(Louie) Hong Yao

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EDUCATION

Virginia Tech — **Blacksburg, VA, USA**
Ph.D. in Physics — *Aug. 2018 – May 2023*
Advisor: Prof. Uwe C. Täuber

Nankai University — **Tianjin, China**
B.Sc. in Physics — *Sept.2014 - Jun. 2018*

PROFESSIONAL EXPERIENCE

The Cincinnati Insurance Company — **Cincinnati, OH, USA**
Predictive Modeling Analyst — *Jul. 2023 – Present*

- Led a collaborative research project with Ohio State University leveraging language modeling for homeowner pricing: applied direct preference optimization (DPO) to rank zip-code–level risk, and used LLM-based summarization and embedding of demographic, social media (Reddit), and crime data for territory-level risk tiering.
- Led development of an Azure-hosted GPT-based assistant using retrieval-augmented generation (RAG), enabling underwriters to query predictive models, documentation, and risk factors via natural language in collaboration with IT stakeholders.
- Improved territory factor modeling by introducing graph-based smoothing and clustering methods inspired by Graph Neural Networks, integrating spatial, locational, and demographic information to enhance stability and interpretability.
- Designed and deployed a predictive model to identify policies requiring inspection, incorporating expert risk assessments and adapting to evolving risk profiles; contributed approximately $1M in annual premium uplift.
- Conducted large-scale feature analysis across 1,000+ candidate variables to identify robust predictors for homeowner rating and underwriting models under regulatory and business constraints.

The Cincinnati Insurance Company — **Cincinnati, OH, USA**
Predictive Modeling Intern — *May 2022 – Jul. 2022*

- Developed machine learning models to predict territory factors for homeowner insurance pricing, supporting actuarial rate development and model validation workflows.

PUBLICATIONS

Artificial Intelligence & Machine Learning

- **L. H. Yao**, N. Jarvis, T. Jiang, *"Towards Robust Evaluation of Visual Activity Recognition: Resolving Verb Ambiguity with Sense Clustering'*, *Findings of the Association for Computational Linguistics: EACL 2026*.
- **L. H. Yao**, N. Jarvis, T. Zhan, S. Ghosh, L. Liu, T. Jiang, *"JE-IRT: A Geometric Lens on LLM Abilities through Joint Embedding Item Response Theory"*. [arXiv:2509.22888]

Quantum Information & Computation

- S. Wald, **L. H. Yao**, T. Platini, C. Hooley, F. Carollo, *"Stochastic Resetting in Discrete-time Quantum Dynamics: Steady States and Correlations in Few-qubit Systems"*, *Quantum* 9 (2025): 1742.
- **L. H. Yao**, *"Digital Quantum Simulation of Reaction–Diffusion Systems on Lattices"*, *Eur. Phys. J. B* 98 (2025).
- **L. H. Yao**, S. Wald, *"Coined Quantum Walks on the Line: Disorder, Entanglement and Localization"*, *Phys. Rev. E* 108 (2023).

Statistical Physics & Complex Systems

- **L. H. Yao**, M. Swailem, U. Dobramysl, U. C. Täuber, *"Perturbative Field-Theoretical Analysis of Three-Species Cyclic Predator–Prey Models"*, *J. Phys. A: Math. Theor.* 56 (2023).
- **L. H. Yao**, U. C. Täuber, *"Critical Dynamics of the Antiferromagnetic $O(3)$ Nonlinear Sigma Model with Conserved Magnetization"*, *Phys. Rev. E* 105 (2022).
- R. I. Mukhamadiarov, S. Deng, S. R. Serrao, R. Nandi, **L. H. Yao**, U. C. Täuber, *"Social Distancing and Epidemic Resurgence in Agent-Based Susceptible–Infectious–Recovered Models"*, *Scientific Reports* 11 (2021).

PROJECTS

Easy21 *Github repo:Easy21-Game-RL*
I developed the game Easy21 as specified in David Silver's Reinforcement Learning Course final project. I trained tabular Monte Carlo and Temporal-Difference (TD) agents and implemented a Sarsa(λ) agent with linear function approximation to explore various reinforcement learning strategies.

QHack 2024: Quantum Convolutional Neural Network for Phase Identification *Github repo:QCNN-Phases*
We developed and trained quantum convolutional neural networks (QCNNs) for phase identification using a GPU-accelerated simulator and evaluated their robustness on IonQ's device through AWS Bracket.
NanoGPT *Github repo:NanoGPT*
I developed and trained a nano GPT model (11M parameters) from scratch, featuring a decoder-only architecture with 6 causal multi-head self-attention blocks and a 2-layer linear language model head, using a custom Byte Pairing tokenizer trained on Shakespeare and a language model trained on Ernest Hemingway's works.

AWARDS AND ACHIEVEMENTS

- **QHack 2024:** Third Place in the "A Matter of Taste" Challenge; **Amazon Braket Prize (Top 3)** PennyLane Highlights
- Tipsword Graduate Scholarship (2021); Clayton Williams Graduate Fellowship (2022), Virginia Tech
- Nankai Gong Neng Scholarship (2015–2018), Nankai University

CERTIFICATIONS

- IBM Certified Associate Developer — Quantum Computation using Qiskit

TALKS

- *Recovering Classical Langevin Dynamics by Coupling the System to Quantum Noise*, APS March Meeting 2021
- *Critical Dynamics of the Antiferromagnetic $O(3)$ Nonlinear Sigma Model with Conserved Total Magnetization*, APS March Meeting 2022
- *Critical Dynamics of the Antiferromagnetic $O(3)$ Nonlinear Sigma Model with Conserved Total Magnetization*, Virginia Tech Condensed Matter Seminar, Dec. 2022
- *Perturbative Field-Theoretical Analysis of Three-Species Cyclic Predator-Prey Models*, APS March Meeting 2023

JOURNAL REFEREE

- Physical Review A (PRA)
- Physical Review E (PRE)
- Europhysics Letters (EPL)
- Advanced Quantum Technology
- International Journal of Modern Physics B

TEACHING EXPERIENCE

Virginia Tech **Blacksburg, Virginia, USA**
Teaching Assistant
Introductory Physics Lab (2305/2306): Fall 2018, Spring 2019, Spring 2020
Math Method in Physics (2504): Fall 2019
Modern Classical Physics (4984/5984): Fall 2020
Graduate Statistical Mechanics (5705): Spring 2021, Spring 2023
Intro Quantum Mechanics (4455&4456): Spring&Fall 2022

SKILLS

Programming	Python: Scikit Learn, NetworkX, Qiskit, PennyLane, Torch, Huggingface Transformers SQL, Mathematica, C/C++, R, Snowflake
Language	English (Fluent), Mandarin (Native)