Ting-Ju Wei

Ph.D. Candidate | Expected June 2026

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🌐 Personal Website 　 🎓 Google Scholar

Employment History

2021 – 2022	🔖 **Contractor's Professional Engineer** Feng-Ya Construction Co., Ltd.	
2017 – 2021	🔖 **Associate Technical Specialist.** Experiment Forest, National Taiwan University	

Education

2023 – now　🔖 **Ph.D., Civil Engineering, National Taiwan University**
Division: AI for Engineering Applications.
Thesis: *Deep Material Networks for Microstructure Learning in Multiscale Simulations*.
Professional Statement: My Ph.D. research focuses on multiscale modeling of heterogeneous materials motivated by industrial virtual product development challenges. I developed semi-analytical AI surrogate models that predict nonlinear crystal plasticity of polycrystalline materials using linear elastic data only, achieving errors below 1% and over 1000× speedup compared to highly optimized FFT-based solvers (DAMASK), with results published in *Computer Methods in Applied Mechanics and Engineering*. I further extended this framework to foundation models for short-fiber composites and FCC polycrystals, enabling generalization across manufacturing-induced microstructure variations. In the final stage of my Ph.D., I expanded my research toward multi-physics modeling, including electromechanical and thermomechanical coupling, with applications to piezoelectric materials and through-silicon via (TSV) structures, aiming to translate physics-based simulations into scalable methodologies for TCAD-related applications.

2021 – 2023　🔖 **M.Sc., Civil Engineering, National Taiwan University**
Division: Computer-Aided Engineering.
Thesis: *Study on Bubble Generation Phenomena during Root Canal Treatment: Numerical Modeling and Experimental Validation*.
Professional Statement: My master's training focused on physics-based CAE, numerical modeling, and algorithm development. I performed molecular dynamics simulations on high-entropy alloys and developed planar defect identification algorithms, leading to a publication in *Materials Chemistry and Physics*. As my thesis work, I collaborated with National Taiwan University Hospital to develop and experimentally validate a CFD-based predictive framework for estimating root canal irrigation efficiency under varying operational parameters.

2013 – 2017　🔖 **B.Sc., Civil Engineering, National Chung Hsing University**

Research Publications

Journal Articles

1 **Wei**, **Ting-Ju** and Chuin-Shan Chen (2025a). "Foundation model for composite microstructures: Reconstruction, stiffness, and nonlinear behavior prediction". In: *Materials & Design* 257, p. 114397.

2 **Wei**, **Ting-Ju** and Chuin-Shan Chen (2025b). "Foundation Model for Polycrystalline Material Informatics". In: *arXiv preprint arXiv:2512.06770*.

3 **Wei**, **Ting-Ju**, Tung-Huan Su, and Chuin-Shan Chen (2025a). "Crystallographic Texture-Generalizable Orientation-Aware Interaction-Based Deep Material Network for Polycrystal Modeling and Texture Evolution". In: *arXiv preprint arXiv:2512.06779*.

4 **Wei**, **Ting-Ju**, Tung-Huan Su, and Chuin-Shan Chen (2025b). "Orientation-aware interaction-based deep material network in polycrystalline materials modeling". In: *Computer Methods in Applied Mechanics and Engineering* 441, p. 117977. ISSN: 0045-7825.

5 **Wei**, **Ting-Ju**, Wen-Ning Wan, and Chuin-Shan Chen (2025a). "Deep Material Network: Overview, applications and current directions". In: *arXiv preprint arXiv:2504.12159*. Manuscript in submission.

6 Wan, Wen-Ning, **Ting-Ju Wei**, Tung-Huan Su, and Chuin-Shan Chen (2024). "Decoding material networks: exploring performance of deep material network and interaction-based material networks". In: *Journal of Mechanics* 40, pp. 796–807. ISSN: 1811-8216.

7 Chen, Kuan-Ting, **Ting-Ju Wei**, Guo-Chi Li, Mei-Yi Chen, Yi-Shiang Chen, Shu-Wei Chang, Hung-Wei Yen, and Chuin-Shan Chen (2021). "Mechanical properties and deformation mechanisms in CoCrFeMnNi high entropy alloys: A molecular dynamics study". In: *Materials Chemistry and Physics* 271, p. 124912. ISSN: 0254-0584.

Conference Abstracts

1 Lu, Shiuan-Ming, **Ting-Ju Wei**, Abhinav Khedkar, Michael Kaliske, and Chuin-Shan Chen (2025). "An Orientation-Aware Interaction-Based Deep Material Network Surrogate Model for Efficient Multiscale Simulation of Carbon-Reinforced Concrete". In: *Proceedings of the XVIII International Conference on Computational Plasticity (COMPLAS 2025)*. September 2–5. Barcelona, Spain.

2 **Wei**, **Ting-Ju**, Wen-Ning Wan, and Chuin-Shan Chen (2025b). "Orientation-Aware Interaction-Based Deep Material Network for Polycrystalline Materials with Diverse Microstructures". In: *Proceedings of the XVIII International Conference on Computational Plasticity (COMPLAS 2025)*. September 2–5. Barcelona, Spain.

3 **Wei**, **Ting-Ju** and Chuin-Shan Chen (2024). "Advancing Multiscale Modeling in Polycrystalline Materials: A Novel Deep Material Network Approach". In: *Proceedings of the 16th World Congress on Computational Mechanics (WCCM) and 4th Pan American Congress on Computational Mechanics*. July 21–26. Vancouver, Canada.

4 **Wei**, **Ting-Ju**, Tung-Huan Su, and Chuin-Shan Chen (2024). "Graph-Enhanced ODMN: A Unified Model for Advanced Polycrystalline Material Modeling". In: *Association of Computational Mechanics Taiwan (ACMT 2024) and The 15th Workshop on Boundary Element Methods (TWBEM 15)*. October 5–6.

5 **Wei**, **Ting-Ju**, Yu-Yang Chen, Cheng-Chuan Lin, Wei-Wen Liu, An-Bang Wang, and Jun-Shan Chen (2023). "Simulating an Irrigation Flow in Root Canal: Predicting the Likelihood of the Cavitation Bubble Formation". In: *Association of Computational Mechanics Taiwan (ACMT) 2023 Annual Meeting*. October 28–29. Taipei, Taiwan.

Skills

Languages	Fluent in English and Mandarin Chinese.
Programming	Python, C/C++, Fortran, MATLAB; experienced in numerical algorithm development, scientific computing, and model prototyping.
Simulation & Modeling	Multi-physics simulation (mechanical, thermal, electromechanical coupling); multiscale modeling; nonlinear finite element methods; reduced-order and surrogate modeling.

Skills (continued)

Software & Tools   ◼ Commercial FEM: Abaqus, ANSYS; Atomistic simulation: LAMMPS. Experienced in developing in-house nonlinear FEM solvers, implementing advanced numerical algorithms, and designing scalable simulation frameworks with modular code architectures.

Miscellaneous Experience

Awards and Achievements

Aug 2025   ◼ **Saxon Student Mobility Scholarship**,
Funded by the Saxon Ministry for Science, Culture and Tourism for a research stay at TU Dresden.

Sep 2024   ◼ **113 Academic Year Ministry of Education Doctoral Scholarship**,
Issued by National Taiwan University.

Sep 2023   ◼ **Xin-Miao Technology Doctoral Student Scholarship**,
Awarded by the Xin-Miao Educational Foundation to only 5 doctoral students university-wide each year.

Dec 2023   ◼ **Second Place, Taipei City**,
Awarded by NASA in the 2023 NASA Space Apps Challenge.

Dec 2022   ◼ **Global Winner – Best Use of Science (1st out of 5,300+ teams)**,
Awarded by NASA in the 2022 NASA Space Apps Challenge.
https://2022.spaceappschallenge.org/challenges/2022-challenges/carrington-event/teams/whats-new/project.

Certification

Sep 2021   ◼ **Professional Engineer (PE) of Civil Engineering**, Public Construction Commission.
Credential ID: 017987.