

Tianrui Qi

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EDUCATION

Ph.D. in Biomedical Engineering <i>Boston University, Boston, MA</i>	09/2025 - 12/2030
B.S. in Computer Science <i>Georgia Institute of Technology, Atlanta, GA</i>	01/2023 - 05/2025 GPA: 3.85/4.00
<ul style="list-style-type: none">Achievements: Highest Honor, President's Undergraduate Research Awards	
B.S. in Computer Science; Double Major in Mathematics <i>Rensselaer Polytechnic Institute, Troy, NY</i>	09/2020 - 12/2022 GPA: 3.73/4.00
<ul style="list-style-type: none">Achievements: Dean's Honor List (every semester)Minor: Economics	

EXPERIENCE

Undergraduate Research Assistant <i>Georgia Institute of Technology and Emory University, Atlanta, GA</i> <i>Jia Laboratory for Systems Biophotonics, PI: Shu Jia, Ph.D.</i>	04/2023 - 05/2025
<ul style="list-style-type: none">Engineered a scalable 3D U-Net pipeline based entirely on simulated data for volumetric localization in single-molecule super-resolution microscopy, resolving sub-cellular structure down to 60 nm.Developed a patch-based prediction pipeline that flexibly adapts to various input volume sizes and achieves a 100x speedup over conventional deterministic localization methods.Integrated the redundant cross-correlation algorithm for drift correction with the deep learning-based prediction pipeline.	
Co-op <i>Regeneron Genetics Center, Tarrytown, NY</i> <i>Therapeutic Area Genetics, Manager: Jing He, Ph.D.</i>	01/2024 - 08/2024
<ul style="list-style-type: none">Utilized BERT-based large language models (LLMs) and unsupervised feature selection to obtain a vector representation in a bio-meaningful space for each whole exome sequencing (WXS) sample.Demonstrated that the representations capture sample-wise differences by predicting immune system indicators of The Cancer Genome Atlas Program (TCGA) skin cancer samples.Scaled up the pipeline to handle hundreds WXS samples with billion DNA sequences by optimizing parallel computing for high-performance computing (HPC) and enhancing file system efficiency through hashing.	
Undergraduate Research Assistant <i>Rensselaer Polytechnic Institute, Troy, NY</i> <i>AI-based X-ray Imaging System Lab, PI: Ge Wang, Ph.D.</i>	11/2021 - 12/2022
<ul style="list-style-type: none">Derived backward propagation formulation for quadratic neural networks and compared forward and backward propagation between quadratic and conventional neural networks mathematically.Implemented forward propagation, backward propagation, and training process of quadratic and conventional neural networks explicitly using NumPy in Python.Demonstrated that single-layer quadratic neural networks rival conventional neural networks with hundreds of neurons in classifying simulated and real-world Gaussian mixture data.	
Undergraduate Teaching Assistant <i>Rensselaer Polytechnic Institute, Troy, NY</i> <i>CSCI 2200 Foundations of Computer Science, Instructor: David Goldschmidt, Ph.D.</i>	09/2022 - 12/2022
<ul style="list-style-type: none">Led weekly recitation sessions to help students understand course material.Assisted students' understanding of weekly lab exercises and graded assignments and exams.	

PUBLICATIONS

Keyi Han[†], Xuanwen Hua[†], **Tianrui Qi[†]**, Zijun Gao, Xiaopeng Wang, Shu Jia. “Volumetric Reconstruction and Localization Networks for 3D Single-molecule Localization Microscopy.” *Manuscript under revision at Nature Communications.* **2025**

Tianrui Qi, Ge Wang. “Superiority of quadratic over conventional neural networks for classification of gaussian mixture data.” *Visual Computing for Industry, Biomedicine, and Art.* **2022**

[†] denotes co-first authors

COURSE PROJECTS

Datapath and Control for a Turing Complete ISA with Interrupt Handling **09/2023 - 12/2023**

Georgia Institute of Technology, Atlanta, GA

CS 2200 Systems and Networking, Instructor: Daniel Forsyth

- Designed a single-bus datapath and an efficient four-ROM microcontroller for a Turing complete instruction set architecture (ISA), supporting arithmetic, logical, memory access, and control flow instructions.
- Handled basic and input device interrupts by additional hardware including new instructions, interrupt registers, signals, and I/O bus, along with software supports such as interrupt vector tables.

Alternating Direction Method of Multipliers for Support Vector Machine **01/2022 - 05/2022**

Rensselaer Polytechnic Institute, Troy, NY

MATP 4820 Computational Optimization, Instructor: Yangyang Xu, Ph.D.

- Formulated the primal and augmented dual optimization problems for support vector machine (SVM) objective and developed alternating direction method of multipliers (ADMM) solver.
- Implemented the ADMM solver in MATLAB and reported the primal and dual feasibility violations at each outer iteration for the testing datasets.

SKILLS

Programming: Python (PyTorch, NumPy, pandas), MATLAB, Java, C, C++, R, Swift (ARKit), Bash, MIPS.

Development Tools: Git, Conda, VS Code, RStudio, JetBrains Suite, Android Studio, Xcode.

Computing Platforms: Linux (Ubuntu), AWS (EC2, S3), HPC (Slurm).

Software: LaTeX, ImageJ, Adobe Illustrator.

Laboratory: optics and laser alignment, fluorescence imaging, fluorescence labeling, cell culture maintenance.

Communication: English (Professional), Mandarin (Native).

REFERENCES

David Goldschmidt, Ph.D.

Executive Officer

Computer Science Department

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Shu Jia, Ph.D.

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Ge Wang, Ph.D.

Clark-Crossan Chair Professor and Director of the Biomedical Imaging Center

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