

# Yu (Demi) Qin

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## EDUCATION

**Tulane University**, *New Orleans, LA*

*Ph.D. in Computer Science*

*Sep. 2018 – May. 2025*

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*

*Aug. 2014 – Jun. 2018*

Graduated top of the class (Rank 1/145)

GPA: 3.8/4.0

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## PROFESSIONAL EXPERIENCE

**Tulane University**

*Sep. 2018 – Present.*

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 querying and classification across complex datasets from various domains. Published multiple first-author papers in top-tier venues (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 complex supply chain networks in collaboration with Stanford University. This is the first GNN model capable of predicting internal production functions and simultaneously forecasting transactions in supply chain networks [[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).
- 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 RESEARCH 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.

## 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 AAAI 2025 phase 2 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." *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% of all 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)