DR. YIN LIN 林胤

yin01@mit.edu | github.com/ylin910095 | linyin.dev

RESEARCH INTERESTS

Lattice quantum chromodynamics: first-principles simulations of quantum chromodynamics (QCD)—the theory of the strong nuclear strong–with Markov Chain Monte Carlo using high-performance computing.
Deep learning for scientific computing: applications of deep learning algorithms to solving sparse linear systems and the sign problem in Monte Carlo integrations in the context of QCD simulations and beyond.

EMPLOYMENT AND EDUCATION

Postdoctoral associate, Center for Theoretical Physics, Massachusetts Institute of Technology	2021 - present
Postdoctoral associate, the NSF AI Institute for Artificial Intelligence and Fundamental Interactions	2021 - present
Ph.D. in physics, the University of Chicago	2015 - 2021
– Thesis: *Nucleon Mass and Charges with Lattice Quantum Chromodynamics*	
Visiting scholar, Fermi National Accelerator Laboratory	2017 - 2021
B.Sc. in physics, University of California Santa Barbara	2011 - 2015

SOFTWARE CONTRIBUTION

My software are maintained in my github https://github.com/ylin910095
Major contribution to open-source software:

- **MILC:** high-performance software for lattice QCD simulation in C.
  https://github.com/ylin910095/milc_baryon/tree/testb

AWARDS AND HONORS

LEAPS fellow for leadership and professional strategies & skills training (MIT)	2023
University research association visiting scholars (Fermilab and UChicago)	2017, 2021
Graduation speaker (UCSB)	2015
Arnold Nordsieck award for demonstrating research promise in physics (UCSB)	2015
Physics highest academic honors (UCSB)	2015
CCS summer undergraduate fellow for undergraduate summer research (UCSB)	2014
Worster summer research fellow for undergraduate summer research (UCSB)	2014

PREPRINTS AND PUBLICATIONS

[9] W. Detmold, G. Kanwar, **Y. Lin**, P. E. Shanahan, and M. L. Wagman. “Learned integration contour deformation for signal-to-noise improvement in Monte Carlo calculations”. In: *Conference on Neural Information Processing Systems. Machine Learning and the Physical Sciences Workshop, NeurIPS 2023*. URL: https://ml4physicalsciences.github.io/2023/files/NeurIPS_ML4PS_2023_180.pdf.

[8] W. Detmold, G. Kanwar, **Y. Lin**, P. E. Shanahan, and M. L. Wagman. “Signal-to-noise improvement through neural network contour deformations for 3D $SU(2)$ lattice gauge theory”. In: *40th International Symposium on Lattice Field Theory*. arXiv: 2309.00600 [hep-lat].

[7] S. Calì, D. C. Hackett, **Y. Lin**, P. E. Shanahan, and B. Xiao. “Neural-network preconditioners for solving the Dirac equation in lattice gauge theory”. In: *Phys. Rev. D* 107.3 (2023), p. 034508. DOI: 10.1103/PhysRevD.107.034508. arXiv: 2208.02728 [hep-lat].

[6] D. Boyda, S. Calì, S. Foreman, L. Funcke, D. C. Hackett, **Y. Lin**, et al. “Applications of machine learning to lattice quantum field Theory”. In: *2022 Snowmass Summer Study*. 2022. arXiv: 2202.05838 [hep-lat].

[5] **Y. Lin**, A. S. Meyer, S. Gottlieb, C. Hughes, A. S. Kronfeld, J. N. Simone, and A. Strelchenko. “Computing nucleon charges with highly improved staggered quarks”. In: *Phys. Rev. D* 103.5 (2021), p. 054510. DOI: 10.1103/PhysRevD.103.054510. arXiv: 2010.10455 [hep-lat].

[4] **Y. Lin**, A. S. Meyer, C. Hughes, A. S. Kronfeld, J. N. Simone, and A. Strelchenko. “Nucleon mass with highly improved staggered quarks”. In: *Phys. Rev. D* 103.3 (2021), p. 034501. DOI: 10.1103/PhysRevD.103.034501. arXiv: 1911.12256 [hep-lat].

[3] **Y. Lin**, C. Hughes, and A. S. Meyer. "Nucleon and Ω baryon masses with all-HISQ fermions at the physical point". In: *37th International Symposium on Lattice Field Theory*. 2019. arXiv: 1912.00028 [hep-lat].

[2] **Y. Lin**, S. P. Oh, S. R. Furlanetto, and P. M. Sutter. "The Distribution of bubble sizes during reionization". In: *Mon. Not. Roy. Astron. Soc.* 461.3 (2016), pp. 3361–3374. DOI: 10.1093/mnras/stw1542. arXiv: 1511.01506 [astro-ph.CO].

[1] J. C. van Eyken, M. J. Strader, A. B. Walter, S. R. Meeker, P. Szypryt, C. Stoughton, K. O'Brien, D. Marsden, N. K. Rice, **Y. Lin**, and B. A. Mazin. "The ARCONS pipeline: data reduction for MKID arrays". In: *The Astrophysical Journal Supplement Series* 219.1 (2015), p. 14. DOI: 10.1088/0067-0049/219/1/14. arXiv: 1507.05631 [astro-ph.IM].

PROPOSALS

Co-PI, National Science Foundation computing proposal, 1.8M CPU-hours on Stampede2 supercomputer 2022-2023
Co-PI, Department of Energy computing proposal, 100K CPU-hours on Cori supercomputer 2022-2023
Co-PI, National labs computing proposal, 150K CPU hours on Fermilab computing cluster 2022-2023

PRESENTATIONS

Learned integration contour deformation for signal-to-noise improvement in Monte Carlo calculations (Neurips 2023 ML for physical science workshop, poster) 2023
Accelerating lattice gauge theory calculations with deep learning (TUM virtual seminar) 2023
Toward contour deformation for 4d gauge theories (Lattice conference 2023, Fermilab) 2023
Staggered nucleon masses, axial charges, and form factors (Lattice conference 2023, Fermilab, poster) 2023
Setting the scale of HISQ ensembles (MIT, virtual) 2023
Machine learning accelerates quantum chromodynamics simulations (MIT, poster) 2023
Contour deformation for lattice gauge theory (MIT) 2023
Neutrino-nucleon quasielastic scattering from lattice QCD (CIPANP conference 2022, Orlando) 2022
Neural-network preconditioners for lattice QFT (CERN) 2022
Accelerating Dirac equation solves in lattice QCD with neural-network preconditioners (INT, UWashington) 2022
Accelerating Dirac equation solves in lattice QCD with neural-network preconditioners (MIT) 2022
Nucleon masses and charges with lattice QCD (MIT) 2021
Nucleon masses and charges with lattice QCD (Fermilab) 2021
First-principles calculation of g_A (U. Kentucky virtual) 2021
Staggering nucleon matrix elements (MIT, virtual colloquium) 2020
Nucleon mass and omega mass with all-HISQ fermions at the physical point (APLAT virtual conference) 2020
Nucleon and omega masses with all HISQ fermions (Lattice conference 2019, Wuhan China) 2019
Nucleon physics with all HISQ fermions (Lattice conference 2018, Michigan State U.) 2018

TEACHING AND MENTORING

Co-facilitator, leadership and professional strategies & skills training (MIT) 2023
Brian Xiao, undergraduate student mentored (MIT) 2021-2023
Workshop lecturer, data visualization for Chicago public high school students (UChicago) 2020
Teaching assistant, analog and digital electronics labs (UChicago) 2017
Teaching assistant, introductory physics courses (UChicago) 2015-2016