

Keao Ho

2023 Condensed matter physics master (3 years) | Chinese Academy of Sciences, China
E-mail: hejiahao23@mailsucas.ac.cn

Research Interest

- Geometric analysis
- Mathematical physics (General Relativity, Applied partial differential equation)
- Partial differential equation

Educational Experience

Bachelor: South China Agriculture University
Optoelectronic Information Science and Engineering
Minor in Mathematics and Applied Mathematics

2018 | 2022

Master: Chinese Academy of Sciences
Condensed matter physics master

2023 | -Present

Research Experience

First principles material calculations(5/2024-10/2024)

- I cooperated with my partner, focusing on the density functional calculation of two-dimensional material. I mainly responsible for: data processing, visualization design and DFT simulations. I was taught by a post-doctoral using some simulation software to build material and device structures, explore material properties, and design suitable device configurations. We focused on the CrXY material which with high carrier mobility. The key characteristic of this material system is the photogalvanic effect (PGE), where non-centrosymmetric materials generate a photocurrent upon illumination without the need for an external electric field. Furthermore, this material also exhibits magnetoelectric and spin-polarization effects, making it highly promising for a wide range of applications.

AI-agent for quantum physics course(10/2024-4/2025)

- I participated in the AI-agent project as a developer. For the project I learned python and pytorch at the initial stage of the project, and I took an active part in research on the development of LLM. In early 2025 we used the Coze platform to build the agent to assist course teaching. For the AI-agent I mainly responsible for the data training, resource collecting(using some OCR tool to change the original into the useful text), prompt engineering optimizing and workflow establishing. The beta version I has published in my personal Wechat public account. After completing the initial agent development, we plan to develop the UI design. Due to the pursuit of academic research, I handed over the left work to my collaborating colleague.

Machine learning in materials science(1/2025-6/2025)

- I developed a machine learning-based regression model to predict the photoelectric conversion efficiency of perovskite solar cells, aiming to accelerate the optimization of material compositions and device architectures. To finish the work, I need to responsible for data collection and filtering, model training and hyperparameter tuning, and model evaluation and visualization. Ultimately, I utilized a manually curated dataset of 1,028 entries to perform a regression task using six traditional machine learning models. The project was utilize sk-learn machine learning package for regression task and R-language for model data visualization exploration and analysis. I conducted all the research independently and authored a personal paper using LaTeX. The paper is currently being revised by a postdoc, who plans to add Density Functional Theory calculations and aims to publish the paper in the second half of 2025.

Research on mathematics(6/2025-present)

- I participated in Finsler Geometry Seminar at Xiamen University and Applied Mathematics Summer School at Peking University. The follow-up plan is to seek mathematical research work to increase research experience and strengthen professional knowledge for future doctoral studies

Basic courses study experience

Algebra

Linear algebra, Abstract algebra, Basic category, Group representation, Lie group and Lie algebra

Analysis

Real analysis, Complex analysis, Functional analysis, Partial differential equation, Mathematical physics equation, Mathematical physics method, Elliptic differential equation, Numerical analysis

Geometry

Differential manifold, Point set topology, Riemann geometry, Algebra topology

Major Courses

Master courses

- General relativity
- Modern cosmology
- Quantum physics
- Lie algebra
- Group theory
- Mathematical physics method
- Partial differential equation
- Computational physics

Minor Courses

- Advanced algebra
- Mathematical analysis
- Numerical analysis
- Real analysis
- Topology
- Mathematics modeling

Bachelor courses

- Principles of Communication
- Information optics
- Analog circuit
- Digital circuit
- Digital image processing

Summer School

- Xiamen University Summer School: Finsler Geometry (Lecturer: Cheng Xinyue, Mo Xiaohuan)
- Peiking University Applied Mathematics Summer School
 1. The theory of Large Language Model
 2. Random Calculation
 3. Dynamical System and Application
 4. Quantum Computation

Skills

- **Programming:** Python, MATLAB
- **Software:** R language, Adobe Illustrator, Latex
- **Language:** Chinese (Mandarin and Cantonese, native), English (fluent, IELTS in preparation)

Personal Introduction

My name is Keao, an academic master's student at the Chinese Academy of Sciences (CAS). I am particularly enthusiastic about differential geometry and PDE. During my college years, I audited a mathematical analysis course as a physics student. It was then that I realized mathematics is not just a tool for science; but an elegant art. Throughout my nearly four years in college, I attended almost all mathematical courses apart from statistics and financial mathematics. However, since I was not accepted for the pure mathematics master's degree at the CAS, I could only pursue a major in condensed matter physics at CAS.

During my first year (2023) of my master's degree, I studied many theoretical physics courses and participated in a cosmology discussion group led by Yun-Long Zhang. I continued to study Riemann geometry, measure theory, and ring theory in my free time on weekends or holidays. At the beginning of the second year of my master's degree, my supervisor suggested that I should focus on materials science to meet the graduation requirements. Therefore, I spent the entire year (2024-2025) working for my supervisor and finally finished my personal paper one year ahead of schedule. I received the support from my supervisor and have decided to pursue a PhD in mathematics. In the latter half of 2025, I plan to seek a research assistant position in mathematical physics or applied mathematics to expand my research experience and expertise.