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**EDUCATION**

2016/09 - 2025/06 Ph.D. Depart. of Horticulture, National Chung Hsing University, Taiwan

2013/09 - 2016/08 M.S. Depart. of Horticulture, National Chung Hsing University, Taiwan

2008/09 - 2013/08 B.A. Depart. of Electric Engineering, National Chung Hsing University, Taiwan

**EMPLOYMENT**

2025/08 - present Postdoctoral Researcher RCEC, Academia Sinica, Taiwan

**RESEARCH INTEREST**

Large‐scale datasets on branch and tree failures provide an indispensable statistical foundation for urban-forest risk management. Yet frequency data alone cannot fully explain when and why a particular structure fails under specific conditions. To bridge this gap, I integrate wood-physiology parameters into high-resolution finite-element models (FEM), adding quantitative mechanical insight on top of conventional statistics. Model outputs—crown stability, carbon retention, and structural service life—translate directly into highly actionable risk maps and pruning schedules. Municipal forestry teams now use these results to select typhoon-resilient species and plan preventive maintenance, while the same biomechanical principles have inspired biomimetic joints for civil-engineering structures, creating synergy between ecology and engineering. Interactive visualizations further convert dense mechanical data into intuitive narratives that guide policymakers and reassure residents, ensuring that vibrant urban canopies remain a source of safety and comfort rather than hidden risk.

**RESEARCH HIGHLIGHTS**

**1. Mechanical roles of branch–stem junction morphologies**

The apparent complexity of a tree can be reduced to its fundamental unit: the branch–stem junction. I quantified how distinct junction shapes redistribute loads, showing that each morphology shifts both the magnitude and location of stress hotspots [1, 2]. These hotspots predict where adaptive growth occurs or where mechanical failure is likely, allowing the physiological benefits and structural risks of each junction type to be identified and compared [2].

Reference: [1]. Peng and Liu, 2016. [2] Liu et al. 2023

**2. Tree internal cone: conical interlocking connections in normal versus latent-bud branches**

Beyond external form, junction strength is dictated by concealed architecture. In normal branches, sequential xylem growth creates an *internal cone*—a conical interlocking connection—that sharply boosts axial and shear resistance [1]. Comparing this robust geometry with the flatter attachment of latent-bud branches reveals how developmental origin governs mechanical integrity at the branch–stem interface.

Reference: [1]. Peng et al. 2025

**REPRESENTATIVE PUBLICATIONS**

1. **Peng, Y.-S.**, B.-Y. Cheng, and T.-C. Liu**\***, “Mechanical properties and optimization strategies of tree fork structures,” *Plants*, vol. 14, no. 2, p. 167, 2025. doi:10.3390/plants14020167
2. **Liu, T.-C., Y.-S. Peng, and B.-Y. Cheng\***, “Physiological and Physical Strategies to Minimize Damage at the Branch–Stem Junction of Trees: Using the Finite Element Method to Analyze Stress in Four Branch–Stem Features,” *Plants*, vol. 12, no. 23, p. 4060, 2023. doi:10.3390/plants12234060

**Others (Invited Talks，Keynote speech et al.)**

1. **Peng, Y.-S.**, B.-Y. Cheng, and T.-C. Liu\*, “Application of the finite-element method in visual diagnosis,” in *Proceedings of the 2023 Sustainable Taiwan Environmental Protection and Development Conference (STPD 2023)*, Yunlin University of Science and Technology, 2023.
2. **Peng, Y.-S.**,and T.-C. Liu**\***, “Mechanical analysis of branch–stem interweaving regions in trees,” in *Proceedings of the 2023 Sustainable Taiwan Environmental Protection and Development Conference (STPD 2023)*, Yunlin University of Science and Technology, 2023.
3. **Peng, Y.-S.**, and T.-C. Liu\*, “Finite-element analysis of mechanical behaviour in normal, latent-bud, and included-bark branches,” invited talk, National Chung Hsing University, March 2025 (in Chinese).