Chin-Ching Fan (Castaly Fan)

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Education

2022 – **Ph.D. Candidate, Physics,** University of Florida.
Accumulative GPA: 3.89.

2018 – 2022 **B.S., Physics (Minor: Astronomy),** Rutgers University.
Departmental Honors in Physics, Sep 2021.

Awards and Honors

Oct 2025 **URA Visiting Scholar Program Award,** Universities Research Association.

- Project: University of Florida SBND ν_e Cross Section Analysis and PDS Calibration Effort.
- Granted $4,945 to support research at Fermilab. Upcoming on-site work is planned for Spring 2026.

Apr 2024 **URA Visiting Scholar Program Award,** Universities Research Association.

- Project: University of Florida SBND PDS and Machine Learning Effort.
- Granted $8,000 to support research at Fermilab. LED calibration device for PMT timing calibration at SBND was installed and done with the first test successfully.

Mar 2024 **IHEPA Fellowship,** Institute of High Energy Physics and Astrophysics, University of Florida.

- Received $15,000+ to facilitate research at Fermilab in Summer 2024.

Sep 2021 **Departmental Honors in Physics,** Rutgers University.

- Recognized for outstanding academic performance in physics.

Research Experiences

Sep 2023 – Present **SBND (Short-Baseline Near Detector) Experiment,** University of Florida.

- **Mentor:** *Dr. Heather Ray*, University of Florida
- Analyzing SBND ν_e selection, shower energy reconstruction, and TPC gain calibration using the SPINE (Scalable Particle Imaging with Neural Embeddings) framework developed at SLAC National Accelerator Laboratory.
- Constructing and commissioning the LED calibration system for SBND's photon detection system (PMT timing and gain calibration).

Research Experiences (continued)

Mar 2023 – Aug 2023

Research for the Magnetoelectric Effects, University of Florida.

- **Mentor:** *Dr. Neil Sullivan*, University of Florida
- Investigated magnetoelectric effects in single-molecule magnets.
- Designed a tunnel diode oscillator (TDO) detector immersed in superfluid helium and achieved ultra-high operating frequency (216 MHz) with excellent stability (standard deviation 300 Hz).

Sep 2020 – Sep 2021

Quantum Mechanics with Matrices, Rutgers University.

- **Mentor:** *Dr. Larry Zamick*, Rutgers University
- Identified a new quantum number arising from symmetric patterns and odd-even staggering regularities in wavefunctions computed from an 11×11 pentadiagonal matrix under strong coupling.
- Calculated transition rates using Mathematica to analyze emergent spectral behavior.

Jun 2020 – Aug 2020

Research Internship, Institute of Physics, Academia Sinica.

- **Mentor:** *Dr. Shih-Chang Lee*, High Energy Theory Group at IoP
- Conducted literature review on black hole physics, cosmology, and condensed matter theory.
- Studied and reported on the Beryllium-8 (^{8}Be) anomaly, covering both experimental setup and theoretical implications.

Employment History

Aug 2022 – Present

Instructor (Teaching Assistant), Department of Physics, University of Florida.

- Constructed laboratory lectures for introductory physics courses, motivated student engagement in classical mechanics, and assigned grades for lab reports.

Jan 2020 – May 2022

Research Administrator, Theoretical Condensed Matter Group, Rutgers University.

- Assisted Prof. Gabriel Kotliar in compiling quantum field theory lecture notes using LaTeX, prepared research proposals, supervised reports to the Department of Energy, and managed citation databases for CVs and publications.

Research Publications

Journal Articles

1. SBND Collaboration, "The short-baseline near detector at fermilab: Input to the european strategy for particle physics 2026 update," 2025. arXiv: `2504.00245 [physics.ins-det]`.
2. SBND Collaboration, "Scintillation light in sbnd: Simulation, reconstruction, and expected performance of the photon detection system," *European Physical Journal C*, vol. 84, Article 1046, 2024.

3. D. S. Fosso, L. Zamick, and C. Fan, "Comparisons of matrices with different elements but identical eigenvalues," *International Journal of Modern Physics E*, vol. 32, p. 2 350 019, 2023.
4. C. Fan and L. Zamick, "Matrix model: Emergence of a quantum number in the strong coupling regime," *International Journal of Modern Physics E*, vol. 30, no. 07, p. 2 150 059, 2021.
5. S. Robinson, C. Fan, M. Harper, and L. Zamick, "On the vibrational model of 92pd and comparison with 48cr," *International Journal of Modern Physics E*, vol. 30, no. 06, 2021.

Books and Selected Articles

1. L. Zamick and C. Fan, "Magnetic moments with akito arima," in *Akito Arima: Scientist, Educator, and Poet*, Y.-M. Zhao, D. H. Feng, and R. F. Casten, Eds., Shanghai Jiao Tong University Press, 2021, pp. 98–102, ISBN: 978-7-313-25597-6.
2. C. Fan, "Physics, technology, and future of humans," in *VO1SS Journal*, Sep. 2019.

Relevant Associations

2024 – Present
Visitor, Fermilab.
SBND Experiment.

2023 – Present
Columnist, PanSci.
Scriptwriter/columnist focusing on quantum computing and black hole physics topics.
Author page: `https://pansci.asia/archives/author/castaly-fan`

Columnist, The News Lens (TNL).
Contracted writer for physics-related articles.
Author page: `https://www.thenewslens.com/author/castaly`

2016 – Present
Project Participant, Wikipedia (Wikimedia Foundation).
Created and edited pages on high energy physics, mathematical physics, and astrophysics.

Expertises

Programming Languages	Python, C++ (ROOT framework).
Technologies	Machine Learning (Deep Learning), Quantum Computing.
Analytical/Computational Frameworks	Mathematica, MATLAB, OriginLab, Digitizer.
Document Compiling	LaTeX, Microsoft Office.
Languages	English (Fluent), Chinese (Native), French (Elementary).