Kai (E.) Yang

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Research Experience

SETI Institute — Mountain View, CA, U.S.
Research Scientist — Sep. 2025–present

The University of Hawai'i at Mānoa — Pukalani, HI, U.S.
Post doctorate at Institute for Astronomy, RCUH — Apr. 2022–Sep. 2025

The University of Sydney — Sydney, NSW, Australia
Post doctorate at Sydney Institute for Astronomy, School of Physics — Mar. 2019–Nov. 2021

Nanjing University — Nanjing, Jiangsu, China
Post doctorate at School of Astronomy and Space Science — Jul. 2018–Feb. 2019

Education

Nanjing University — Nanjing, Jiangsu, China
Ph.D. in Astronomy, School of Astronomy and Space Science — Sep. 2015–Jun. 2018

- Thesis: "Magnetic Field Topology Associated with Solar Eruptive Events and Coronal Heating"

Montana State University — Bozeman, MT, US
Exchanged Ph.D., Physics Department — Jan. 2017–Jan. 2018

Nanjing University — Nanjing, Jiangsu, China
M.S. in Astronomy, School of Astronomy and Space Science — Sep. 2013–Jun. 2015

Jilin University — Changchun, Jilin, China
B.S. in Physics, School of Physics — Sep. 2009–Jun. 2013

Synergistic Activities

- Organize parallel/splinter session of *Solar-Stellar Eruption Analogy: Observations and Models*, on Coolstars 22 Workshop (San Diego, CA, Jun 24–28, 2024), and SHINE Workshop (Stowe, VT, Aug, 7–11, 2023).
- Co-advising/co-advised undergraduate student. NSF Research Experiences for Undergraduates project at the University of Hawaii at Manoa. 2023, Ms. Denise Yudovich. Three undergraduate students at the University of Sydney. Mr. Karl Smith (Dalyell Research Program, 2020), Mr. Zac Enviah and Mr. Matthew Panagopoulos (Special Studies Program, 2021).

- Co-advised two graduate students at the University of Sydney (2019–2024): Dr. Victor M. Demcsak (awarded PhD in 2022), and Dr. James Crowley (awarded PhD in 2024).
- Observed the Sun at Big Bear Solar Observatory for six days in August 2016. Awarded a total of 50 hours from the Canada-France-Hawaii Telescope with SPIRou in 2024B, 2025A, and 2025B semesters. Operate Perkins Telescope at Lowell Observatory, AZ, 2025A and 2025B. DKIST cycle 4 with 120 min observational time.
- Review the Daniel K. Inouye Solar Telescope (DKIST) proposals 2024.
- NSF Astrophysics panel reviewer (2023).
- Referee for peer-review articles for 4 journals, The Astrophysical Journal, The Astronomy and Astrophysics Journal, Research in Astronomy and Astrophysics, Scientific Data.
- Judge, Maui County Regional Science and Engineering Fair 2023, 2024, 2025.
- Local coordinator at University of Sydney for Sydney–Nanjing international exchange program, 2019.

Full Publications

1. **Kai E. Yang**, Michael S. Wheatland, *Winds of Hot Stars with Multipolar Magnetic Fields*, in prep.
2. **Kai E. Yang**, Lucas A. Tarr, Matthias Rempel, S. Curt Dodds, Sarah A. Jaeggli, Peter Sadowski, Thomas A. Schad, Ian Cunnyngham, Jiayi Liu, Yannik Glaser, Xudong Sun, *Spectropolarimetric Inversion in Four Dimensions with Deep Learning (SpIn4D): 2. A Physics-Informed Machine Learning Method for 3D Solar Photosphere Reconstruction*, Astrophys. J. accepted.
3. **Kai E. Yang**, Lucas A. Tarr, Matthias Rempel, S. Curt Dodds, Sarah A. Jaeggli, Peter Sadowski, Thomas A. Schad, Ian Cunnyngham, Jiayi Liu, Yannik Glaser, Xudong Sun, *Spectropolarimetric Inversion in Four Dimensions with Deep Learning (SpIn4D): 1. Overview, Magnetohydrodynamic Modeling, and Stokes Profile Synthesis*, Astrophys. J. 976, 204.
4. **Kai E. Yang**, Xudong Sun, Graham Kerr, Hugh Hudson, *A Possible Mechanism for "Late Phase" in Stellar White-Light Flares*, 2023, Astrophys. J., 959, 54.
5. **Kai E. Yang**, Michael S. Wheatland, and Stuart A. Gilchrist, *Relative Magnetic Helicity Based on a Periodic Potential Field*, 2020, Astrophys. J., 894, 151.
6. **Kai E. Yang**, Dana W. Longcope, M. D. Ding, and Yang Guo, *Observationally Quantified Reconnection Providing a Viable Mechanism for Active Region Coronal Heating*, 2018, Nature Communications, 9, 692.
7. **Kai Yang**, Yang Guo, and M. D. Ding, *Quantifying the Topology and Evolution of a Magnetic Flux Rope Associated with Multi-flare Activities*, 2016, Astrophys. J., 824, 148.
8. **Kai Yang**, Yang Guo, and M. D. Ding, *On the 2012 October 23 Circular Ribbon Flare: Emission Features and Magnetic Topology*, 2015, Astrophys. J., 806, 171.

9. Bryam Yamashiro, Xudong Sun, Ivan Milic, Carlos Quntero Noda, Adur Pastor Yabar, Jiayi Liu, Rebecca Centeno, Milan Gosic, **Kai Yang**, *Refining the Magnetic Field Estimate for the Solar Polar Region*, Astrophys. J., underview.

10. Denise G. Yudovich, **Kai E. Yang**, and Xudong Sun, *Analyzing the Morphology of Late-Phase Stellar Flares From G-type Stars*, Astrophys. J., 894, 186.

11. Vera L. Berger, Jason T. Hinkle, Michael A. Tucker, Benjamin J. Shappee, Jennifer L. van Saders, Daniel Huber, Jeffrey W. Reep, Xudong Sun, **Kai E. Yang**, *Stellar Flares Are Far-Ultraviolet Luminous*, 2024, MNRAS, 532, 4436–4445.

12. James Crowley, Michael S. Wheatland, **Kai Yang**, *Superflare Rate Variability on M Dwarfs*, 2024, MNRAS, 530, 457.

13. Yang Guo, Jinhan Guo, Yiwei Ni, M. D. Ding, P. F. Chen, Chun Xia, Rony Keppens, **Kai E. Yang**, *Data-constrained Magnetohydrodynamic Simulation of an Intermediate Solar Filament Eruption*, 2023, Astrophys. J. 958, 25.

14. Wensi Wang, Jiong Qiu, Rui Liu, Chunming Zhu, **Kai E. Yang**, Qiang Hu, and Yuming Wang, *Investigating pre-eruptive magnetic properties at the footprints of erupting magnetic flux ropes*, 2023 Astrophys. J., 943, 80.

15. James Crowley, Michael S. Wheatland, **Kai Yang**, *Observed Rate Variations in Superflaring G-type Stars*, 2022, Astrophys. J., 941, 193.

16. A. Mastrano, **K. E. Yang**, M. S. Wheatland, *Self-consistent Nonlinear Force-free Field Reconstruction from Weighted Boundary Conditions*, 2020, Sol. Phys., 295, 97.

17. Victor M. Demcsak, Michael S. Wheatland, Alpha Mastrano, **Kai E. Yang**, *Reconstructing Highly-twisted Magnetic Fields*, 2020, Sol. Phys., 295, 166.

18. Wang, Wensi; Zhu, Chunming; Qiu, Jiong; Liu, Rui; **Yang, Kai E.**; Hu, Qiang, *Evolution of a Magnetic Flux Rope toward Eruption*, 2019, Astrophys. J., 871, 25.

19. Hao, Q.; **Yang, K.**; Cheng, X.; Guo, Y.; Fang, C.; Ding, M. D.; Chen, P. F.; Li, Z., *Two White-light Sources in a Circular Flare Observed by ONSET and SDO*, 2017, Nature Communications, 8, 2202.

20. Dai, Yu; Ding, Mingde; Zong, Weiguo; **Yang, Kai E.** , *Extremely Large Extreme-ultraviolet Late Phase Powered by Intense Early Heating in a Non-eruptive Solar Flare*, 2018, Astrophys. J., 186, 124.

21. Z. Xu, **Kai Yang**, Yang Guo, and Jie Zhao, *Homologous Circular-ribbon Flares Driven by Twisted Flux Emergence*, 2017, Astrophys. J., 851, 30.

22. Zou P.; Fang C.; Chen P. F.; **Yang, K.**; Hao Q.; Cao Wenda, *Magnetic Separatrix as the Source Region of the Plasma Supply for an Active-region Filament*, 2017, Astrophys. J., 836, 122.

23. Zheng, R. S.; Zhang, Q. M.; Chen, Y.; Wang, B.; Du, G. H.; Li ,C. Y.; **Yang, K.**, *Interaction of Two Filaments in a Long Filament Channel Associated with Twin Coronal Mass Ejections*, 2017, Astrophys. J., 836, 160.

24. J. Chen, W. Xie, Y. Zhou, **K. Yang**, Y. Ouyang, and P. F. Chen, *A Reexamination of A Filament Oscillation Event on 2013 March 15*, 2017, Astrophysics and Space Science, 362, 164.

25. Xue, Z. K.; Yan, X. L.; Cheng, X.; Yang, L. H.; Su, Y. N.; Bernhard Kliem; Zhang, J.; Liu, Z.; Bi, Y.; Xiang, Y. Y.; **Yang, K.**; Zhao, L., *Observing the release of twist by magnetic reconnection in a solar filament eruption*, 2016, Nature Communications, 7, 11837.

26. Li, Ying; Qiu, Jiong; Longcope, D. W.; Ding, M. D.; **Yang, K.**, *Observations of an X-shaped Ribbon Flare in the Sun and Its Three-dimensional Magnetic Reconnection*, 2016, Astrophys. J. Letters, 823, L13.

27. Hong, J.; Ding, M. D.; Li, Ying; **Yang, K.**; Cheng, Xin; Chen, Feng; Fang, Cheng; Cao, Wanda, *Bidirectional Outflows as Evidence of Magnetic Reconnection Leading to a Solar Microflare*, 2016, Astrophys. J. Letters, 820, L17.

28. Zou P.; Fang C.; Chen P. F.; **Yang, K.**; Hao Q.; Cao Wenda, *Material Supply and Magnetic Configuration of an Active Region Filament*, 2016, Astrophys. J., 831, 123.

29. Sun, J. Q.; Zhang, J.; **Yang, K.**; Cheng, X.; Ding, M. D., *Observation of Magnetic Reconnection at a 3D Null Point Associated with a Solar Eruption*, 2016, Astrophys. J. Letters, 830, L4.

30. Li, T., **Yang, K.**, Hou, Y., Zhang, J., *Slipping Magnetic Reconnection of Flux Rope Structures as a Precursor to an Eruptive X-class Solar Flare*, 2016, Astrophys. J., 830, 152.

31. Ouyang, Y., **Yang, K.**, Chen, P. F., *Is Flux Rope a Necessary Condition for the Progenitor of Coronal Mass Ejections?*, 2015, Astrophys. J., 815, 72.

Scholarships and Awards

- Sydney Informatics Hub HPC Allocation Scheme at NCI Gadi, Project: tt50, 100 kSU 2020
- The First Prize Scholarship for PhD student at Nanjing University. 2016, 2017, 2018
- Youth Paper Award, the 9th Space Weather Conference in China. 2014

Conferences & Workshops

- The University of Hawai'i's (UH)
  Research Cyberinfrastructure (CI) Symposium , Honolulu Oct 01, 2025
  Spectropolarimetric Inversion in Four Dimensions with Deep Learning, A Physics-informed Machine Learning Method for 3D Solar Photosphere Reconstruction. (Invited Oral Presentation)
- National Solar Observatory, Boulder online Jun 24, 2025
  Spectropolarimetric Inversion in Four Dimensions with Deep Learning, A Physics-informed Machine Learning Method for 3D Solar Photosphere Reconstruction. (Invited Oral Presentation)
- 246th American Astronomical Society meeting, Anchorage, Alaska Jun 09, 2025
  Spectropolarimetric Inversion in Four Dimensions with Deep Learning (SPIn4D): II. A Physics-Informed Machine Learning Method for 3D Solar Photosphere Reconstruction. (iposter)

- Machine Learning and Computer Vision in Heliophysics 2025 Conference, Sofia, Bulgaria, online Apr 08, 2025
  Spectropolarimetric Inversion in Four Dimensions with Deep Learning (SPIn4D): Physics-Informed Machine Learning for 3D Reconstruction of the Solar Photosphere. (Oral Presentation)
- High Altitude Observatory Colloquium, Boulder online Apr 02, 2025
  Spectropolarimetric Inversion in Four Dimensions with Deep Learning, A Physics-informed Machine Learning Method for 3D Solar Photosphere Reconstruction. (Invited Oral Presentation)
- Solar Focus Meeting, Boulder online Mar 7, 2025
  Refining the Understanding of Stellar Flare's Late Phase. (Oral Presentation)
- Hinode/IRIS/SPHERE conference, Bozeman 2024
  A New Disambiguation Method Based on Physics-Informed Machine Learning. (Oral Presentation)
- Organize Cool Stars 22 Workshop Session, San Diego 2024
  Session: Solar-Stellar Eruption Analogy: Observations and Models
- Triennial Earth-Sun Summit 2024, Dallas 2024
  1. Refining the Understanding of Stellar Flare's Late Phase. (Oral Presentation)
  2. Spectropolarimetric Inversion in Four Dimensions with Deep Learning (SpIN4D): Validating MURaM Simulations using DKIST/ViSP Observations. (Oral Presentation)
- AGU 2023 Fall Meeting, San Francisco 2023
  1, Spectropolarimetric Inversion in Four Dimensions with Deep Learning (SpIN4D): Magneto-hydrodynamic Modeling and Forward Synthesis Pipeline. (Poster Presentation)
  2, Onset of a Solar Coronal Mass Ejection Observed by the Helioseismic and Magnetic Imager. (Poster Presentation)
- The 54th Meeting of the AAS Solar Physics Division, Minnesota 2023
  Possible Mechanism for Late Phase in Stellar White-Light Flares. (Oral Presentation)
- Organize SHINE Workshop Session 2023
  Session: Solar-stellar eruption analogy: observations and models
- SHINE Workshop Session 2023
  A Possible Mechanism for "Late Phase" in Stellar White-Light Flares. (Poster Presentation)
- MFR on the Sun, Nagoya University 2023
  Magnetic Flux Ropes on the Sun: What are they, and "would you know one if you had one?"
- SH12D-1484, AGU 2022
  Spectropolarimetric Inversion in Four Dimensions with Deep Learning (SpIN4D): Magnetohydrodynamic Modeling and Forward Synthesis Pipeline. (Poster Presentation)
- SHINE Workshop 2022
  Relative Magnetic Helicity Based on a Periodic Potential Field. (Poster Presentation)
- The Astronomical Society of Australia Annual Science Meeting 2021
  Failed Solar Eruption from a Multi-Current Active Region (E-poster Presentation)
- The 43rd COSPAR, ID E2.3-0013-21 2021

Failed Eruption Caused by Interacting Multi-current System in the Solar Corona. (Oral Presentation)

- The 48th AAS Solar Physics Division, Portland, Oregon, USA 2017
  Using observations of non-ideal velocities to test the hypothesis that reconnection heats the active region corona. (Oral Presentation)
- The Hinode-11/IRIS-8 Science Meeting, Seattle, USA 2017
  Using observations of slipping velocities to test the hypothesis that reconnection heats the active region corona. (E-poster Presentation)
- The 13th Asia Oceania Geosciences Society Annual Meeting, Beijing, China 2016
  Quantifying the Topology and Evolution of a Magnetic Flux Rope Associated with Multi-Flare Activities. (Poster Presentation)
- The 3rd Asia-Pacific Solar Physics Meeting, Seoul, South Korea 2015
  Helicity Evolution of a Magnetic Flux Rope Associated with Multi-Flare Activities in AR 12017. (Oral Presentation)
- The 9th Space Weather Conference in China, WuXi, China 2014
  Magnetic Topology and Emission Features of a Circular Flare. (Invited Oral Presentation)

Extra Training

- Solar Spectropolarimetry and Diagnostic Techniques 2022
  *HAO/NSO Spectropolarimetry School, Boulder, CO, USA*2022
- He I Diagnostics in the Solar Atmosphere 2022
  5th NCSP DKIST Data-Training Workshop, Online
- An Introduction to Chromospheric Diagnostics 2021
  4th NCSP DKIST Data-Training Workshop, Online
- Milne-Eddington Spectro-polarimetric Inversions 2020
  3rd NCSP DKIST Data-Training Workshop, Online
- Summer school of "Advanced Topics in MHD" 2018
  The International Centre for Mechanical Sciences in Udine, Italy
- Heliophysics Summer School, "Long-Term solar activity and the climates of space and Earth" 2017
  The University Corporation for Atmospheric Research (UCAR), Cooperative Programs for the Advancement of Earth System Science (CPAESS), Boulder, Colorado, USA.
- "International Summer School on Magnetic Reconnection in Space and Laboratory Plasmas" 2016
  Yunan Obervatory, Kunming, China
- "Joint Observation with IRIS and BBSO/NST for Filament and Flare" 2016
  Leading a coordinated solar observation with Big Bear Solar Observation, Hinode, and IRIS

Related Research Skills

- Analyzing observational data.
  - *Thermal structures calculation by extreme ultraviolet images from Atmospheric Imaging Assembly (AIA)/Solar Dynamics Observatory (SDO).*
  - *Calculate the plasma flow, helicity, and energy injection flux across the photosphere based on the vector magnetogram from The Helioseismic and Magnetic Imager (HMI)/SDO.*
  - *X-ray energy spectrum and image analysis from Reuven Ramaty High Energy Solar Spectroscopic Imager (RHESSI) observations.*
  - *Analyzing spectropolarimetric observation from Big Bear Solar Observatory (BBSO)/Near InfraRed Imaging Spectropolarimeter (NIRIS) and DKIST/Visible Spectropolarimeter.*
- Reconstruct the 3D solar coronal magnetic field based on a nonlinear force-free field model.
  Optimization method, Grad-Rubin method, and MHD relaxation method.
  Developer of the CFIT-FFTW3 code https://github.com/Kai-E-Yang/cfit_fftw3.
- Topological analysis of the magnetic field.
  Search for topological singularity, i.e., locating the 3D null point, calculating the quasi-separatrix layer, the twist number, and the relative magnetic helicity.
  Developer of the K-QSL code. https://github.com/Kai-E-Yang/QSL.
- Small-scale dynamo simulation supports training a machine learning model under the SPIN4D project.
  The MURaM simulation produces 130 TB of data for training the ML model. https://ifauh.github.io/SPIN4D/.
- Machine learning-based solar spectropolarimetry analysis.
  Developer of the Haleakala Disambiguation Decoder under the SPIn4D project. https://github.com/Kai-E-Yang/HDD.
- MHD simulation based on the open-source Message Passing Interface Adaptive Mesh Refinement Versatile Advection Code (MPI-AMRVAC 3.0).
- One-dimensional equilibrium and dynamic coronal loop simulations.
- Spectropolarimetry inversion based on the spectral inversion codes SIR and DeSIRe, and Milne-Eddington model, and developing the machine learning-based inversion technique.
- Programming language
  Interactive Data Language(IDL), Python, Fortran, LateX.