Jinbo Zhang

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Education

University of California, Irvine Sep. 2023 - June 2027 (Expected)
Bachelor of Science in Physics; GPA: 3.83 *Irvine, CA*

Relevant Coursework:

- Quantum Mechanics I, II
- Electromagnetic Theory I, II
- Classical Mechanics
- Graduate Quantum Field Theory
- Graduate Quantum Mechanics
- Graduate Machine Learning and Statistics
- Graduate Group Theory
- Graduate Elementary Particle Physics

Research Experience

Caltech SURF in Muon-Beam Dark Matter Searches July 2026 - Sep. 2026
Advisor: Prof. Bertrand Echenard, California Institute of Technology

- Implemented a detailed Geant4 simulation of a 40-layer LYSO crystal active target for an LDMX-like muon-beam missing-momentum dark matter search, with per-crystal energy deposition readout.
- Developed signal selection criteria for muon missing-momentum signatures and simulated key backgrounds including muon bremsstrahlung with photonuclear interactions and hard muon–nucleus scattering.
- Produced background rejection vs. signal efficiency curves by scanning active-target veto thresholds and track-consistency metrics, providing optimized working points for the detector design.

Research on the Future Circular Collider (FCC-ee) Jan. 2026 - Present
Advisor: Prof. Christoph Paus, Massachusetts Institute of Technology

- Contributed to the feasibility studies for the proposed Future Circular Collider (FCC-ee), specifically analyzing the physics potential for high-precision electroweak measurements beyond LHC capabilities.
- Investigated the detector sensitivity for key observables, such as the Z boson mass and width and the Higgs boson invisible width, using Monte Carlo simulations to optimize experimental design parameters.

Time-Dependent Signals of New Physics at the LHC May 2025 - April 2026
Advisor: Prof. Daniel Whiteson, University of California, Irvine

- Spearheading the development of a novel time-dependent search strategy for Dark Matter signals at the LHC, utilizing the time delay of heavy long-lived particles.
- Implemented the CATHODE method (Classifying Anomalies THrough Outer Density Estimation) to perform "Sideband-in-Time" background estimation, effectively decorrelating invariant mass and arrival time.
- Generated extensive Monte Carlo simulations using MadGraph5 and Pythia8, coupled with Delphes for detector response modeling.
- Demonstrated that the time-sideband strategy significantly enhances sensitivity to delayed signals compared to traditional resonance searches.

Photometric Analysis of High-Redshift Galaxy Evolution Dec. 2024 - Sep. 2025
Advisor: Prof. Asantha Cooray, University of California, Irvine

- Analyzed photometric data from Spitzer and ALMA telescopes to investigate the redshift distribution and physical properties of Herschel-selected ultra-red dusty star-forming galaxies.
- Developed automated pipelines in Python and CARTA to visualize spectral energy distributions (SEDs) and interpret high-redshift signals.

Nanophotonic Fabrication of Epsilon-Near-Zero Materials Feb. 2024 - Sep. 2025
Advisor: Prof. Howard Lee, University of California, Irvine

- Fabricated gate-tunable 2D Indium Tin Oxide (ITO) films using liquid metal printing techniques for Epsilon-Near-Zero (ENZ) applications.
- Characterized optical nonlinearity and tunability of metasurfaces, contributing to the development of next-generation nanophotonic devices.

Publications & Presentations

SELECTED PAPERS

- Euclid Collaboration: X. Xu, R. Chen, T. Li, A. R. Cooray, ..., **J. Zhang**, et al. "Euclid Quick Data Release (Q1). AgileLens: A scalable CNN-based pipeline for strong gravitational lens identification." *arXiv:2604.06648* (2026).
- Christopher M. Gonzalez, Yu-Hsun Chen, Christopher Effarah, **Jinbo Zhang**, Aleksei Anopchenko, Yalun Tang, Kenji Nomura, and Ho Wai (Howard) Lee. "Gate-tunable two-dimensional ITO epsilon-near-zero materials fabricated by liquid metal printing." *Proc. SPIE PC13579*, PC135791B (2025).
- Ho Wai (Howard) Lee, Quynh Dang, David Dang, Aleksei Anopchenko, Christopher Gonzalez, Stuart Love, Yu-Hsun Chen, Leo Zheng, Meena Salib, **Jinbo Zhang**, et al. "Active and nonlinear epsilon-near-zero photonics." *Proc. SPIE PC13892* (2026).

WORK IN PROGRESS

- Max Fieg, Patrick J. Fox, **Jinbo Zhang**, Aishik Ghosh, Daniel Whiteson. "Time-dependent signals of new physics at the LHC." *In Preparation for PRD* (2026).
- Rouiela Myles Valencia, Guowen Xing, Anagha Subbaraman, **Jinbo Zhang**, Asantha Cooray, Tom Bakx. "The redshift distribution and physical properties of Herschel-selected ultrared dusty, star-forming galaxies with ALMA Band-3 spectral scans." *In Preparation* (2026).
- **Jinbo Zhang**, Jan Eysermans, Sara Aumiller. "Measurement of $H \to WW^*$ in the $q\bar{q}\,\ell\nu\,q\bar{q}'$ final state at the FCC-ee." *In Preparation* (2026).

POSTERS

- **Jinbo Zhang**. "Time-Dependent Signals of New Physics at the LHC." *Poster presented at UCI Undergraduate Research Symposium* (May 2026).
- Yu Hsun Chen, **Jinbo Zhang**, et al. "Liquid Metal Printed 2D ITO for Nanophotonic Applications." *Poster presented at UCI Undergraduate Research Symposium* (May 2025).

Technical Skills

- **Programming & Machine Learning**: Python (PyTorch, TensorFlow, NumPy), PyRoot
- **Physics Software**: MadGraph5, Pythia8, Delphes, Geant4
- **Languages**: English (Professional Proficiency), Chinese (Native)

Teaching Experience

Learning Assistant: Classical Mechanics / Electromagnetism Jan. 2025 - Present

University of California, Irvine

- Facilitated discussion sections and laboratory sessions, guiding students through experimental setups, error analysis, and problem-solving strategies for upper-division physics courses.

Honors and Awards

- Caltech SURF Scholarship 2026 - 8110
- UCI Undergraduate Research Opportunities Program (UROP) Award - 2024, 2025
- Dean's Honor List - All Quarters