Curriculum Vitae

Zixi Xia

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Gender: Male Birthday: 06/18/2006

Education

University of Science and Technology of China (USTC) 2022.09– Present

School of the Gifted Young, Yan Jici Talent Program in Physics

B.S. Major in Condensed Matter Physics, Applied Physics Minor in Computer Science

Major GPA: **4.18 / 4.30** (**95.08 / 100**) Minor GPA: 4.24 / 4.30 (96.21 / 100)

Major Rank: **1 / 156** in Applied Physics, **1 / 293** in the department of Physics

GRE Physics Test: 990 (96%) Classical Mechanics (100%) Electromagnetism (100%)
Quantum Mechanics and Atomic Physics (100%)

Selected courses:

Math: Linear Algebra B1 (100) Computational Method (97) Probability Theory and Mathematical Statistics (95)

Physics: College Physics – Base Experimentation A (95) Optics A (99) Electrodynamics (95)
Quantum Mechanics A (97) **Solid State Physics A** (95) ***Computational Physics** (100)
Introduction to Condensed Matter Physics (96) ***Advanced Quantum Mechanics** (95)
Thermodynamics and Statistical Physics A (96) Physics of Semiconductor (97)

Computer Science: Data Structures (95) Computer Graphics (99) **Foundations of Algorithms** (97)

** Represent graduate courses*

Skills

Programming: C, C++ OOP, Python (Pytorch), OpenGL, Matlab
Data Analysis: Origin, Matlab
Writing: LaTeX, MarkDown

Language

TOEFL ibt score: 108 (Reading: 30; Listening: 29; Speaking: 22; Writing: 27)

Research Interests

Computational and Experimental Condensed Matter Physics, Experimental Data Processing, AI for Materials Science, AI for Quantum Science, Image Processing.

Research Experience

Machine Learning for Bragg Disk Detection in Electron Diffraction of Crystalline Materials

UGVR Program in Stanford University, Stanford, California, US. 2025.06-2025.08

Advisor: Prof. Colin Ophus *Mentor: Arthur McCray*

- Generating datasets: Diffraction patterns and peak intensities are generated by Bloch wave method from py4DSTEM, and further augmented to noisy experimental-like dataset. I developed some of the augment part as well as the workflow.
- Training machine learning models: We use CBAM-UNet neural network for the task of peak extraction from the diffraction patterns, and the model showed strong ability to extract peaks, so we demonstrated that CBAM-UNet is one prospective neural network architecture for this task.
- We also tested a Vision Transformer (ViT) architecture for detecting the center of diffraction patterns, which works well, as well as a Deformable Detection Transformer structure for end-to-end detection that directly outputs a list of peaks. These methods are promising, but still needs further training and optimization.
- Future work will continue with a larger training set, refined loss function, and continued development of methods that directly return a list of peaks.
- UGVR Poster Session: made a summary poster for UGVR closing ceremony (August 26).

Electromagnetic Simulations and 2D TMD Materials Characterization 2024.07–2024.10
Research Internship in Rice University, Houston, Texas, US.

Advisor: Prof. Xuedan Ma

- Design of High-Q Photonic Crystal Nanobeam Cavity: Using FDTD electromagnetic simulation methods, I independently designed a planar cavity structure capable of being fabricated from silicon wafers. This cavity effectively traps electromagnetic fields, focusing a 700 nm laser beam into a small region. The design achieves a Q factor greater than 10^6, demonstrating exceptional performance.
- Synthesis and Characterization of 2D Material: I synthesized WS_2 flakes through a systematic CVD process. Collaborating with a postdoc and a graduate student, we performed photoluminescence (PL) and time-resolved PL analyses to characterize the excitonic properties of the flakes and nanowires.
- Design of CoPlanar Waveguides for Microwave Transmission: Using Ansys HFSS, I independently designed CoPlanar Waveguides optimized for fine transmission at 5 GHz (with switchable configurations). These waveguides are intended for efficient microwave transmission in various applications.

Study on the formation mechanism of Schwarz Crystal 2024.12–Present

Advisors: Prof. Ping Cui and Prof. Zhenyu Zhang

- Studying the mechanism: research on weak localization, trying to explain the mechanism of negative magnetoresistance as well as abnormal resistance behavior at low temperature.
- Modeling of structure of Schwarz Crystal: designing the application of E(n)-Equivariant Graph Neural Network for modeling grain boundaries, and implementing this trained model to fill the grain boundaries.

Study of WS2-graphene heterojunction quantum Hall device 2024.10–2025.01
Course Project of *College Physics Experiment IV*, USTC.

Advisor: Prof. Changgan Zeng *Collaborators: Site Li, Zichao Liu*

- Fabrication of 2D Material Flakes: hBN, WS_2, and graphene 2D flakes were prepared using the exfoliation technique, with the resulting flakes located and identified under microscopes.
- Characterization of WS_2 Flakes: Few-layer WS_2 flakes were examined using confocal Raman spectroscopy. The characteristic Raman peaks provided information on the thickness of the flakes at the identified sites.

Simulation of the visual effects of *Einstein's Special Theory of Relativity* 2024.04-2024.05
Course Project of *Computer Graphics*, USTC.

Advisor: Prof. Ligang Liu *Collaborators*: *Zichao Liu, Yutian Zhu*

- We developed a numerical method to simulate the visual effects of Einstein's Special Theory of Relativity in 3D space, including simulating light and object positions, color shifts, and numerically solving equations of light approaching an object.
- Using OpenGL GPU shaders, we adapted the framework for solving the equations efficiently.
- Leveraging effective numerical methods, we realized real-time scene rendering, offering a complete relativistic visual simulation tool. Users can import scenes and adjust physics parameters to explore relativity-based effects.

Honors & Awards

China National Scholarship (Top 2.5% in USTC)	**2025.12**
Cyrus Tang Foundation Moral Education Scholarship	2025.07
China National Scholarship (Top 2.5% in USTC)	**2024.12**
First Prize, 16th National Undergraduate Mathematics Competition (non-mathematics major, category A)	2024.12
Cyrus Tang Foundation Moral Education Scholarship	2024.07
China National Scholarship (Top 1.25% in USTC)	**2023.12**
First Prize, 15th National Undergraduate Mathematics Competition (non-mathematics major, category A)	2023.12
Cyrus Tang Foundation Moral Education Scholarship	2023.05
Outstanding Freshman Scholarship, USTC	2022.12

Extracurricular Activities

- Teaching Assistant for Quantum Mechanics A (Spring 2025), 6-credit course, responsible for grading assignments, providing feedback, conducting review sessions, and assisting with homework explanations for a class of 69 sophomore students.
- Serve as a volunteer in USTC Cyrus Tang CaringHeart Club. Accrued over 40 hours of volunteer service.