Yu-Chao Huang

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EDUCATION

M. Sc. in Physics, National Taiwan University | Taipei, Taiwan **2022 - Present**

B. Sc. in Physics, National Central University | Taoyuan, Taiwan **2018 - 2022**

PUBLICATION | *Equal contribution

- **Yu-Chao Huang***, …, Han Liu. BiSHop: Bi-Directional Cellular Learning for Tabular Data with Generalized Sparse Modern Hopfield Model. International Conference on Machine Learning (ICML) 2024. [link]
- **Yu-Chao Huang***, …, Yun-Nung Chen. Two Tales of Persona in LLMs: A Survey of Role-Playing and Personalization, arXiv. [link]

HONORS & AWARDS

- Academic Excellence Award (Top 5%) [2018, 2019]
- DeChen Culture and Arts Foundation Scholarship (80,000 TWD ≈ 2,500 USD) [2021]
- Hui-Jung Welfare and Charity Foundation Elite Student Award (100,000 TWD ≈ 3,000 USD) [2020]

RESEARCH EXPERIENCE

Research Internship with Prof. Han Liu

Northwestern University July 2023 - February 2024

- Proposed the **Bi**-Directional **S**parse Modern **Hop**field Model (**BiSHop**), a novel framework utilizing the generalized sparse Hopfield model and bi-directional learning modules, aiming to address the current challenges in deep learning models for tabular data learning. Empirically demonstrated that BiSHop outperforms current SOTA methods on real-world datasets.

Graduate Research with Prof. Hsi-Sheng Goan

Quantum Computation Lab, National Taiwan University 2022 - Present

- Introduced the L2O-$g^{\dagger}$ framework, a novel approach that integrates a meta-optimizer with the Fubini-Study metric to address the Variational Quantum Algorithms (VQA) problem. Theoretical analysis establishes an upper bound, while experimental results demonstrate faster convergence and superior performance compared to state-of-the-art methods.
- Investigated the phase transition and magnetization susceptibility properties of the transverse Ising model in a longitudinal magnetic field by employing the variational quantum circuit implemented with Qiskit.
- Obtained comparable results to classical CNN using hybrid quantum-classical CNN for pneumonia detection.
- Created a personal website using HTML/CSS and JavaScript to showcase project results and visualize many common physics phenomena.

Undergraduate Research with Prof. Shih-Hung Chen

Plasma Theory & Simulation Lab, National Central University 2019 - 2022

- Developed a highly parallelized Fortran program with MPI and OpenMP for numerically simulating the mesoscopic scale of strongly coupled plasma-laser interaction.
- Incorporated molecular dynamics simulation with particle-in-cell simulation to understand and improve the conversion efficiency of EUV light generation through laser-produced plasmas process.
- Explored the behavior of electromagnetic waves in various dielectric mediums using the finite-difference time-domain (FDTD) method with Fortran. Analyzed and visualized various three-dimensional physical quantities in Python.
- Built a Beowulf cluster from scratch using eight old PCs to act as a testing platform before being employed in a larger cluster.

PRESENTATIONS

1. Yu-Chao Huang (October 2023), *BDSHop: Bi-Directional Cellular Learning for Tabular Data with Generalized Sparse Modern Hopfield Model*. AI x Natural Science Journal Club. (Invited oral presentation)
2. Yu-Chao Huang, Mao-Syun Wang, Shih-Hung Chen (January 2022), *Modeling mesoscopic light-matter interaction using MicPIC method,* Annual Meeting of the Physical Society of Taiwan 2022.
3. Yu-Chao Huang, Shih-Hung Chen, Peilong Chen (January 2021), *Coupled Oscillations in Plant Shoots,* Annual Meeting of the Physical Society of Taiwan 2021.

TEACHING EXPERIENCE

Teaching Assistant, National Taiwan University 2022 Spring, Fall; 2023 Fall

Course: General Physics, Introduction to Quantum Computation and Information

Responsibilities: Office hours, project instructor, and grading.

Teaching Assistant, National Central University 2021 Spring, Fall

Course: General Physics Laboratory, General Physics

Responsibilities: Prepared lectures, supervised 40 students in 3-hour laboratory sessions, and grading.

Teaching Assistant, National Central University 2020 Fall

Course: Introduction to Python Programming and its Application

Responsibilities: Taught multiple lectures on numerical simulation methods, project instructor, and developed assignments and exam questions.

PROFESSIONAL ASSOCIATIONS

Taiwan Physics Students Association (TPSA), 3rd Executive Committee & Treasurer 2023 - Present

- Organized student night events during the Annual Meeting of the Physical Society of Taiwan, uniting physics majors from various universities across Taiwan.
- Promote physics to the general public and strive to enhance Taiwan's global role in the field of physics.

American Physical Society (APS), Graduate Student Member 2023 - Present