



# Gang Qu


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 Gang Qu Scholar

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## Education

- **Ph.D., Biomedical Engineering, Tulane University** [2018–Now]  
GPA: 3.81/4.0. Research interests: *Deep learning application on neuroimaging study, Medical imaging analysis.*
- **M.Sc., Computer Science, Georgia Institute of Technology** [2021–Now]  
GPA: 3.5/4.0. Relevant coursework: *Reinforcement learning, Software development, Database, Computer Networks.*
- **M.Sc., Bioengineering and Biomedical (Minor in Electronic and Computer Engineering) University of Florida** [2016–2018]  
GPA: 3.83/4.0. Thesis title: *Automatic Pleomorphism Grading For Breast Cancer Image.*
- **B.Ec., Biomedical Engineering, Xi'an Jiaotong University** [2012-2016]  
GPA:80/100. Relevant coursework: *Statistics, Data structure and algorithm, C++ Programming, Signal processing.*

## Research Publications

### Journal Articles

- 1 G. Qu, W. Hu, L. Xiao, *et al.*, “Brain functional connectivity analysis via graphical deep learning,” *IEEE Transactions on Biomedical Engineering*, vol. 69, no. 5, pp. 1696–1706, 2022.
- 2 G. Qu, L. Xiao, W. Hu, *et al.*, “Ensemble manifold regularized multi-modal graph convolutional network for cognitive ability prediction,” *IEEE Transactions on Biomedical Engineering*, vol. 68, no. 12, pp. 3564–3573, 2021.
- 3 J. Wang, H. Li, G. Qu, *et al.*, “Dynamic weighted hypergraph convolutional network for brain functional connectome analysis,” *Medical Image Analysis*, vol. 87, p. 102 828, 2023, ISSN: 1361-8415.  DOI: <https://doi.org/10.1016/j.media.2023.102828>.
- 4 W. Yan, G. Qu, W. Hu, *et al.*, “Deep learning in neuroimaging: Promises and challenges,” *IEEE Signal Processing Magazine*, vol. 39, no. 2, pp. 87–98, 2022.
- 5 X. Shi, H. Su, F. Xing, Y. Liang, G. Qu, and L. Yang, “Graph temporal ensembling based semi-supervised convolutional neural network with noisy labels for histopathology image analysis,” *Medical image analysis*, vol. 60, p. 101 624, 2020.
- 6 L. Xiao, B. Cai, G. Qu, *et al.*, “Distance correlation-based brain functional connectivity estimation and non-convex multi-task learning for developmental fmri studies,” *IEEE Transactions on Biomedical Engineering*, vol. 69, no. 10, pp. 3039–3050, 2022.
- 7 W. Hu, X. Meng, Y. Bai, A. Zhang, G. Qu, *et al.*, “Interpretable multimodal fusion networks reveal mechanisms of brain cognition,” *IEEE Transactions on Medical Imaging*, vol. 40, no. 5, pp. 1474–1483, 2021.
- 8 J. Wang, L. Xiao, W. Hu, G. Qu, *et al.*, “Functional network estimation using multigraph learning with application to brain maturation study,” *Human Brain Mapping*, vol. 42, no. 9, pp. 2880–2892, 2021.
- 9 A. Orlichenko, G. Qu, G. Zhang, *et al.*, “Latent similarity identifies important functional connections for phenotype prediction,” *IEEE Transactions on Biomedical Engineering*, 2023, early access.

## Conference Proceedings

- 1 G. Qu, W. Hu, L. Xiao, and Y.-P. Wang, "A graph deep learning model for the classification of groups with different IQ using resting state fMRI," A. Krol and B. S. Gimi, Eds., International Society for Optics and Photonics, vol. 11317, SPIE, 2020, 113170A.
- 2 A. Orlichenko, G. Qu, and Y.-P. Wang, "Phenotype guided interpretable graph convolutional network analysis of fMRI data reveals changing brain connectivity during adolescence," B. S. Gimi and A. Krol, Eds., International Society for Optics and Photonics, vol. 12036, SPIE, 2022, p. 1203612.

## Research Experience

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### 📌 AI-Driven Whole-Slide Imaging Digital Health System

**Company:** Merck & Co., Inc.

**Position:** Research Internship

**Description:** Collaboration with the medical and pathology team at Merck UK.

#### 1. *Development of an Advanced AI Solution for Automated PD-L1 CPS Analysis in Clinical Applications* [2022]

- Designed a deep learning-powered AI solution for PD-L1 CPS scoring, inspired by Merck's top-selling and globally recognized KEYTRUDA® (pembrolizumab) anti-PD-1 therapy, which generated close to \$21 billion in 2022.
- Worked closely with clinical experts to create test scenarios using 302 commercial Stained IHC Whole Slide Images, fine-tuning the AI system's precision with an AUROC of over 0.98, and evaluated its clinical significance by comparing its performance to pathologist evaluations using data from clinical trials.
- Utilized Python and PyTorch to develop the AI solution, focusing on automated data quality control (such as pen markings, dark areas, tissue folds, etc.), cell segmentation, and predictive modeling with 37,646 annotated cells.

## Research Experience (continued)

### ■ Interpretable Graph deep learning model for multimodal medical imaging analysis

**Laboratory:** The Multiscale Bioimaging and Bioinformatics Laboratory (MBB), Tulane University, PI: Dr. Yu-Ping Wang.

**Position:** Research Assistant

**Description:** Collaboration with TReNDS Center (GSU/Gatech/Emory), DICOIN Lab (Boys Town National Research Hospital), and Mind Research Network for neuroimaging and brain function research, supported by NIH and NSF grants totaling over \$2 million.

#### 1. *Graphical Deep Learning for Brain Functional Connectivity Analysis* [2018-2020]

- Developed innovative graph-based deep learning methods by applying advanced graph theory for fMRI data analysis and phenotype prediction.
- Employed semi-supervised graph deep learning with Laplacian regularization to address the oversmoothing issue, leveraging the relationships between subjects.

#### 2. *Ensemble manifold regularized multi-modal graph convolutional network for cognitive ability prediction* [2020-2021]

- Integrated multimodal data to examine associations among various fMRI paradigms and identify key biomarkers.
- Introduced multimodal graph-based deep learning approaches incorporating manifold learning for highly accurate results.

#### 3. *Interpretable Cognitive Ability Predictions: A Comprehensive Gated Graph Transformer Framework for Analyzing Functional Brain Networks* [2022-2023]

- Implemented prior spatial knowledge and a random-walk diffusion strategy to simultaneously capture complex structural and functional relationships between brain regions.
- Applied attention mechanisms for learning multi-view node feature embeddings and dynamically assigning propagation weights, allowing for the identification of significant functional brain network biomarkers and enhancing result interpretability.

### ■ Rule-based End-to-End Lung Cancer Classification on Whole Slide Images (master thesis), University of Florida

**Position:** Research Assistant

**Description:** Collaboration with pathologists and medical doctors for clinical applications.

#### 1. *Graph temporal ensembling based semi-supervised convolutional neural network with noisy labels for histopathology image analysis* [2017-2018]

- Designed a rule-based CNN model (Nottingham Histologic Grade) for classifying SCC and ADC breast cancer cells, leveraging TensorFlow and PyTorch frameworks.
- Employed advanced pre-processing techniques for whole-slide images, including image augmentation and data normalization, to minimize potential biases in the dataset.



## Work Experience

2022 Summer     ■ **Research Internship, BARDS, Merck & Co., Inc.**

2018-Now        ■ **Research Assistant, Tulane University**

## Work Experience (continued)



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- 2021-Now     **Lab technician, MBB Lab & CBG Center, Tulane University**
- 2017-2018     **Research Assistant, University of Florida**



## Presentations

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### Conference Presentation


-  **OHBM Annual Meeting**, Montréal, Québec, Canada. [2023]  
Exploring General Intelligence via Gated Graph Transformer in fMRI Functional Connectivity Studies
-  **SPIE Medical Imaging**, Houston, TX, USA. [2020]  
A graph deep learning model for the classification of groups with different IQ using resting state fMRI

### Campus Presentation

-  **Virtual dev-CoG/dev-MIND Meeting**, Virtual Presentation. [2021]  
Structure-enriched Collaborative Regression (SCoRe) and its Application to Brain-related Study
-  **Virtual dev-CoG/dev-MIND Meeting**, Virtual Presentation. [2020]  
Ensemble manifold based regularized multi-modal graph convolutional network for cognitive ability prediction





## Service To Profession

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-  Reviewer for Medical Image Analysis (MedIA)
-  Reviewer for Computers in Biology and Medicine



## Skills

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-  **Programming:** Python, TensorFlow, Pytorch, Java, MATLAB, SQL, C/C++, R
-  **Database:** MySQL, EER Diagram Design
-  **Language:** Chinese (native), English (fluent)
-  **Others:** Git, Microsoft Office,  $\LaTeX$

## Membership

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-  IEEE Student Membership [2022-Now]
-  Member of SPIE, the international society for optics and photonics [2020-2021]


## Honors & Certifications

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### Awards and Achievements

-  **Academic Honor Achievement Award**, University of Florida [2016&2016]

### Certification

-  **Machine Learning**. Awarded by Coursera [2020]
-  **Natural Language Processing Specification**. Awarded by Coursera [2020]

## Honors & Certifications (continued)

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📖 **Deep Learning Specification.** Awarded by Coursera

[2020]