Gang Qu

gangqu Gang Qu Scholar GQ93 GQ 813-606-8327
adamrt9319@gmail.com LBC 500, Tulane University, New Orleans, LA 70118

Education And Training

- **Postdoctoral Research Fellow, McWilliams School of Biomedical Informatics and School of Public Health, The University of Texas Health Science Center at Houston** [2024–*Now*]
  Research interests: *Computational Bioinformatics, Imageinformatics, Deep Learning, Medical Imaging Analysis*

- **Ph.D., Biomedical Engineering, Tulane University** [2018–2024]
  GPA: 3.86/4.0. Research interests: *Deep learning application on neuroimaging study, Medical imaging analysis.*

- **M.Sc., Computer Science, Georgia Institute of Technology** [2021–2024]
  GPA: 3.72/4.0. 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**, A. Orlichenko, J. Wang, G. Zhang, L. Xiao, *et al.*, "Interpretable cognitive ability prediction: A comprehensive gated graph transformer framework for analyzing functional brain networks," *IEEE Transactions on Medical Imaging*, vol. 43, no. 4, pp. 1568–1578, 2024. DOI: 10.1109/TMI.2023.3343365.
2. **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. DOI: 10.1109/TBME.2021.3127173.
3. **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. DOI: 10.1109/TBME.2021.3077875.
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. DOI: 10.1109/MSP.2021.3128348, (**W. Yan, G. Qu, W. Hu contributed equally**).
5. 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.
6. 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. DOI: 10.1016/j.media.2019.101624.

7. 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. DOI: 10.1109/TBME.2022.3160447.
8. 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. DOI: 10.1109/TMI.2021.3057635.
9. 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. DOI: 10.1002/hbm.25410.
10. A. Orlichenko, **G. Qu**, G. Zhang, *et al.*, "Latent similarity identifies important functional connections for phenotype prediction," *IEEE Transactions on Biomedical Engineering*, vol. 70, no. 6, pp. 1979–1989, 2023. DOI: 10.1109/TBME.2022.3232964.
11. W. Wang, L. Xiao, **G. Qu**, V. D. Calhoun, Y.-P. Wang, and X. Sun, "Multiview hyperedge-aware hypergraph embedding learning for multisite, multiatlas fmri based functional connectivity network analysis," *Medical Image Analysis*, p. 103 144, 2024. DOI: 10.1016/j.media.2024.103144.
12. B. Patel, A. Orlichenko, A. Patel, **G. Qu**, *et al.*, "Explainable multimodal graph isomorphism network for interpreting sex differences in adolescent neurodevelopment," *Applied Sciences*, 2024. DOI: 10.3390/app14104144.
13. Y. Wang, C. Qiao, **G. Qu**, *et al.*, "A deep dynamic causal learning model to study changes in dynamic effective connectivity during brain development," *IEEE Transactions on Biomedical Engineering*, pp. 1–12, 2024. DOI: 10.1109/TBME.2024.3423803.
14. L. Chen, K. Ren, **G. Qu**, *et al.*, "Explainable spatio-temporal graph evolution learning and its applications to dynamic brain network analysis during development," *NeuroImage*, vol. 298, p. 120 771, 2024.

Journal Articles in Submission

1. J. Li, Y. Wang, H. Zhou, C. Qiao, **G. Qu**, *et al.*, "Egcn-tsd: Explainable gcn for time series data and its applications to the study of brain development," *Neurocomputing*, 2024.
2. F. Xu, Y. Wang, C. Qiao, **G. Qu**, *et al.*, "Stdcdae: A deep spatio-temporal fusion architecture for dynamic causal discovery and its application to brain dynamic effective connectivity networks," 2024.
3. Z. Zhou, A. Orlichenko, **G. Qu**, Z. Fu, Z. Ding, and Y.-P. Wang, "An interpretable cross-attentive multi-modal mri fusion framework for schizophrenia diagnosis," 2024.
4. A. Orlichenko, **G. Qu**, A. Liu, H.-W. Deng, Z. Ding, *et al.*, "A demographic-conditioned variational autoencoder for fmri distribution sampling and removal of confounds," *IEEE Transactions on Biomedical Engineering*, 2024.
5. **G. Qu**, Z. Zhou, V. D. Calhoun, A. Zhang, and Y.-P. Wang, "Integrated brain connectivity analysis with fmri, dti, and smri powered by interpretable graph neural networks," *MIA*, 2024.
6. A. Liu, B. Tian, C. Qiu, *et al.*, "Multi-view integrative approach for imputing short-chain fatty acids (scfas) and identifying key factors predicting blood scfas," *Computers in Biology and Medicine*, 2024.

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. 1 203 612.

Research Experience

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), DICoN 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.

Teaching Experience

Teaching Assistant, Department of Biomedical Engineering

- **Mathematical Modeling and Analysis of Biological Systems** [2024*Spring*]
  - Facilitated weekly homework discussions with students
  - Graded assignments, provided solutions, and held office hours for additional support
  - Assigned and supervised student projects

Work Experience

2024-Now **Postdoctoral Research Fellow, The University of Texas Health Science Center at Houston.**

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

2018-2024 **Research Assistant, Tulane University**

2021-2024 **Lab technician, MBB Lab & CBG Center, Tulane University**

2017-2018 **Research Assistant, University of Florida**

Presentations and talks

Conference Presentation

- **Neurips workshop**, New Orleans, LA, USA. [2023]
- **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

Invited talk

- **Center for Precision Health, UTHealth**, Houston, TX, USA [2024]
  Deep learning for multimodal neuroimaging study

Service To Profession

- Reviewer for Medical Image Analysis

Service To Profession (continued)

- Reviewer for IEEE Transactions on Medical Imaging
- Reviewer for Computers in Biology and Medicine
- Reviewer for Cognitive Computation
- Reviewer for Translational Psychiatry
- Reviewer for Patterns
- Reviewer for Brain Imaging and Behavior
- Reviewer for Journal of Molecular Neuroscience
- Reviewer for International Journal of Machine Learning and Cybernetics
- Reviewer for Meta-Radiology
- Reviewer for Human Brain Mapping
- Reviewer for Artificial Intelligence Review
- Reviewer for BioData Mining
- Reviewer for Neuroinformatics
- Reviewer for BMC Medical Informatics and Decision Making
- Reviewer for BMC Neuroscience
- Reviewer for BMC Medical Imaging
- Reviewer for Psychiatry
- Reviewer for Scientific Reports
- Reviewer for PLOS ONE
- Reviewer for Signal,Image and Video Processing

Skills

- **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

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

Honors & Certifications

Awards and Achievements

- **CPRIT Biomedical Informatics, Genomics and Translational Cancer Research (BIG-TCR) Fellowship**, The University of Texas Health Science Center at Houston [2025]
- **Summer Graduate Award**, Data Hub, Tulane University [2023]
- **Outstanding Self-financed Students Abroad Award**, China Scholar Council [2022]
- **Academic Honor Achievement Award**, University of Florida [2016&2017]

Certification

- **Machine Learning**. Awarded by Coursera [2020]

Honors & Certifications (continued)

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