

Curriculum Vitae

Ying-Jer Kao

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Education

- 2001 M.S., Ph.D., Department of Physics, University of Chicago
- 1993 B.S., Department of Physics, National Taiwan University

Positions

- 08/2013 - present **Professor**
Department of Physics, National Taiwan University.
- 08/2009 - 07/2013 **Associate Professor**
Department of Physics, National Taiwan University.
- 02/2005 - 08/2009 **Assistant Professor**
Department of Physics, National Taiwan University.
- 06/2015 - 05/2019 **Center Scientist**
National Center for Theoretical Sciences.
- 09/2003 - 01/2005 **Postdoctoral Fellow**
Department of Physics, University of Toronto, Canada.
- 10/2001 - 08/2003 **Postdoctoral Fellow**
Department of Physics and Astronomy, University of Waterloo, Canada.

Honors

- 2008 Young Investigator Merit Award, National Science Council (國家科學委員會傑出學者養成計畫)
- 2009 Young Theorist Award, National Center of Theoretical Sciences (國家理論科學研究中心年輕理論學者獎)
- 2010 Research Award for Junior Research Investigators, Academia Sinica (中央研究院年輕學者研究著作獎)
- 2011 Ta-You Wu Memorial Award, National Science Council (吳大猷先生紀念獎)
- 2018 QuantEmX Scientist Exchange Award (sponsored by ICAM)

Services

- Editorial Board: Physical Review Research (2025-).
- Project Manager: Taiwan Quantum Program Office (2022-).
- President: The Physical Society of Taiwan (2022-2023).
- Coordinator: Physics and TCECM Programs, Ministry of Science and Technology (2020-2023).

- Vice President and Director for Division of Academic Affairs: The Physical Society of Taiwan (2021-2022)
- International Advisory Committee: SCES2020, 2021, 2-
- Advisory Committee: Computational Approaches to Quantum Many-body Problems, ISSP, University of Tokyo (2019).
- Organizer (with Y. C. Lin, P. Chen, C.-J. Lin and C.-Y. Huang): Workshop on Tensor Network States: Algorithms and Applications 2019-2020, Taipei, Taiwan (2019).
- Advisory Committee: Second Asia Pacific Workshop on Quantum Magnetism (APWQM), Bangalore, India, November 29-December 07 (2018).
- Advisory Committee: Asia Pacific Workshop on Quantum Magnetism (APWQM)", Seoul, South Korea, August 28-30 (2017).
- Organizer: 2017 TEQMS Summer School: From Tensor Network to Deep Learning, Hsin-Chu, Taiwan, August 7-9 (2017).
- Organizer: Fourth Workshop on Tensor Network States: Algorithms and Applications", Hsin-Chu, Taiwan, December 12-15 (2016).
- Organizer: International Conference on Highly Frustrated Magnetism 2016 (HMF2016)", Taipei, Taiwan, September 7-11 (2016).
- Organizer: Tensor Network States: Algorithms and Applications, Beijing, China, December 1-5, 2014.
- Organizer: Taipei Tensor Network Workshop 2013, Taipei, Taiwan, December 2-5, 2013.
- Organizer: Workshop on Statistical Physics of Quantum Matters, Taipei, Taiwan, July 28-31, 2013.
- Organizer (with R. Melko): Taipei Density Matrix Renormalization Group Winter School, Taipei, Taiwan, December 7-9, 2012.
- Organizer: Mini-workshop on recent developments in DMRG/TNS, Taipei, Taiwan, December 10, 2012.
- Organizer: Summer School for Numerical Methods in Condensed Matter Physics, Hsin-Chu, Taiwan, September, 2011.
- Organizer: Summer School for Computational Statistical Physics, Taipei, Taiwan, July, 2010.
- Program Committee: Computational Physics Conference 2009.
- Organizer: Quantum information science and manybody physics, Tainan, Taiwan, December 2009.
- Organizer: Mini-workshop on strong correlations in condensed matter, Hsin-Chu, Taiwan, December, 2007.
- Organizer: Numerical Methods in Strongly Correlated Electron Systems, Taipei, Taiwan, August, 2006

Publications

Since 2016

- Guilherme Catumba, Atsuki Hiraguchi, Wei-Shu Hou, Karl Jansen, Ying-Jer Kao, C.-J. David Lin, Alberto Ramos, Mugdha Sarkar, Lattice study of $SU(2)$ gauge theory coupled to four adjoint Higgs fields, *Phys. Rev. Research* 6, 043172 (2024),
- Yun-Chung Chen, Yu-Ping Lin, **Ying-Jer Kao**, Chern dartboard insulator: sub-Brillouin zone topology and skyrmion multipoles, *Commun Phys* 7, 32 (2024).
- Yun-Chung Chen, Yu-Ping Lin, **Ying-Jer Kao**, Stably protected gapless edge states without Wannier obstruction, *Phys. Rev. B* 107, 075126 (2023).
- Samuel Yen-Chi Chen, Chih-Min Huang, Chia-Wei Hsing, Hsi-Sheng Goan, Ying-Jer Kao, Variational Quantum Reinforcement Learning via Evolutionary Optimization, *Mach. Learn.: Sci. Technol.* 3 015025(2022).
- Yu-Hseuh Chen, Jozef Genzor, Yong Baek Kim, Ying-Jer Kao, Excitation spectrum of spin-1 Kitaev spin liquids, *Phys. Rev. B* 105, L060403(2022).
- Josef Genzor, Andrej Gendiar, Ying-Jer Kao, J1-J2 fractal studied by multi-recursion tensor-network method, *Phys. Rev. E* 105, 024124(2022).
- Yu-Hsueh Chen, Ching-Yu Huang, and Ying-Jer Kao, Detecting transition between Abelian and non-Abelian topological orders through symmetric tensor networks *Phys. Rev. B* 104, 045131 (2021)
- Jui-Hui Chung, **Ying-Jer Kao**, Neural Monte Carlo Renormalization Group *Phys. Rev. Research* 3 (2), 023230 (2021).
- Wen-Han Kao, Gia-Wei Chern, **Ying-Jer Kao**, Emergent Snake Magnetic Domains in Canted Kagome Ice, *Physical Review Research* 2 (2), 023046 (2020).
- Jui-Hui Chung, Ying-Jer Kao, Optimal Real-Space Renormalization-Group Transformations with Artificial Neural Networks, arXiv:1912.09005, proceeding of Workshop on Machine Learning and the Physical Sciences at the 33rd Conference on Neural Information Processing Systems (NeurIPS).
- Kai-Hsin Wu, Tsung-Cheng Lu, Chia-Min Chung, Ying-Jer Kao, Tarun Grover, Entanglement Renyi negativity across a finite temperature transition: a Monte Carlo study, *Phys. Rev. Lett.* 125, 140603 (2020).
- Mari Carmen Bañuls, Krzysztof Cichy, Ying-Jer Kao, C-J David Lin, Yu-Ping Lin, David T-L Tan, Phase structure of the 1+ 1 dimensional massive Thirring model from matrix product states, *Phys. Rev. D*, 100, 094504 (2019).
- Adil A. Gangat, **Ying-Jer Kao**, Phase boundary location with information-theoretic entropy in tensor renormalization group flows, *Phys. Rev. B* 100, 094430 (2019).
- Kai-Wen Zhao, Wen-Han Kao, Kai-Hsin Wu, **Ying-Jer Kao**, Generation of ice states through deep reinforcement learning, *Phys. Rev. E* , 99, 062106 (2019)
- Chung-Yu Lo, Yoshiki Fukusumi, Masaki Oshikawa, **Ying-Jer Kao**, and Pochung Chen, Crossover of correlation functions near a quantum impurity in a Tomonaga- Luttinger liquid. *Phys. Rev. B*, 99, 121103(R) (2019).
- Kai-Hsin Wu, Yi-Ping Huang, **Ying-Jer Kao**, Tunneling-induced restoration of classical degeneracy in quantum kagome ice *Phys. Rev. B* 99, 134440 (2019).
- Chih-Yuan Lee, B. Normand, and **Ying-Jer Kao**, Gapless spin liquid in the kagome Heisenberg antiferromagnet with Dzyaloshinskii-Moriya interactions, *Phys. Rev. B* 98, 224414 (2018).

- A. A. Gangat, I. P. McCulloch, **Ying-Jer Kao**, Symmetry between repulsive and attractive interactions in driven-dissipative Bose-Hubbard systems. *Scientific Reports* 8, 3698 (2018).
- N Xu, K.-H. Wu, S. J. Rubin, **Y.-J. Kao**, A. W. Sandvik, Dynamic scaling in the two-dimensional Ising spin glass with normal-distributed couplings. *Physical Review E* 96 , 052102 (2017)
- Yu-Chin Tzeng, Hiroaki Onishi, Tsuyoshi Okubo, and **Ying-Jer Kao**, Quantum phase transitions driven by rhombic-type single-ion anisotropy in the S=1 Haldane chain. *Phy. Rev. B*, 060404(R) (2017).
- Yu-Ping Lin, **Ying-Jer Kao**, Pochung Chen, and Yu-Cheng Lin, Griffiths singularities in the random quantum Ising antiferromagnet: A tree tensor network renormalization group study. *Physical Review B*, 96, 064427 (2017). [Editors' suggestion]
- Adil A. Gangat, Te I, and **Ying-Jer Kao**, Steady States of Infinite-Size Dissipative Quantum Chains via Imaginary Time Evolution. *Phys. Rev. Lett.* , 119, 010501 (2017).
- A Farrell, P.-K. Wu, **Y.-J. Kao**, T. Pereg-Barnea, Incommensurate spin density wave as a signature of spin-orbit coupling and precursor of topological superconductivity, *Phys. Rev. B* 94, 214424 (2016).
- W.-H. Kao, P. C. W. Holdsworth, **Y.-J. Kao**, Field-induced ordering in dipolar spin ice, *Phys. Rev. B* 93, 180410 (2016).

Presentations

- **Invited Conference Presentations**

Since 2016

1. *Variational Tensor Network Operator*, Workshop on Tensor Network States: Algorithms and Applications (TNSAA), Hong Kong, China, Dec. 17-20, 2024.
2. *Tunneling-induced restoration of classical degeneracy in quantum kagome ice*, Korean Physical Society Fall Meeting, Yeosu, South Korea, Oct. 22-26, 2024.
3. *Hybrid Classical-Quantum Architectures for Quantum Machine Learning*, SQAI-NCTS Workshop on Tensor Network and Quantum Embedding, Tokyo, Japan, Mar. 25-29, 2024.
4. *Emergence of a Dirac spin liquid state in the spin-1/2 AF kagome Heisenberg mode: a symmetric tensor network study*, YIPQS long-term workshop on Quantum Information, Quantum Matter and Quantum Gravity, YITP, Kyoto, Japan, Sep. 25- 29, 2023.
5. *Possible Dirac spin liquid in the spin-1/2 AF kagome Heisenberg model*, A New Spin on Quantum Magnets, KITP, Santa Barbara, USA, Jul 17 - Sep 8, 2023.
6. *Detecting Topological Phase Transitions through Symmetric Tensor Networks*, Workshop on Entanglement in Strongly Correlated Systems, Benasque, Spain (online), 02/15-26, 2021.
7. *Gapless spin liquid in the kagome Heisenberg antiferromagnet with Dzyaloshinskii-Moriya interactions*, 3rd Asia Pacific Workshop on Quantum Magnetism, T.D. Lee Institute, Shanghai, China, 11/24-11/30, 2019.
8. *Fate of two quantum spin liquids on the kagome lattice*, Computational Approaches to Quantum Many-body Problems, ISSP, University of Tokyo, Japan, 7/16-8/8, 2019.
9. *Generation of topologically constrained states through deep reinforcement learning*, Machine Learning for Quantum Many-Body Physics, KITP, Santa Barbara, USA, 1/28-3/22, 2019.

10. *Tunneling-induced restoration of classical degeneracy in quantum kagome ice*, The 2nd Asia Pacific Workshop on Quantum Magnetism, Bangalore, India, 11/29-12/07, 2018.
11. *Quantum Impurity in a Luttinger Liquid: Subleading corrections*, Tensor-Network Methods: Structure, Applications and Holography, Stony Brook, 12/11-15, 2017.
12. *Tree Tensor Network Strong Disorder Renormalization Group on a Disordered Antiferromagnetic Ising Chain in External Fields*, International Conference on Computational Physics 10, Macau, China, 01/16 - 20, 2017.
13. *Tree Tensor Network Strong Disorder Renormalization Group on a Disordered Antiferromagnetic Ising Chain in External Fields*, The 3rd Workshop on Tensor Network States: Algorithms and Applications, Okazaki, 1/11-14, 2016.
14. *Field induced ordering in dipolar spin ice*, The 16th Japan- Korea-Taiwan Workshop on Strongly Correlated Electron Systems, U of Tokyo, 2/18-21, 2016.
15. *Tree Tensor Network Strong Disorder Renormalization Group on a Disordered Antiferromagnetic Ising Chain in External Fields*, The 6th Workshop on Quantum Many-Body Computation, CSRC, Beijing, China, 4/21-24, 2016.
16. *Tree Tensor Network Strong Disorder Renormalization Group on a Disordered Antiferromagnetic Ising Chain in External Fields*, From Quantum Field Theories to Numerical Methods, Nordita, Stockholm, 5/2-27, 2016.
17. *Field induced ordering in dipolar spin ice*, School on Current Frontiers in Condensed Matter Research, ICTS, Bangalore, 6/20-29, 2016.