Yi-Jia (Jimmy) Liu

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Education

University of Wisconsin-Madison — **Madison, WI, United States**
PhD Program in Physics — *Sep. 2025 – Present*
- **First-year PhD Student**

National Taiwan Normal University — **Taipei, Taiwan**
Bachelor of Science in Physics — *Sep. 2020 – Jun. 2024*
- **Overall GPA: 4.05/4.3; Physics-related GPA: 4.25/4.3**

Research Experience

Department of Physics, National Taiwan Normal University — **Taipei, Taiwan**
Research Assistant — *Aug. 2021 – Nov. 2024*
Advisor: Professor Hsiang-Chih Chiu

- Conducted nearly three years of undergraduate research focusing on investigating the physical and chemical properties of two-dimensional materials using Atomic Force Microscopy (AFM)-based techniques.
- Worked on several projects:
  - **Nanotribology**:
    - Investigated the physiochemical properties of defective and pristine graphene in a sliding electrical contact under ambient conditions. Main contributions included conducting all AFM-related experiments and performing data analysis. *(Applied Surface Science, 2023)*
    - Explored the temperature effects on graphene in a dynamic electrical contact, focusing on water meniscus formation at elevated temperatures. Responsible for designing and conducting experiments, as well as drafting the manuscript. *(APS March Meeting, 2024) (In preparation, 2024)*
    - Studied the tunneling triboelectric effect on hexagonal boron nitride, analyzing charge dissipation mechanisms via AFM-based techniques. Responsibilities included assisting with AFM experiments and contributing to experimental design. *(In preparation, 2024)*
  - **Nanomagnetism**:
    - Generated localized skyrmion and stretched stripe domains on two-dimensional magnetic material Fe_3GaTe_2 using a novel approach with conductive AFM. Played a key role in designing experiments to uncover the mechanisms behind magnetic bubble domain creation, breaking down the complex topic into distinct, explainable components for deeper analysis. *(Applied Surface Science Advanced, 2025)*
- Mentored three undergraduate and three master's students, supporting their skill development and lab projects.

Department of Physics, Simon Fraser University — **Burnaby, Canada**
Visiting Research Student — *Jul. 2023 – Sep. 2023*
Advisor: Professor John Bechhoefer

- Focused on controlling a classical nonlinear dynamic system—the inverted pendulum.
- Developed a prototype of a real-time feedback system using MATLAB/Simulink Desktop Real-time, working from scratch on both hardware and software components.
- Constructed hardware using 3D printing and integrated sensors and the motor by compiling the necessary software in Simulink.

Publications

- **Yi-Jia Liu**, Ruei-Si Wang, Kun-Hua Yang, Wen-Yao Cheng, Shuei-De Huang, En-De Chu, Shang-Hsien Hsieh, Chia-Hao Chen, Yu-Han Wang, Jhe-Wei Liou, Wei-Yen Woon, and Hsiang-Chih Chiu*, *Effect of Structural Defects on the Physiochemical Properties of Supportive Single-layer Graphene in a Sliding Electrical Contact Interface under Ambient Conditions*, **Applied Surface Science, 637, 157992 (2023)**. https://doi.org/10.1016/j.apsusc.2023.157992

- Chak-Ming Liu†, **Yi-Jia Liu**†, Po-Chun Chang†, Po-Wei Chen, Masahiro Haze, Ming-Hsien Hsu, Neleena Nair Gopakumar, Yukio Hasegawa, Yixi Su, Hsiang-Chih Chiu*, Wen-Chin Lin*, *Localized Creation of Skyrmion Bubbles in Fe_3GaTe_2 by Conductive Atomic Force Microscopy*. († These authors contributed equally to this work.) **Applied Surface Science Advances, 26, 100718 (2025).** https://doi.org/10.1016/j.apsadv.2025.100718

In Preparation

- **Yi-Jia Liu**, Ruei-Si Wang, Chun-Ying Tsai, Ho-Chen Hsieh, Hsiang-Chih Chiu*, *Temperature Effects on the Behavior of Electrically-Biased Monolayer Graphene under Dynamic Contact*.
- Ruei-Si Wang, **Yi-Jia Liu**, Chih-Chieh Yang, Shuei-De Huang, En-De Chu, Yu-Han Wang, Jhe-Wei Liou, Wei-Yen Woon, and Hsiang-Chih Chiu*, *Charge Injection, Storage, and Dissipation in Supported Single-layer h-BN within a Dynamic Electrical Contact*.

Conference Presentations

- **Yi-Jia Liu**, Shuei-De Huang, En-De Chu, Li-Ling Wei, Shang-Hsien Hsieh, Yu-Han Wang, Jhe-Wei Liou, Ruei-Si Wang, Wen-Yao Cheng, Wei-Yen Woon, Hsiang-Chih Chiu*, *Structural Defects Influenced Effective Work Function Variations of Monolayer Graphene in Sliding Electrical Contact under Ambient Conditions*, Annual Meeting of Physical Society of Taiwan, 2023.
- **Yi-Jia Liu**, Ruei-Si Wang, Kun-Hua Yang, Shuei-De Huang, Shang-Hsien Hsieh, Hsiang-Chih Chiu*, *Effect of Environmental Humidity and Temperature on the Variations in Physiochemical Properties of Monolayer Graphene in Sliding Electrical Contact Interface*, Bulletin of the American Physical Society, March Meeting, 2024.

Awards & Achievements

- ***Undergraduate Student Thesis Award***, The Physical Society of Taiwan, 2024
  - Awarded to the top 3 undergraduate theses in Physics across Taiwan. The highest honor for undergraduate theses.
- ***Excellent Student Scholarship***, College of Science, National Taiwan Normal University, 2024
  - Selected as the sole recipient from the Department of Physics, recognizing exceptional academic achievement and leadership.
- ***College Student Research Award***, National Science and Technology Council of Taiwan, 2023
  - Awarded for an innovative undergraduate research proposal selected annually in Taiwan.
- ***Merits Award of Student Poster Presentation***, Annual Meeting of the Physical Society of Taiwan, 2023
  - Honored among the top 10% poster presenters at the meeting for outstanding research presentation.
- ***Overseas Internship Program***, Ministry of Education of Taiwan, 2023
  - Chosen as the only Physics Department student for a summer internship at SFU, Canada.
- ***Academic Excellence Award***, Department of Physics, NTNU, 2022, 2023
  - Recognized three times for ranking in the top 5% GPA among peers in the Physics Department.
- ***New Generation Talent Cultivation Scholarship***, Department of Physics, NTNU, 2022, 2023
  - Distinguished among the top 4 students for merit in research, earning the department's top research award.

Teaching Experience

Undergraduate General Physics — **National Taiwan Normal University**

Teaching Assistant — *Spring 2024*

- Assisted 56 first-year Chemistry majors with course material and assignments.
- Graded bi-weekly homework assignments, providing detailed feedback to facilitate deeper understanding.
- Conducted regular office hours for one-on-one and group discussions to clarify concepts and assist students.

Research Interests

My research interests in **Condensed Matter Experimental Physics** include:

- Low-Dimensional Materials
- van der Waals Heterostructures
- Nanomagnetic and Spintronic Materials
- Scanning Probe Microscopy

Technical Skills

- Atomic Force Microscopy (Bruker Multimode 8):
  - Topography Imaging: Contact mode, tapping mode, and PeakForce tapping mode in ambient conditions.
  - Nano-mechanical and Electrical Measurements: Lateral Force Microscopy, Force Volume Mode, Magnetic Force Microscopy, Kelvin Probe Force Microscopy, and Conductive-AFM.
- Graphene Transfer by Mechanical Exfoliation and Bubble-assisted Wet Transfer
- Raman Spectroscopy and X-ray Photoelectron Spectroscopy (XPS)
- Thin Film Deposition by Sputter Coating
- Data Analysis Tools: Origin, Python, and CasaXPS
- 3D Printing and CAD Software: AutoCAD, Inventor