Yiwen Zhang

Pasadena, CA | yiwenz@alumni.caltech.edu | (847) 542-4854 | linkedin.com/in/yiwen-zhang-8087135b

Education

California Institute of Technology, Ph.D. in Physics, M.S.'23, GPA: 4.3/4.3 Sept. 2019 – June 2025

- **PhD Thesis:** Quantum Gravity and Laser Interferometry: Towards Observable Predictions

University of Wisconsin–Madison, B.S. in Applied Math, Physics, and Engineering, GPA: 3.97/4.0 Sept. 2015 – May 2019

- **Senior Honors Thesis:** The Anomalous Hall Effect and Giant Magnetoresistance of Mn_3GaN

Work Experience

Natural Scientist, Caltech – Pasadena, CA Aug. 2025 – Present

- Investigating **reinforcement learning algorithms** for **robotic navigation**, with an emphasis on improving navigation accuracy and efficiency.
- Developing and evaluating RL models in **Python (PyTorch)** through simulation-based experiments, emphasizing reproducibility and performance benchmarking.
- Extending reinforcement learning techniques to problems in **mathematical finance**, formulating portfolio optimization strategies under uncertainty and analyzing their theoretical properties.
- Exploring advanced **deep learning architectures** (e.g., LSTMs) and **hyperparameter search methods** (e.g., Bayesian optimization) to investigate how RL and neural networks can be applied to model and predict complex financial markets.

Quantitative Researcher, Goldman Sachs – New York, NY June 2025 – Aug. 2025

- **Improved** an **FX portfolio risk decomposition model**, achieving **40% faster runtime**, simplifying model complexity, and reducing the error rate to **zero**.
- **Designed** and **implemented** a **muni-bond structuring optimization framework**, successfully meeting complex objectives and constraints to support financing strategies.

Research Experiences

PhD Researcher, Caltech – Pasadena, CA Sept. 2019 – June 2025

- **Developed** and **validated stochastic process models** to study complex systems, applying rigorous mathematical analysis and simulation techniques to extract signals from noisy environments.
- Built and executed **large-scale numerical simulations** to evaluate model predictions, demonstrating that small signals could be detected above background noise by two orders of magnitude.
- Applied **probability theory and Brownian motion methods** to derive analytical models and connect theoretical predictions with observable consequences.
- Designed quantitative models integrating **stochastic modeling and statistical inference**, assessing detectability of weak signals in real-world measurement systems.
- Led and managed **multiple research projects**, producing peer-reviewed publications and securing competitive research funding.
- Communicated complex theoretical concepts to **interdisciplinary teams**, fostering collaboration and making sophisticated ideas accessible.

Skills

Core Skills
Mathematical Modeling • Probability Theory • Stochastic Processes • Applied Mathematics • Statistical Modeling • Deep Learning & Neural Networks • Reinforcement Learning • Optimization & Control Theory • Problem Solving & Data Science

Technical Skills

- **Programming & ML Frameworks:** Python • PyTorch
- **Data Science Stack:** Numpy • Pandas • Scikit-learn • Matplotlib
- **Optimization Libraries:** CVXPY • Scipy
- **Other Tools:** Microsoft Excel/Word/PowerPoint • Mathematica • LaTeX

Publications (Authors in alphabetical order)

Stochastic description of near-horizon fluctuations in Rindler-AdS Sept. 2023
Y. Zhang (**Lead Author**) and K.M. Zurek. *Physical Review D: 108.066002*

Quantum gravity background in next-generation gravitational wave detectors Sept. 2023
M.W. Bub, Y. Chen, Y. Du, D. Li, ***Y. Zhang***, and K.M. Zurek. *Physical Review D: 108.064038*

Rindler fluids from gravitational shockwaves Mar. 2024
S-E. Bak, C. Keeler, ***Y. Zhang*** (**Major Contribution**), and K.M. Zurek. *JHEP: 10.1007/JHEP05(2024)331*

The quantum mechanics of a spherically symmetric causal diamond in Minkowski spacetime Aug. 2024
M.W. Bub, T. He, P. Mitra, ***Y. Zhang*** (**Major Contribution**), and K.M. Zurek. *Submitted to Phy. Rev. Letters*