CURRICULUM VITAE

Chu-Te (Ethan) Chen

Ph.D. candidate
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EDUCATION

Doctor of Philosophy | University at Buffalo, The State University of New York — Feb 2024 - Jan 2027

- Major: Materials informatic and data science
- Research Area: 2D materials, electronic devices, clean energy applications, and machine learning
- GPA: **3.93** / 4.0

Master of science | University at Buffalo, The State University of New York — Sep 2022 - Jan 2024

- Major: Materials informatic and data science
- Related coursework: Multivariate Statistics & Materials Informatics / Quantitative Methods in Materials Characterizations / Experimental Design for Materials Development
- GPA: **3.92** / 4.0

Bachelor of Science & Master of science | National Chung Cheng University, Taiwan — Sep 2014 - Aug 2019

- Major: Earth and Environmental Sciences
- Master's degree | GPA: 4.14 / 4.3
- Bachelor's degree | GPA: 3.45 / 4.3
- Related coursework: Data structure, Algorithm, Object Oriented Programming

SKILLS & ABILITIES

Experimental skills

- Low-dimensional material synthesis using chemical vapor deposition (CVD) technique. Materials include transition metal dichalcogenides (TMDs, such as MoS_2), transition metal carbides, nitrides, and carbonitrides (MXenes).
- Electronic device fabrication skills include e-beam lithography, e-beam evaporation, sputtering deposition, atomic layer deposition (ALD), etcher, and spin coating. Electrical measurement techniques for electronic device (such as field effect transistors) characterizations.
- Proficiency in a set of microscopic and spectroscopic material characterization techniques, including optical microscopy, atomic force microscopy (AFM), scanning electron microscopy (SEM), transmission electron microscopy (TEM), Raman, photoluminescence spectroscopy (PL), Fourier-transform infrared spectroscopy (FTIR), energy dispersive spectroscopy (EDS), X-ray diffraction analysis (XRD), X-ray photoelectron spectroscopy (XPS).

Data science abilities

- Data science techniques to assist the material characterization and data analysis, including design of experiment, machine learning (ML), principal component analysis-based feature selection and reduction.
- Experience with Neural Networks, Genetic Algorithms, XGBoost, Random Forest, and Bayesian Regressions.
- Software development skills such as Python, Flask, JavaScript, React.js, MySQL, Docker, Git, Claude Code, CI/CD processes and AWS services (Certified AWS Cloud Practitioner)

PROFESSION EXPERIENCES

Research Assistant | University at Buffalo, The State University of New York Jan 2023 - Present

Project I: Selective synthesis of two-dimensional (2D) materials using chemical vapor deposition (CVD)

- Lead member in collaboration with **Applied Materials Inc.** for 2D material synthesis
- Explored CVD parameter space for site-specific nucleation and growth with 150+ synthesis.
- Performed material characterization through various microscopic/spectroscopic techniques, including AFM, SEM, EDS, Raman, PL, and XPS.
- Coordinated interdisciplinary efforts among industrial institute and academic research groups, streamlining experimental design and publishing findings in **MRS Bulletin**. (DOI: https://doi.org/10.1557/s43577-023-00597-2)
- Published research findings in the 84th Physical Electronics Conference - PEC 2025 (Poster)
- Published research findings in the 34th Microelectronics Design and Test Symposium (IEEE MDTS 2025) (Talk)
- Published research findings in the AVS 70th International Symposium & Exhibition, 2024 (Talk)
- Published research findings in the AVS 69th International Symposium & Exhibition, 2023 (Poster)
- **Filed 1 research patent in the semiconductor field** titled "Location-on-demand Selective Synthesis of Two-dimensional Semiconductors for transistors." (Under review)

Project II: Collaboration with **Air Force Office of Scientific Research (AFOSR)** for 2D material synthesis

- Performed comprehensive material characterization using various microscopic/spectroscopic techniques.
- Executed 30+ advanced analytics and data visualization for an annual project review by OriginLab.
- Coordinated a team of 5+ researchers in interdisciplinary collaborations across 3 laboratories.
- Published research findings in **the 2D materials journal, 2025** (Under review)

Project III: Data-driven smart synthesis of two-dimensional materials (Conference poster and Github repo)

- Conducted literature review and collected CVD growth parameters and optical image data for 2D material synthesis.
- Optimized synthesis success rate from 61% to 90% by machine learning (ML) techniques such as Random Forest regression.
- Served as a panelist of AI Impact on the Common Good and published research finding in the **SUNY Graduate Research Conference**. (Video link)

Project IV: Collaboration with **Suny Albany and University of Nebraska** for 2D material synthesis

- Developed and optimized 15+ CVD synthesis trials using both liquid and solid Mo precursors to grow MoS_2 on advanced substrates, such as Cr_2O_3 magnetoelectric films and SiO_2/Si stacks, achieving improved crystallinity.
- Evaluated 10+ samples to establish clear process–structure–property relationships, revealing substrate-dependent growth behaviors and enabling integration with both microscale electrical testing and optical spectroscopy (Raman and PL).
- Led a 3-institution collaboration involving synthesis, device fabrication, and materials characterization, demonstrating a distinct ability to coordinate complex research efforts across academia and disciplines.

Project V: Collaboration with **University of Burgundy, France** for AI-assisted 2D material discovery

- Developed an AI/CNN workflow to predict twist angles in bilayer MoS_2 with >90% accuracy.
- Integrated automated optical microscopy and electrochemical testing to rapidly screen HER-active 2D materials.
- Created open-source ML tools for 2D material characterization and HER prediction, accelerating collaborative device discovery across institutions.

Project VI: High-Performance $Ti_3C_2T_x$-MXene/Mycelium Hybrid Membrane for Efficient Lead Remediation: Design and Mechanistic Insights

- Performed XPS analysis on 12+ samples to quantify chemical state changes in $Ti_3C_2T_x$-MXene/mycelium membranes before and after Pb(II) removal, providing key mechanistic data.
- Optimized electrochemical deposition to fabricate >20 uniform MXene/mycelium hybrid membranes, enhancing Pb(II) adsorptive capacity by 35%.
- Coordinated interdisciplinary efforts among 3 research groups, streamlining experimental design and publishing findings in **ACS Applied Materials & Interfaces**. (DOI: https://doi.org/10.1021/acsami.4c19943)

Project VII: Video-based in-situ microrheological analysis of hydrogel synthesis (Report and Github repo)

- Led quantitative video-based microrheology, analyzing 2,000+ particle trajectories and extracting gelation, viscosity, and modulus metrics, achieving precise gel time determination (22–37s) for silk-based hydrogels.
- Demonstrated rapid, automated Differential Dynamic Microscopy (DDM), reducing analysis time and user intervention by >50% compared to traditional tracking, while validating results with Multiple Particle Tracking (MPT).
- Facilitated close collaboration with soft materials experts, integrating rheological data and feedback to ensure video analysis outcomes matched hydrogels' viscoelastic phase transitions and mechanism.

Software Engineer | Vizuro LLC, Taipei, Taiwan (Causal AI leader by Gartner 2024) Sep 2021- Aug 2022

Project: Causal inference AutoML web applications (https://vizuro.com/kairos)

- Increased client campaign effectiveness by 40% and ROI by 25% on average, by building Kairos: Marketing Optimization by Causal AI -- a top-tier precision marketing platform, using Vue.js, Flask, and PostgreSQL.
- Increased 80% in customer satisfaction, by building an interactive AI chatbot delivering personalized, actionable insights to clients, using GPT-based Large Language Models (LLM) and Streamlit.
- Improved deployment efficiency and reduced downtime by 50%, by implementing 10+ web application deployments leveraging Docker, GitLab CI/CD, and AWS Cloud.

Research Assistant | Academia Sinica, Taipei, Taiwan (1st National Laboratories) Jul 2020 - Aug 2021

Project: Taiwan Archived Platform for Seismology (https://taps.earth.sinica.edu.tw/en-US/)

- Designed and developed 3+ web applications for Taiwan Archived Platform for Seismology.
- Visualized seismic waveform and quality assurance analysis by 10+ figures.
- Accelerated 2X manual data handling efficiency, by designing the top 1 seismology database web service in Taiwan (webpage: Taiwan Archived Platform for Seismology; repo: TAPSClient, fetchTAPS), enhanced data accessibility and analysis capabilities for 50+ researchers, automating the data analysis process using Vue.js, Django, MySQL, GraphQL, and Python.

HONORS & AWARDS

- Awarded the prestigious **UB Engineering Alumni Association Endowed Scholarship**, 2025
- **1 patent** of materials synthesis is under review of SUNY RF and Applied Materials Inc., 2024
- **First place** in the Ph.D. comprehensive exam at MDI department in 2023
- Selected as a **panelist** of SUNY Graduate Research Conference 2023, Apr 2023
- First place in MDI poster competition in 2023
- Third place in the Graduate Student 3 Minutes Thesis (3MT) competition of the MDI department in 2023
- Nominated in the 2023 Graduate Student Poster Competition of the School of Engineering and Applied Sciences
- Nominated in the 2023 Celebration of Student Academic Excellence Poster Presentations at SUNY Buffalo
- Member of graduate student association (GSA) at UB, Conference Funding, Oct 2023
- New York State Center of Excellence in Materials Informatics, Career Experience Program fellowship, Mar 2023
- SUNY Buffalo, Research Foundation Tuition Scholarship, Jan 2023
- Geological Society located in Taipei, VEI CHOW JUAN Thesis Award, Nov 2020
- National Chung Cheng University, Dean's List Award, Jun 2018

PROFESSION SERVICES

- **Peer reviewer** of 3 journals such as JES, ACS Appl. Mater. Interfaces, and PSS (b)
- **Member of board of directors GSA** at UB, Sep 2024 – Sep 2025
- **Hosted 3 international researchers from the SKKU University, Korean**, Jul 2025
- **Organized lab tours for MDI departmental visits for the French researchers from the University of Burgundy, France**, 2024
- Committee of Taiwanese GSA, 2024
- Panelist of SUNY Graduate Research Conference 2023, Apr 2023
- Organization committee for MDI STUFF (a regular event for graduate student research talks), 2023
- Student volunteer for Erich Bloch Symposium, 2023
- Hosted Taiwanese international graduate students in Fall of 2023

PUBLICATIONS

Underline as the applicant, † as these authors contribute equally, * as the corresponding author.

1. C. Chen†, Y. Fu†, X. Gao, A. Butler, K. Reyes, H. Li, M. Pentaris, A. Yadav, K. T. Wong, H. Yue, and F. Yao*, "Two-dimensional van der Waals materials and their mixed low-dimensional hybrids for electrochemical energy applications", **MRS Bulletin** (2023). (DOI: https://doi.org/10.1557/s43577-023-00597-2)
2. S. Shahi, A. Ahmed, R. Yang, A. Cabanillas, A. Chakravarty, M. Liu, H. N. Jaiswal, Y. Fu, Y. Guo, S. Jadeja, H. Murugesan, A. Butler, C. Chen, J. Muhigirwa, M. Enaitalla, J. Liu, F. Yao*, and H. Li*, "Plasma-induced energy band evolution for two-dimensional heterogeneous anti-ambipolar transistors", **Journal of Vacuum Science & Technology B** (2023) (selected as an **Editor's Pick**). (DOI: https://doi.org/10.1116/6.0002888)
3. A. Cabanillas, H. N. Jaiswal, A. Chakravarty, A. Ahmed, Y. Fu, C. Chen, F. Yao, H. Li*, "Inherent Photogating in $MoTe_2$ Transistors with Van der Waals Contacts", **IEEE 2024 Device Research Conference (DRC)**. (DOI: https://doi.org/10.1109/DRC61706.2024.10605297)

4. M. S. Parasnis, Y. Fu, E. Deng, A. Butler, C. Chen, R. Dias, H. Lin, F. Yao*, and P. C. Nalam*, "High-Performance $Ti_3C_2T_x$-MXene/Mycelium Hybrid Membrane for Efficient Lead Remediation: Design and Mechanistic Insights", **ACS Applied Materials & Interfaces (2025)**. (DOI: https://doi.org/10.1021/acsami.4c19943)
5. S. K. Arachchige†, C. Chen†, A. Dutta†, S. Im, A. Butler, A. Kuzmin, A. Neelur, P. Khadagale, A. Cabanillas, D. Adinehloo, A. Rzhevskii, M. Swihart, V. Perebeinos, H. Li, F. Yao*, P. N. Prasad*, "Rare-Earth-Modified Luminescent Two-dimensional Nanosheets Derived from Oxidized Mo_2C MXene", under review.
6. C. Chen†, A. Cabanillas†, A. Ahmed, A. Butler, Y. Fu, H. Hui, H. Zeng, A. Yadav, G. Lee, K. T. Wong*, F. Yao*, and H. Li*, "Wafer-Scale 2D MoS_2 Transistors Using Transfer-Free Location-on-Demand Selective Synthesis", manuscript in preparation.
7. K. Bayoudh, C. Chen, F. Yao, S. Bricq*, "Hybrid machine learning for 2D materials design and discovery in computer vision: A comprehensive review", manuscript in preparation.
8. Z. Li, Y. Fu, S. Wei, J. Lee, C. Chen, F. Yao, and H. Sun*, "Machine Learning in 2D Materials: A Comprehensive Review of Synthesis, Characterization, and Bandgap Engineering", manuscript in preparation.

CONFERENCES

Underline as the applicant, * as the corresponding author.

1. C. Chen, A. Cabanillas, H. Li*, F. Yao*, "Wafer-Scale 2D MoS_2 Transistors Using Transfer-Free Location-on-Demand Selective Synthesis", in **the 84th Physical Electronics Conference - PEC 2025**, Brookhaven National Laboratory, New York, Aug 2025
2. C. Chen, A. Cabanillas, H. Li*, F. Yao*, " Location-Controlled Chemical Vapor Deposition of MoS_2 for High-Performance Field-Effect Transistor Arrays", in **the 34th Microelectronics Design and Test Symposium (IEEE MDTS 2025)**, Albany, New York, May 2025 (oral presentation)
3. C. Chen, A. Cabanillas, A. Ahmed, A. Butler, Y. Fu, A. Chakravarty, H. Hui, H. Zeng, A. Yadav, K. T. Wong, H. Li*, F. Yao*, " Location-Selective CVD Synthesis of Circular MoS_2 Flakes with Ultrahigh Field-Effect Mobility", in **the AVS 70th International Symposium & Exhibition**, Tampa, Florida, November 2024 (oral presentation)
4. C. Chen, Y. Fu, A. Butler, A. Cabanillas A. Ahmed, A. Chakravarty, S. S. Jadeja, H. Hui, L. Samson, H. Zeng, A. Yadav, K. T. Wong, H. Li*, F. Yao*, "Site-Specific Synthesis of Molybdenum Dichalcogenide Using Chemical Vapor Deposition Technique", in the Erich Bloch Symposium, University at Buffalo, June 2024
5. C. Chen, Y. Fu, A. Butler, A. Cabanillas A. Ahmed, A. Chakravarty, S. S. Jadeja, H. Hui, L. Samson, H. Zeng, A. Yadav, K. T. Wong, H. Li*, F. Yao*, "Site-Specific Synthesis of Molybdenum Dichalcogenide Using Chemical Vapor Deposition Technique", in **the AVS 69th International Symposium & Exhibition**, Portland, Oregon, November 2023
6. C. Chen, "Data-driven smart synthesis of two-dimensional materials", in the Erich Bloch Symposium, University at Buffalo, June 2023 (oral presentation)
7. C. Chen, A. Tiroucoumarane, D. V. S. P. Kosana, R. Finster, Y. Fu, A. Butler, A. Chakravarty, H. Li, S. Broderick, K. Rajan, and F. Yao*, "Data-driven smart synthesis of two-dimensional materials", in **the 127th Topical Symposium of the New York State Section of the American Physical Society (NYSSAPS)**, Buffalo, NY, USA, April 29, 2023.
8. C. Chen, panelist of AI Impact on the Common Good, **SUNY Graduate Research Conference 2023**, Apr 2023 (virtual conference)