

# Yen-Hsun Lin, PhD | Curriculum Vitæ

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## SUMMARY

I am an astroparticle phenomenologist specializing in multimessenger astronomy and dark matter detection. My research focuses on topics such as supernova neutrino-boosted dark matter and the effects of self-interacting dark matter on compact stars, the Sun, and Earth. I work with members of DUNE/COHERENT to reduce systematic uncertainties in DUNE-like detectors. I was also in the JUNO collaboration, with the role of estimating its sensitivity to Solar captured dark matter. With a background in astroparticle physics and extensive research experience, I have developed a deep understanding of dark matter studies and their applications.

## RESEARCH TOPIC

Astroparticle physics, dark matter physics in compact stars and supernovæ, nuclear astrophysics, scientific computations (parallel and GPU computing), Bayesian inference and Monte Carlo simulations

## EDUCATION

### National Chiao Tung University

*PhD of the Institute of Physics*

**Advisor:** Prof. Lin, Guey-Lin

**Thesis:** *Indirect detection of dark matter through neutrinos*

**Hsinchu, Taiwan**

*Aug. 2011 - Jul. 2016*

### National Chiao Tung University

*MS of the Institute of Physics (Direct to PhD program)*

**Advisor:** Prof. Lin, Guey-Lin

**Hsinchu, Taiwan**

*Aug. 2010 - Jul. 2011*

### National Chiao Tung University

*BS of the Department of Electrophysics*

**Hsinchu, Taiwan**

*Aug. 2006 - Jul. 2010*

## WORKING EXPERIENCE

### Institute of Physics, Academia Sinica

*Postdoctoral Scholar*

**Host:** Dr. Wu, Meng-Ru

**Taipei, Taiwan**

*Aug. 2023 - present*

### School of Physics, Melbourne University

*Visiting Scholar*

**Host:** Prof. Bell, Nicole

**Melbourne, Australia**

*Oct. 2023 - Nov. 2023*

### Physics Division, National Center for Theoretical Sciences

*Postdoctoral Scholar*

Independent position with travel funding

**Taipei, Taiwan**

*Dec. 2021 - Jul. 2023*

**Institute of Physics, Academia Sinica**

*Distinguished Postdoctoral Scholar*

Independent position with grant

**Host:** Dr. Wu, Meng-Ru

**Taipei, Taiwan**

*Aug. 2019 - Dec. 2021*

**Department of Physics, National Cheng Kung University**

*Postdoctoral Scholar*

**Host:** Prof. Chen, Chuan-Hung

**Tainan, Taiwan**

*Oct. 2017 - Jul. 2019*

## HONORS AND AWARDS

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**NCTS Postdoc Paper Award**

*Taiwan, 2024*

- Awarded by the Physics Division, National Center for Theoretical Sciences

**Best Research Paper Award for Junior Research Investigator**

*Taiwan, 2024*

- Awarded by the Institute of Physics, Academia Sinica

**Selected Participant of the 13<sup>th</sup> HOPE Meeting with Nobel Laureates**

*Japan, 2022*

- Representative of Taiwan

**Distinguished Postdoctoral Scholar**

*Taiwan, 2019*

- Independent position with grant, selected by the Academia Sinica

**Annual Best PhD Thesis in Physical Science**

*Taiwan, 2017*

- Best PhD Thesis of the year, awarded by the Taiwan Physical Society

**Selected Honorary Member of the Phi Tau Phi Scholastic Society**

*Taiwan, 2016*

- Issued to the student graduated with top score

## INVITED TALKS AT CONFERENCES AND WORKSHOPS

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**The 3<sup>rd</sup> International Joint Workshop on the Standard Model and Beyond and the 11<sup>th</sup> KIAS Workshop on Particle Physics and Cosmology**

*Jeju, 2023*

- **Title:** Detection of  $\text{SN}\nu$  BDM in current and future large underground detectors
- **Host:** Korea Institute for Advanced Study (KIAS)

**Interplay of Nuclear, Neutrino and BSM Physics at Low-Energies**

*Seattle, 2023*

- **Title:** Searching for afterglow: Light dark matter boosted by supernova neutrinos
- **Host:** Institute for Nuclear Theory (INT 23–85w)

**Supernova Early Warning System (SNEWS) Online Seminar**

*US, 2023*

- **Title:** Searching for afterglow: Light dark matter boosted by supernova neutrinos
- **Host:** SNEWS Institutions (invited by Alec Habig)

**Theory Meeting Experiment: Particle Physics and Cosmology**

*Quy Nhơn, 2023*

- **Title:** Light DM constraints from neutron stars and supernova neutrinos
- **Host:** International Centre for Interdisciplinary Science and Education (19<sup>th</sup> Recontres du Vietnam)

**NCTS Annual Theory Meeting**

*Taipei, 2022*

- **Title:** Light DM constraints from neutron stars and supernova neutrinos
- **Host:** National Center for Theoretical Sciences

**Dark Matter in Compact Objects, Stars, and in Low Energy Experiments**

*Seattle, 2022*

- **Title:** Light dark matter boosted by supernova neutrinos
- **Host:** Institute for Nuclear Theory (INT 22–2b)

### Particle Physics Phenomenology Workshop (PPP 14)

Taipei, 2022

- **Title:** Searching the afterglow from supernova neutrino boosted dark matter
- **Host:** National Center for Theoretical Sciences

### Sydney Consortium for Particle Physics and Cosmology Seminar

Sydney, 2021

- **Title:** Searching light to heavy dark matter by supernova neutrinos and neutron star temperature
- **Host:** University of New South Wales Sydney and University of Sydney (Sydney-CPPC)

### Mini-workshop on Novel Experimental and Astrophysical Probes for Dark Matter

Taipei, 2021

- **Title:** Exploring dark matter with compact stars
- **Host:** Academia Sinica

### NCTS Annual Theory Meeting

Taipei, 2019

- **Title:** Probing the isospin violation of self-interacting dark matter through old neutron stars
- **Host:** National Tsing Hua University

### Particle Physics Phenomenology Workshop (PPP 13)

Taipei, 2019

- **Title:** Probing self-interacting dark matter through neutron stars
- **Host:** National Taiwan Normal University

## COLLABORATION MEMBERSHIP

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### With Members of DUNE/COHERENT Collaborations

US, 2020-present

- Collaborating with Dr. Gianluca Petrillo and Dr. Yun-Tse Tsai from SLAC
- Study the impact on the thermal pinched parameter analysis due to the uncertainty of  $\nu_e$ -Ar cross section
- Data analysis (python)

### Jiangmen Underground Neutrino Observatory (JUNO)

China, 2015-2016

- Co-author of the JUNO Yellow Book (R&D tech notes)
- Sensitivity projection for the solar-captured DM in JUNO

## WORKSHOP ORGANIZATION

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### Mini-workshop on Novel Experimental and Astrophysical Probes for Dark Matter

Taipei, 2021

- Main organizer of the workshop with Dr. Wu, Meng-Ru

## SUPERVISING EXPERIENCE

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### Co-supervisor of Academia Sinica Summer Student Program

AS, 2020-2022

- Co-supervising with Dr. Wu, Meng-Ru
- Tsung-Han Tsai (now an undergraduate at NTHU), work published on *Phys. Rev. D* **108**, 083013 (2023)
- Yong Sheng Yap (now a PhD student at Cambridge U), work on compact star equation of states in terms of neutrons and dark matter
- Wen-Hua Wu (now a PhD student at Rice U), work published on *Phys. Rev. Lett.* **130**, 111002 (2023)

### Co-supervisor of SLAC Summer Student

UTSA/SLAC, 2020-2021

- Co-supervising with Prof. Tanaka, Hirohisa (SLAC) and Dr. Tsai, Yun-Tse (SLAC)
- Adeela Malik (an undergraduate at Texas at San Antonio U), work on beyond Standard Model physics in supernovæ

## Co-supervisor of NYCU Students

NYCU, 2020-2022

- Co-supervising PhD/MS students from NYCU with Prof. Lin, Guey-Lin
- Aiming for beyond Standard Model physics in supernovæ/colliders and numerical support (Python/Mathematica)

## GITHUB REPOSITORY

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### **snorer: Supernova-Neutrino-bOosted daRk mattER**

- **About:** Evaluating the time-of-flight signatures of boosted dark matter due to supernova neutrinos from Milky Way, SN1987a and arbitrary distant galaxy.
- **Role:** Main developer and maintainer
- <https://github.com/yenhhsunlin/snorer>

### **dukes: DiffUse-boosted darK mattEr by Supernova neutrinos**

- **About:** Evaluating the signatures of diffuse boosted dark matter by supernova neutrinos in the early Universe.
- **Role:** Main developer and maintainer
- <https://github.com/yenhhsunlin/dukes>

### **dynesor: DYnamical NEsted Sampling integratOR**

- **About:** MCMC integrator for evaluating multidimensional integration based on dynamical nested sampling.
- **Role:** Main developer and maintainer
- Non-disclose

## PROGRAMMING

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Python/Cython/C++/Mathematica/Matlab

# LIST OF PUBLICATION

Yen-Hsun Lin

*Institute of Physics, Academia Sinica, Taipei*

## 1 Refereed Articles

Dagger ( $\dagger$ ) and asterisk (\*) indicate that I am the *first author* and the *corresponding author*, respectively. Otherwise, the author list is arranged alphabetically.

1. **Y.-H. Lin** $\dagger,^*$  and M.-R. Wu, *Supernova-neutrino-boosted dark matter from all galaxies*, [\*Phys. Rev. Lett.\* \*\*133\*\*, 111004 \(2024\)](#)
2. **Y.-H. Lin** $\dagger,^*$ , T.-H. Tsai, G.-L. Lin, H. T.-K. Wong and M.-R. Wu, *Signatures of afterglows from light dark matter boosted by supernova neutrinos in current and future large underground detectors*, [\*Phys. Rev. D\* \*\*108\*\*, 083013 \(2023\)](#)
3. **Y.-H. Lin** $\dagger,^*$ , W.-H. Wu, M.-R. Wu and H. T.-K. Wong, *Searching for afterglow: Light dark matter boosted by supernova neutrinos*, [\*Phys. Rev. Lett\* \*\*130\*\*, 111002 \(2023\)](#)
4. A. Bauswein, G. Guo, J.-H. Lien, **Y.-H. Lin** and M.-R. Wu, *Compact dark objects in neutron star mergers*, [\*Phys. Rev. D\* \*\*107\*\*, 083002 \(2023\)](#)
5. G.-L. Lin and **Y.-H. Lin** $^*$ , *Exploring dark sector parameters in light of neutron star temperatures*, [\*Phys. Rev. D\* \*\*104\*\*, 063021 \(2021\)](#)
6. G.-L. Lin and **Y.-H. Lin** $^*$ , *Analysis on the black hole formations inside old neutron stars by isospin-violating dark matter with self-interaction*, [\*JCAP\* \*\*08\*\*, 022 \(2020\)](#)
7. C.-S. Chen and **Y.-H. Lin** $^*$ , *Reheating neutron stars with the annihilation of self-interacting dark matter*, [\*JHEP\* \*\*08\*\*, 069 \(2018\)](#)
8. C.-S. Chen and **Y.-H. Lin** $^*$ , *On the evolution process of two-component dark matter in the Sun*, [\*JHEP\* \*\*04\*\*, 074 \(2018\)](#)
9. C.-H. Chen and **Y.-H. Lin**, *Study of  $B_c^\pm \rightarrow (D^0 K^\pm, D^0 \pi^\pm)$  decays*, [arXiv:1710.05531](#)
10. C.-S. Chen, G.-L. Lin, **Y.-H. Lin** and F. Xu, *The 17 MeV anomaly in beryllium decays and U(1) portal to dark matter*, [\*Int. J. Mod. Phys. A\* \*\*32\*\*, 1750178 \(2017\)](#)
11. C.-S. Chen, G.-L. Lin and **Y.-H. Lin**, *Thermal transport of the solar captured dark matter and its impact on the indirect dark matter search*, [\*Phys. Dark Univ.\* \*\*14\*\*, 35 \(2016\)](#)
12. F. An *et al.* [JUNO Collaboration], *Neutrino Physics with JUNO*, [\*J. Phys. G\* \*\*43\*\*, 1 \(2016\)](#)
13. C.-S. Chen, G.-L. Lin and **Y.-H. Lin**, *Complementary test of the dark matter self-interaction by direct and indirect detections*, [\*JCAP\* \*\*01\*\*, 013 \(2016\)](#)
14. Z. Djurcic *et al.* [JUNO Collaboration], *JUNO conceptual design report*, [arXiv:1508.07166](#)

15. G.-L. Lin, **Y.-H. Lin** and F.-F. Lee, *Probing the coupling of heavy dark matter to nucleons by detecting neutrino signature from the Earth core*, *Phys. Rev. D* **91**, 033002 (2015)
16. C.-S. Chen, F.-F. Lee, G.-L. Lin and **Y.-H. Lin**, *Probing dark matter self-interaction in the Sun with IceCube-PINGU*, *JCAP* **10**, 049 (2014)

## 2 Conference Proceedings

1. International Conference on Topics in Astroparticle and Underground Physics, Vienna, Austria 2023  
**Title:** *Searching light dark matter boosted by supernova neutrinos in Super-K, Hyper-K and DUNE*
2. International Conference on High Energy Physics, Bologna, Italy 2022  
**Title:** *Exploring dark sector parameters in light of neutron star temperatures*
3. International Conference on High Energy Physics, Prague, Czech 2020 (Webinar)  
**Title:** *Analysis on the black hole formations inside old neutron stars by isospin-violating dark matter with self-interaction*
4. PyCon TW, Taipei, Taiwan 2019 (Computer vision related)  
**Title:** *The art of inference: Practicing Bayesian reasoning in computer vision problems*
5. European Physical Society Conference on High Energy Physics, Ghent, Belgium 2019  
**Title:** *Probing self-interacting dark matter through neutron stars*
6. International Conference on Neutrino Physics and Astrophysics, Heidelberg, Germany, 2018  
**Title:** *On the evolution process of two-component dark matter in the Sun*
7. International Symposium on Nuclei in the Cosmos, Niigata, Japan 2016  
**Title:** *Thermal transport of the solar captured dark matter and its implication*
8. European Physical Society Conference on High Energy Physics, Vienna, Austria 2015  
**Title:** *Thermal transport of the solar captured dark matter and its implication*
9. International Conference on High Energy Physics, València, Spain 2014  
**Title:** *The dark matter self-interaction and its impact on the critical mass for dark matter evaporations inside the Sun*
10. International Symposium on Particles, Strings and Cosmology, Taipei, Taiwan 2013  
**Title:** *Probing the coupling of heavy dark matter to nucleons by detecting neutrino signature from the Earth core*
11. International Symposium on Cosmology and Particle Astrophysics, Honolulu, Hawaii 2013  
**Title:** *Probing the coupling of heavy dark matter to nucleons by detecting neutrino signature from the Earth core*

### 3 Domestic Seminars and Colloquia

TPS = Taiwan Physical Society.

1. *Colloquium*, Tunghai University, Taichung 2024
2. *Seminar*, National Tsing Hua University, Hsinchu 2024
3. *Seminar*, National Tsing Hua University, Hsinchu 2023
4. *Seminar*, Chung Yuan Christian University, Taoyuan 2023
5. *Seminar*, National Taiwan Normal University, Taipei 2022
6. *Seminar*, National Taiwan University, Taipei 2022
7. *Seminar*, National Taiwan University, Taipei 2021
8. *Seminar*, Chung Yuan Christian University, Taoyuan 2020
9. *Seminar*, National Taiwan Normal University, Taipei 2020
10. *Webinar*, National Tsing Hua University, Hsinchu 2020
11. *Seminar*, National Central University, Taoyuan 2020
12. *Seminar*, National Chiao Tung University, Hsinchu 2020
13. *Annual Meeting TPS*, National Chiao Tung University Hsinchu, 2019
14. *Colloquium*, Tamkang University, New Taipei 2018
15. *Seminar*, National Taiwan Normal University, Taipei 2018
16. *Seminar*, Academia Sinica, Taipei 2018
17. *Seminar*, National Chiao Tung University, Hsinchu 2018
18. *Seminar*, Chung Yuan Christian University, Taoyuan 2017
19. *Annual Meeting TPS*, National Sun Yat-Sen University, Kaohsiung 2016
20. *Annual Meeting TPS*, National Tsing Hua University, Hsinchu 2015