

# XUEQING GAO

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## Education

**Tongji University** (*Global Rank: 124, U.S. News*)

Shanghai, China

Major GPA – 90.4/100.0 (Rank: 3/46), Overall GPA – 87.2/100.0

Previously in Mechatronic Engineering, Chinesisch-Deutsche Hochschule für Angewandte Wissenschaften Sep. 2021 – Jul. 2022

B.E. in Optoelectronic Information Science and Engineering, School of Physics Science and Engineering Sep. 2022 – Jul. 2025

## Research Interest

I'm particularly interested in **Physics-based Vision**, which aim to jointly design optics and algorithms for perceiving the physical world beyond conventional limits. With a background in optoelectronics and experience in deep learning, I'm eager to build interpretable, human-centered systems that tightly couple physical modeling with intelligent computation.

## Selected Publications

- **[Oral Presentation, Top 2.2%]** “UFO-3: Unsupervised three-compartment learning for rapid fiber orientation distribution function estimation from diffusion MRI,” **Xueqing Gao**<sup>†</sup>, Rizhong Lin<sup>†</sup>, Jianhui Feng, Yonggang Shi, Yuchuan Qiao. Accepted to the 28th *International Conference on Medical Image Computing and Computer Assisted Intervention* (MICCAI 2025), a top-tier conference in medical imaging.
- “Scattering-Aware Unpaired Test-Time Haze Refinement,” **Xueqing Gao**, Zhijian Wu, Binghuang Yao, Yefeng Zheng (*IEEE Fellow*), Haibin Ling (*IEEE Fellow*). Submitted to the *IEEE/CVF Conference on Computer Vision and Pattern Recognition* (CVPR 2026).
- “Graphene-Gated Control of Ag Nanowire Infrared Polaritons,” Zhenxing Wang<sup>†</sup>, Zerui Wang<sup>†</sup>, Junbo Xu, Quan Li, Baoning Wang, Lei Zhou, Yongwei Pan, **Xueqing Gao**, Hongwei Jia, Kyoung-Duck Park, Di Huang, Zhanshan Wang, Xinbin Cheng, Markus B. Raschke, and Tao Jiang. *Nano Letters* (IF: 9.6), accepted for publication.

<sup>†</sup>Equal contribution.

## Selected Project Experience

### Scattering-Aware Unpaired Test-Time Haze Refinement

April 2025 – Present

Supervised by Prof. Haibin Ling

Stony Brook Univ. & Westlake Univ.

- Proposed an unpaired dehazing framework that jointly predicts the scattering coefficient  $\beta$  and the clean image, integrating Schrödinger Bridge transport with a physically atmospheric model.
- Designed a differentiable fog density estimator test-time optimization strategy that refines  $\beta$  and the dehazed output per image using physics-guided reconstruction losses.
- Achieved state-of-the-art no-reference performance among unsupervised methods on real-world benchmarks.

### Deep Learning for Diffusion MRI Microstructure Estimation

July 2023 – Feb. 2025

Supervised by Prof. Yuchuan Qiao and collaborated with Prof. Yonggang Shi

Fudan University & USC (CA, USA)

- Developed physics-based deep learning methods (UFO-3) for reconstructing fiber Orientation Distributions Function (fODF) from highly limited diffusion MRI data.
- Combined biophysical modeling, spherical harmonics, and optimization-based constraints to improve interpretability, accuracy, and generalizability across populations and acquisition protocols.
- Achieved sub-second inference and strong performance on Chinese-HCP, and simulated datasets, outperforming conventional model-based and recent learning-based methods.

## E(3)-Equivariant Neural Network for PtS<sub>2</sub> Band Structure Prediction

Nov. 2023 – Jan. 2024

*Course project, supervised by Prof. Gang Yan*

*Tongji University*

- Prepared data using OpenMX and Julia, generating randomized samples and Hamiltonian matrices for Density Functional Theory (DFT) calculations.
- Implemented E(3)-equivariant graph neural networks to predict Hamiltonian matrices and energy bands of PtS<sub>2</sub>, validated with experimental absorption spectra and DFT results.

## Efficient Algorithms for Constrained Bayesian Ill-posed Problems

Mar. 2023 – Apr. 2024

*Team member, supervised by Prof. Ning Zheng*

*Tongji University*

- Researched ADMM and its extensions to randomized methods for solving ill-posed problems using MATLAB.
- Mastered concepts from Deblurring Images: Matrices, Spectra, and Filtering and contributed to weekly seminars on optimization techniques.

## Technical Blog & Open Resources

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### Awesome Computational Imaging [Link]

*Author and Maintainer*

Curated a learning and implementation series on modern computational imaging, covering implicit neural representations (SIREN, NeRF, FFN), Gaussian Splatting, diffusion models for inverse problems, and plug-and-play methods. Includes hands-on code, theoretical insights, and applications in scientific imaging. Designed to help researchers bridge physical models and deep learning frameworks.

## Awards

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- **Zhuiyuan Scholarship** (awarded for excellence in optical research; funded by Prof. Zhanshan Wang), 2024.
- **Outstanding Undergraduate Scholarship, Tongji University** (awarded to undergraduates based on academic performance), 2022–2024.

## Talk

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- [2025-09-16] “UFO-3” at the Medical Image Computing Seminar (MICS).
- [2025-09-25] “UFO-3” at MICCAI 2025, [Slides].

## Miscellaneous

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- **Programming Languages:** Python, MATLAB, Julia, C/C++.
- **Frameworks/Libraries:** PyTorch, TensorFlow, OpenCV.
- **Medical Imaging Tools:** MONAI, QITView, FreeSurfer, BrainSuite, Dipy, MRtrix3
- **Software Tools:** Zemax, SolidWorks, COMSOL, Origin, OpenMX, Keil (uVision), STM32CubeIDE.
- **Languages:** Chinese, English, German

Last updated: Nov. 30, 2025.