

**Chongqing University**, Chongqing, China

*B.S. in Computer Science*

2014 – 2018

Graduated top of the class (Rank 1/145)

GPA: 3.8/4.0

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## PROFESSIONAL EXPERIENCE

**Tulane University**

Sep 2018 – Nov 2024

Research Assistant at Tulane Visualization and Graphics Group

- Developed and deployed **large data analysis and visualization** techniques integrating machine learning (**ML**), visualization (**VIS**) and topological data analysis (**TDA**).
- Achieved 100x speed-up in data analysis for medical imaging and climate modeling. Published 5 first-author papers in top-tier venues (AAAI, NeurIPS, IEEE VIS), including a Best Paper Award at IEEE VIS 2024.
- Applied advanced ML models (**CNNs**, **GANs**, **GNNs**) to enhance complex data analysis and interpretation. Improved efficiency and accuracy in applications including medical imaging, climate modeling, graphs, and 3D shapes, supporting scalable and precise data analysis and visualization.

**Hitachi America, Ltd.**

Jul 2023 – Feb 2024

Research Intern at IoT Edge Lab

- Developed dynamic production model using **GNNs** to learn supply chain networks in collaboration with Stanford University. This is the first GNN model capable of jointly learning internal production functions and forecasting transactions in supply chain networks.
- Achieved a 6-50% improvement in production function inference and an 11-62% enhancement in transaction forecasting on real and synthetic data. Published at AAAI 2025 [[Paper](#)] and presented these findings at the [Stanford Graph Learning Workshop 2023](#) (invited talk).
- Designed 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.

**National Renewable Energy Laboratory (NREL)**

Jun 2022 – Aug 2024

Graduate Intern at Data, Analysis, and Visualization Group

- Developed efficient methods for detecting extreme climate events using TDA on **temporal-spatial** climate 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](#)].
  - Designed a node lifting approach to represent higher-order interactions inherent in complex networks. Expanded **topological deep learning** by transforming a graph into a hypergraph, where hyperedges are formed by grouping nodes that share the same attribute.
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## SELECTED TECHNICAL PROJECTS

**Machine Learning Assisted Gigantic-Image Cancer Margin Scanner (ARPA-H)**

*Announced by President Biden as part of the Cancer Moonshot Project, [Website](#)*

Oct 2024 – Present

- Developed high-resolution machine learning models for cancer detection in prostate and colorectal sample images, achieving precise, real-time nuclei-level visualization for enhanced diagnostic accuracy.

- Engineered a high-performance computing pipeline to support petascale data processing, accelerating training of cancer-detection models from months to days. This scalable system facilitates rapid adaptation for future ML model developments.
- Led the development of an advanced **image annotation platform** for medical imaging. Integrated **DEACT** web UI framework and **Girder** data management platform. Developed a custom shape analysis plug-in, advancing the ability to annotate and analyze complex morphological data in cancer research.

## 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

*Website, Paper*

*Aug 2021 – Sep 2023*

- Initiated the first machine learning model for generating binary topological representations using **GANs** with domain-oblivious training. Reduced clustering time from hours to milliseconds and enabled rapid, interactive queries across diverse scientific data domains. Published at IEEE VIS 2021.

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## 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," *AAAI 2025 (oral)*.
  - [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." *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*.
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## 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

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## SERVICES and AWARDS

- **Best Paper Award**, IEEE VIS 2024 (Top 1% of submissions)
- **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)