WEI-NING DENG

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Education

PhD in Theoretical Physics *Sep 2022 – Present*
University of Cambridge, Cambridge, UK

- **Supervisors:** Dr. Will Handley and Dr. Latham Boyle
- **Thesis:** *The CPT-Symmetric Universe and Bayesian Model Comparison*

M.Sc. Physics *Sep 2020 – Jun 2022*
National Taiwan University (NTU), Taipei, Taiwan

- **Supervisor:** Prof. Eugene Lim (King's College London / NTU)
- **Thesis:** *Relativistic Vortices and Numerical Relativity*

B.S. Physics, Minor in Mathematics *Sep 2016 – Jun 2020*
National Taiwan University (NTU), Taipei, Taiwan

- **Related Courses:** Cosmology (A+), Computational Astrophysics (A), General Relativity, Galaxy Formation and Evolution, AI & Machine-Learning (A)
- **Programming Skills:** Python (sklearn, pandas), C++ (parallel computing), Matlab, AWS, Github, Docker

Publications

1. *CPT*-**Symmetric Kähler-Dirac Fermions**, Latham Boyle and **Wei-Ning Deng**, (2025) arXiv:2511.11548 (Submitted to *Physical Review Letter*).
2. **CMB Constraints on Quantized Spatial Curvature Ω_K in Globally *CPT*-Symmetric Universes**, **Wei-Ning Deng** and Will Handley, (2025) arXiv:2509.10379 (Accepted by *Physical Review D*).
3. **Predicting spatial curvature Ω_K in globally *CPT*-symmetric universes**, **Wei-Ning Deng** and Will Handley, *Physical Review D* 110, 103528 (2024).
4. **Spectral energy distributions of dust and PAHs based on the evolution of grain size distribution in galaxies**
Hiroyuki Hirashita, **Wei-Ning Deng**, Maria S. Murga, *MNRAS* 499, 3046-3060 (2020).

Research Experience

***CPT*-Symmetric Universe Framework** *Oct 2024 – Present*
University of Cambridge

- **Advisor:** Dr. Latham Boyle (Perimeter Institute, Higgs Centre for Theoretical Physics).
- Investigated the physical property of Kähler-Dirac fermions, and understood its implication for the new cosmological model: *CPT*-symmetric universe.

Cosmological Model Building and Bayesian Inference *Sep 2022 – Present*
University of Cambridge (Supervisor: Dr. Will Handley)

- Theoretically predicted spatial curvature values in periodic universes and compared these predictions against Planck Satellite observation data via Bayesian analysis.
- **Key Skills:** Nested Sampling, Parameter Estimation, Model Selection, High-Performance Computing (HPC), and AI-integrated workflow optimization.

Numerical Relativity & Relativistic Vortices *Apr 2021 – Jun 2022*
King's College London / NTU (Supervisor: Prof. Eugene Lim)

- Conducted analytical calculations on relativistic vortices and understand its interaction with a black hole via GRChombo (Numerical Relativity code).

Astrophysical Simulations (Fuzzy Dark Matter) *Sep 2020 – Jun 2021*
National Taiwan University (Supervisor: Prof. Hsi-Yu Schive)

- Investigated Globular Cluster formation in Fuzzy Dark Matter scenarios using hydrodynamics zoom-in simulations (GAMER and GIZMO codes).

Undergraduate research in Black Holes *Sep 2019 – Feb 2020*
National Taiwan University (Supervisor: Prof. Pisin Chen)

- Analog black holes with an electron flying mirrors in plasma.
- Modified the acceleration model of a flying mirror using the EPOCH particle-in-cell code.

Summer student in Astrophysics *Jul 2019 – Aug 2019*
Academia Sinica Institute of Astronomy and Astrophysics (Supervisor: Dr. Hiroyuki Hirashita)

- Analyzing results from a dust evolution code and comparing with observations.
- Led to the publication: Hirashita, Deng, and Murga 2020.

Summer student in Galaxy Observation *Jul 2019 – Aug 2019*
The Submillimeter Array (SMA) Observation Group

- Observed NGC6822 using SMA to understand early galaxy formation.
- Contributed to setting up the observation application, calibrating, and analyzing the data.

Awards and Scholarships

- **Best Poster Prize (2024 & 2025):** Awarded for two consecutive years at CosmoVerse, a major European cosmology conference (Poland 2024, Turkey 2025).
- **Cambridge-Taiwan Scholarship (2022–2026):** Full government fellowship covering tuition and stipend for doctoral studies. Around £ 63,000 in total.
- **Yushan Talent Cultivation Scholarship (2021):** Competitive national grant supporting excellence in Master's research. £ 5,000
- **Yulin-NTU Talent Cultivation Scholarship (2020):** overseas research. £ 7,500

Selected Talks & Poster

- **Talk: Quantizing the Kähler-Dirac field: A theoretical explanation for Tenet?!**, Cambridge-LMU Cosmology Meeting, Munich, Germany Sep 2025
- **Poster: Theoretical Prediction of Curvature Ω_K in Periodic Universes**, Cosmological Frontiers in Fundamental Physics, Paris, France June 2025
- **Talk: Predicting Spatial Curvature Ω_K in Globally CPT-Symmetric Universes**, APS Joint March/April Meeting, Anaheim, California, USA March 2025

Teaching Experience

- Supervise Part II Physics: General relativity (total 31 students) *Oct 2022 - Present*
- Supervise Part II Physics: Introduction to Cosmology (12 students) *Oct 2024 - Present*
- **Distinction:** Received exceptional feedback in evaluation reports, with students explicitly citing me as one of the most effective supervisors they encountered during their degree.

Outreach & Leadership

- **Junyi Academy (Taiwan's largest online education platform):** Produced physics videos for high school students; has been viewed by over 10,000 students to date.
- **Science Communication:** Creator/Host of "H-bar Talk Science", a YouTube channel explaining science to the general public.

Technical & Industry Experience

- AI & Machine Learning Engineer (Intern) in Trend Micro, Taipei, Taiwan (Summer 2020): Optimized a phishing email detection model using Natural Language Processing (NLP).
- R&D Intern (Machine Learning) in Quanta Computer, Taipei, Taiwan (Winter 2020): Developed an internal recommendation system to assist managers in resume screening.