Ting-Ju Wei Ph.D. candidate

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Employment History

2017 – 2021 **Associate Technical Specialist.** Experiment Forest, National Taiwan University

2021 – 2022 **Contractor's Professional Engineer** Feng-Ya Construction Co., Ltd.

Education

2023 – now **Ph.D., Civil Engineering, National Taiwan University**
Division: AI for Engineering Applications.

2021 – 2023 **M.Sc., Civil Engineering, National Taiwan University**
Division: Computer-Aided Engineering.
Thesis title: *Study on bubble generation phenomena during root canal treatment: numerical modeling and experimental validation.*

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

Research Publications

Journal Articles

1. **Wei**, **Ting-Ju** and Chuin-Shan Chen (2025). "Foundation model for composite microstructures: Reconstruction, stiffness, and nonlinear behavior prediction". In: *Materials & Design* 257, p. 114397.
2. **Wei**, **Ting-Ju**, Tung-Huan Su, and Chuin-Shan Chen (2025). "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.
3. **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.
4. 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.
5. 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 Proceedings

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 Languages	Proficient in Python, C/C++, Fortran, Java, and MATLAB.
Software and Technologies	Skilled in commercial FEM packages (Abaqus, ANSYS) and atomistic simulations using LAMMPS. Experienced in developing custom finite element solvers, implementing advanced numerical algorithms, and applying software design patterns to enhance FEM code architecture.
Research Expertise	Specialized in computational materials science with emphasis on computational homogenization. Key contributions include: • Developed the Orientation-Aware Deep Material Network (ODMN) for multiphase polycrystalline systems, enabling nonlinear homogenization and texture evolution prediction, and achieving over **100**× acceleration compared to DAMASK-FFT. • Introduced the TACS–GNN–ODMN framework, which integrates texture-adaptive clustering (TACS) and graph neural networks (GNN) to rapidly construct surrogate models for diverse microstructures, significantly enhancing applicability in industrial scenarios. • Pioneered the first composite foundation model in materials science using a masked autoencoder, establishing a versatile framework for microstructure reconstruction, stiffness prediction, and nonlinear behavior analysis.

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.