Ting-Kai, Hsu

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tingkaihsu0924@gmail.com
https://tingkaihsu.github.io

Education

National Taiwan University — Taipei, Taiwan
Bachelor of Science in Engineering — 2022–2026(expected)

- Major: Electrical Engineering
- GPA: 4.23/4.30
- Rank: 7/266 (3%)

Research Projects

An On-shell Approach to Anomalous Threshold
Department of Physics, National Taiwan University — 2024.08–present

- Research Assistant to Professor Yu-tin Huang.
- Study the analytic structure of amplitudes and the dispersion relation for unstable particles.
- Design an on-shell approach to anomalous threshold.
- Restoration of EFT positivity bound in the unstable region.
- K. Aoki, Y.-t. Huang, T.-K. Hsu, *On-shell Approach to Anomalous Threshold*, under construction.

Reconstruction of B Meson Decay Process via Deep Learning
Department of Physics, National Taiwan University — 2023.09–present

- Mentored by Professor Kai-Feng Chen.
- Study the deep learning algorithms and collider physics.
- Training neural networks for capturing non-linear features of collision process.
- Compare CNN model and Transformer model efficiency.

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Internships

n_TOF, CERN | Geneva, Switzerland — 2025.07–2025.08

- Mentored by Professor Alberto Mengoi.
- Developed an online nuclear cross-section database for astrophysical simulations.
- Supported experimental analysis and data organization for the n_TOF facility.
- The modular design allows extension, as more measurements become available.
- T.-K. Hsu, *CERN n_TOF Database of Maxwellian-Averaged Cross Sections (MACS)*, CERN, 2025. report and online database.

Institute of Physics, Academia Sinica | Taipei, Taiwan — 2024.07–2024.08

- Mentored by Professor Wen-Chen Chang.
- Participated in the design and construction of a fixed-target cosmic-ray detector.
- Built automation programs for data acquisition and monitoring of cosmic rays.
- Project Presentation

Awards

- **Best Maker Prize**, MAKENTU Makerthon Contest, 2024.05
- **Outstanding Academic Achievement Award (Dean's List Award)**, National Taiwan University, 2024.05
- **Outstanding Academic Achievement Award (Dean's List Award)**, National Taiwan University, 2023.10

Academic & Leadership Experience

Teaching Assistant | Classical Mechanics, under Professor Yu-tin Huang 2025.09–2025.12

Research Assistant | Theoretical Physics, under Professor Yu-tin Huang 2025.05–present

Host | MAKENTU Makerthon Contest 2025.05

Head of R&D Department | NTU Learning Optimization Club 2024.02–2024.06

Course Projects

Brief Introduction to Integrability and Thermodynamic Bethe Ansatz
Statistical Physics (II) Fall, 2025

- Introduced quantum integrability using the Lieb–Liniger model of a 1D interacting Bose gas, and then used the thermodynamic Bethe ansatz to study the thermodynamic properties, solving it numerically to explore interaction effects on momentum and energy distributions at finite temperature.

A Brief Introduction to Black Hole Entropy
Advanced Topics in Gravity Spring, 2025

- Introduced two methods for calculating the entropy of Schwarzschild black holes and discussed the concept of microstates.

Anisotropic Transmission of Quantum Information through Quantum Fields
Quantum Information and Computation Spring, 2025

- Studied quantum information transmission, combining the non-perturbative quantum field theory with the Unruh-De Witt model, and tried some approaches to the anisotropic transmission.

A Brief Introduction to the Effective Theory of Binary Inspirals
Special Topics on Effective Field Theory and Scattering Amplitudes Fall, 2024

- Introduced the EFT framework, the hierarchy of scales, and the power counting rules for binary inspirals, and calculated the gravitational potential using Feynman diagrams.

A Brief Introduction to Conformal Bootstrap
Quantum Field Theory (II) Fall, 2024

- First introduced the basic concepts of conformal group, and then explained the algorithm of primary spectrum from the OPE associativity in Euclidean signature.

Languages & Skills

Languages: English (TOEFL iBT 106 : 29/28/22/27), Chinese

Programming: `Mathematica`, `ROOT`, `MadGraph`, `Python`, `C++`, LaTeX.

Relevant Coursework

Basic: Quantum Field Theory (I) & (II) (A+), Classical Mechanics (A+), Electromagnetics (I) & (II) (A+), General Relativity (A), Quantum Mechanics (I), Statistical Physics (II).

Advanced: Special Topics on Effective Field Theory and Scattering Amplitudes (A+), Quantum Information and Computation (A+), Advanced Topics in Gravity (A+), Basics of String Theory: from conformal field theory to supersymmetry (A+), Quantum Fields in Cosmology (A).