**Curriculum Vitae for Jian-Zhai Zhang, Francis**

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Jian-Zhai Zhang (Francis) was born in Miaoli, Taiwan, in 2004. He earned his Bachelor of Science degree in Engineering and System Science from National Tsing Hua University (NTHU), Hsinchu, Taiwan, in 2026. From December 2024 to May 2027, he undertook an undergraduate research internship at Data Analysis and Interpretation Laboratory under the supervision and advise of Professor Shun-Chi Wu. His research focused on the development of AI-assisted tools for materials computation and design, atomic-scale particle tracking, and atomic-scale image structural reconstruction, etc. In addition, he founded an independent co-research group related to AI with his peers, dedicated to exploring neural operators and their applications in solving the phonon Boltzmann Transport Equation and electrocardiogram-based disease diagnosis, etc. His academic interests include machine learning, deep learning, inverse design, particle swarm optimization, filter design, and signal as well as image processing.

**Education.**

2022.09-2026.06 B.S. degrees of Engineering and System Science, National Tsing Hua University, Taiwan.

**Research Publication.**

1. Automated Recognition of Atomic-Scale Tracking via A Kalman Based Network and Hungarian Algorithm.
2. Physics-Guided Recursive MUSIC-Kalman Nets for Dynamic 3D Atom Probe Tomography.

**Research Project.**

1. A Bayesian Machine for Relaxed Energy Prediction on Metal-Oxide Catalysts for CO2 reduction.
2. Graph Neural Networks Meets Bird Swarm Algorithm: A Transformative Approach to Computational Electrocatalyst Discovery and Optimization.
3. E2Nebula: A Physics-Equivariant Framework for Generalizable Machine Learning Interatomic Potentials.
4. Unveiling Magnetic Order in 2D Materials via AI-Assisted Exploration of the C2DB.
5. Next-Generation Small Modular Pressurized Water Reactors for Sustainable Nuclear Energy.

**Skill.**

Programming language: Python (major), C ML library: PyTorch, TensorFlow, AtomAI, sklearn

Data analysis: MATLAB, R, NumPy, SciPy, Pandas Data visualization: MATLAB, Matplotlib, Seaborn

Computer aided design: HSPICE and Virtuoso Research tools: LaTeX, Photoshop

Optimized algorithm: Genetic algorithm, Particle swarm algorithm, etc.

Machine learning: Anomaly detection, Bayesian network, Decision tree, Feature learning, Support vector machine, etc.

Deep learning: CNN, DNN, GNN, LSTM, LLMs, RNN, VAE, Transforms, Fine-tune, etc.

Time-frequency analysis: Fourier transform, Hilbert transform, Laplace transform, Wavelet transform, Filter design