OMB No. 0925-0001 and 0925-0002 (Rev. 10/2021 Approved Through 01/31/2026)

**BIOGRAPHICAL SKETCH**

Provide the following information for the Senior/key personnel and other significant contributors.

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|  |
| --- |
| NAME: Qu, Gang |
| eRA COMMONS USER NAME (credential, e.g., agency login): |
| POSITION TITLE: Postdoctoral Research Fellow |

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

|  |  |  |  |
| --- | --- | --- | --- |
| INSTITUTION AND LOCATION | DEGREE (if applicable) | END DATE MM/YYYY | FIELD OF STUDY |
| Xi'an Jiaotong University, Xi'an, Shaanxi | BENG | 05/2016 | Biomedical Engineering |
| University of Florida, Gainesville, FL | MS | 07/2018 | Biomedical Engineering |
| Georgia Institute of Technology, Atlanta, Georgia | MS | 12/2024 | Computer Science |
| Tulane University, New Orleans, LA | PHD | 05/2024 | Biomedical Engineering |
| University of Texas Health Science Center at Houston, Houston, TX | Postdoctoral Fellow | present | Bioinformatics |

### **A. Personal Statement**

I have a multidisciplinary background, blending over eight years of training in bioinformatics, computational modeling, and biomedical engineering. My educational journey began with a BSc in Biomedical Engineering from Xi'an Jiaotong University, followed by a Master of Science from the University of Florida, culminating in a PhD from Tulane University in 2024. These experiences have not only honed my technical prowess but have also laid a robust foundation for my ongoing contributions to the fields of neuroimaging and data science, particularly within the context of mental health.

During my PhD under the guidance of Prof. Yu-Ping Wang at Tulane University's MBB lab, my research was primarily focused on the development of advanced computational models for neuroimaging. This work has been pivotal in identifying key biomarkers and integrating multi-modal imaging data, significantly enhancing the understanding of cognitive functions, brain development, and mental disorders. My methods have established new benchmarks for analyzing complex neurological data sets, earning me a position at the University of Texas Health Science Center at Houston, where I am expanding my research to encompass machine learning techniques that integrate imaging and genetic data.

Ongoing and completed projects that I would like to highlight:

R56MH124925-02 Wang (PI) 06/01/2021-05/31/2024

Integration of brain imaging and multi-omics data for improved diagnosis and prediction of mental disorders

An overarching goal of this project is to incorporate multiscale omics and brain imaging into clinical studies towards a nosology of psychiatric disorders that are biologically defined, and to uncover their specific genetic architectures.

R01MH107354-04 Wang (PI) 09/01/2019-06/30/2021

Integration of fMRI imaging, genomics, network and biological knowledge

We will deliver a set of powerful sparse model based methods for imaging and genomic data fusion, especially by incorporating interaction networks and biological knowledge, which are often overlooked by current approaches. In addition, we will disseminate the developed methods via an open source software toolbox so that this project can have a broad and sustainable impact.

R01GM109068-05 Wang (PI) 09/01/2018-08/31/2021

Integration of multiscale genomic data for comprehensive analysis of complex disease

The goal of this project is to tackle these significant bioinformatics challenges by developing innovative integration approaches such as sparse models by considering the specific features of multiscale genomic data.

U19AG055373-06A1 Wang (PI) 09/01/2022-06/30/2023

Biostatistics and Bioinformatics Core

To evaluate, validate, and apply novel, robust and powerful integrative analysis methods for the identification and characterization of (epi-)genes and variants, gut microbiome bacterial species, and gene/pathway functions for osteoporosis.

R01LM012806-05 Zhao (PI) 06/01/2021-05/31/2025

Predicting Phenotype by Deep Learning Heterogeneous Multi-Omics Data

To develop deep learning methods and phenotype-specific network approaches to resolve genotype-phenotype relationships. These methods will be applied to 16 brain disorders and broad phenotypes.

U01AG079847-01A1 Zhao, Jiang (PIs) 09/15/2023-08/31/2028

AIM-AI: an Actionable, Integrated and Multiscale genetic map of Alzheimer’s disease via deep learning

To develop AIM-AI framework for transforming the genetic catalog of Alzheimer’s disease in a way that is Actionable, Integrated and Multiscale, and that has clear utility for subsequent etiological studies.

Notable citations include:

1. Qu G, Orlichenko A, Wang J, Zhang G, Xiao L, Zhang K, Wilson TW, Stephen JM, Calhoun VD, Wang YP. Interpretable Cognitive Ability Prediction: A Comprehensive Gated Graph Transformer Framework for Analyzing Functional Brain Networks. IEEE Trans Med Imaging. 2024 Apr;43(4):1568-1578. PubMed Central PMCID: PMC11090410.
2. Qu G, Hu W, Xiao L, Wang J, Bai Y, Patel B, Zhang K, Wang YP. Brain Functional Connectivity Analysis via Graphical Deep Learning. IEEE Trans Biomed Eng. 2022 May;69(5):1696-1706. PubMed Central PMCID: PMC9219112.
3. Yan W, Qu G, Hu W, Abrol A, Cai B, Qiao C, Plis S, Wang Y, Sui J, Calhoun V. Deep Learning in Neuroimaging: Promises and challenges. IEEE Signal Processing Magazine. 2022; 39(2):87-98. Available from: https://ieeexplore.ieee.org/document/9721204/ DOI: 10.1109/MSP.2021.3128348
4. Qu G, Xiao L, Hu W, Wang J, Zhang K, Calhoun V, Wang YP. Ensemble Manifold Regularized Multi-Modal Graph Convolutional Network for Cognitive Ability Prediction. IEEE Trans Biomed Eng. 2021 Dec;68(12):3564-3573. PubMed PMID: 33974537.

### **B. Positions, Scientific Appointments and Honors**

**Positions and Scientific Appointments**

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| 2024 - | Postdoctoral Research Fellow, The University of Texas Health Science Center at Houston, Houston, TX |
| 2018 - 2024 | RA, Tulane University, Biomedical Engineering, New Orleans, LA |

**Honors**

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| --- | --- |
| 2025 | Translational Cancer Research Training (BIG-TCR) Fellowship, The University of Texas Health Science Center at Houston |
| 2023 | Summer Graduate Award, Tulane University |
| 2017 | Academic Honor Achievement Award, University of Florida |
| 2016 | Academic Honor Achievement Award, University of Florida |

### **C. Contribution to Science**

1. Integration of Functional Connectivity and Multimodal Neuroimaging: My research has centered on employing machine learning and deep learning models to investigate functional connectivity and its implications on cognitive variations using multimodal neuroimaging. Notably, I pioneered graph neural network models, assessing them against extensive, diverse neuroimaging datasets, including task fMRI, DTI, and sMRI. This work resulted in the discovery of how brain connectome variations affect individual cognitive capabilities, identifying crucial functional connections that predict complex behaviors.
   1. Wang J, Li H, Qu G, Cecil KM, Dillman JR, Parikh NA, He L. Dynamic weighted hypergraph convolutional network for brain functional connectome analysis. Med Image Anal. 2023 Jul;87:102828. PubMed Central PMCID: PMC10247416.
   2. Qu G, Hu W, Xiao L, Wang J, Bai Y, Patel B, Zhang K, Wang YP. Brain Functional Connectivity Analysis via Graphical Deep Learning. IEEE Trans Biomed Eng. 2022 May;69(5):1696-1706. PubMed Central PMCID: PMC9219112.
   3. Qu G, Xiao L, Hu W, Wang J, Zhang K, Calhoun V, Wang YP. Ensemble Manifold Regularized Multi-Modal Graph Convolutional Network for Cognitive Ability Prediction. IEEE Trans Biomed Eng. 2021 Dec;68(12):3564-3573. PubMed PMID: 33974537.
   4. Hu W, Meng X, Bai Y, Zhang A, Qu G, Cai B, Zhang G, Wilson T, Stephen J, Calhoun V, Wang Y. Interpretable Multimodal Fusion Networks Reveal Mechanisms of Brain Cognition. IEEE Transactions on Medical Imaging. 2021; 40(5):1474-1483. Available from: https://ieeexplore.ieee.org/document/9349455/ DOI: 10.1109/TMI.2021.3057635
2. Exploration of Functional Brain Development in Adolescents: I developed various graph deep learning models to map the functional connectivity across the developmental stages from late childhood to early adulthood. This analysis was applied to a dataset of 855 individuals, revealing critical developmental transitions and identifying key brain regions that contribute to functional maturation.
   1. Chen L, Qiao C, Ren K, Qu G, Calhoun VD, Stephen JM, Wilson TW, Wang YP. Explainable spatio-temporal graph evolution learning with applications to dynamic brain network analysis during development. Neuroimage. 2024 Sep;298:120771. PubMed Central PMCID: PMC11533345.
   2. Orlichenko A, Qu G, Zhang G, Patel B, Wilson T, Stephen J, Calhoun V, Wang Y. Latent Similarity Identifies Important Functional Connections for Phenotype Prediction. IEEE Transactions on Biomedical Engineering. 2023; 70(6):1979-1989. Available from: https://ieeexplore.ieee.org/document/10002422/ DOI: 10.1109/TBME.2022.3232964
   3. Xiao L, Cai B, Qu G, Zhang G, Stephen JM, Wilson TW, Calhoun VD, Wang YP. Distance Correlation-Based Brain Functional Connectivity Estimation and Non-Convex Multi-Task Learning for Developmental fMRI Studies. IEEE Trans Biomed Eng. 2022 Oct;69(10):3039-3050. PubMed Central PMCID: PMC9594860.
   4. Wang J, Xiao L, Hu W, Qu G, Wilson TW, Stephen JM, Calhoun VD, Wang YP. Functional network estimation using multigraph learning with application to brain maturation study. Hum Brain Mapp. 2021 Jun 15;42(9):2880-2892. PubMed Central PMCID: PMC8127152.
3. lucidating Neural Mechanisms in Mental Disorders through Multi-Level Neuroimaging Data: My innovative work in this area has involved creating a novel machine learning model that improves our understanding of functional connectivity, applied particularly to autism spectrum disorder studies. This model, which incorporates multi-atlas and multisite data, enhances the robustness of neuroimaging studies, ensuring consistency across different research settings. The advancements in class-consistency and site-independence within this model are pivotal for the model's application in clinical and research settings.
   1. Wang W, Xiao L, Qu G, Calhoun V, Wang Y, Sun X. Multiview hyperedge-aware hypergraph embedding learning for multisite, multiatlas fMRI based functional connectivity network analysis. Medical Image Analysis. 2024 May; 94:103144-. Available from: https://linkinghub.elsevier.com/retrieve/pii/S1361841524000690 DOI: 10.1016/j.media.2024.103144
   2. Yan W, Qu G, Hu W, Abrol A, Cai B, Qiao C, Plis S, Wang Y, Sui J, Calhoun V. Deep Learning in Neuroimaging: Promises and challenges. IEEE Signal Processing Magazine. 2022; 39(2):87-98. Available from: https://ieeexplore.ieee.org/document/9721204/ DOI: 10.1109/MSP.2021.3128348

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