YIN LIN 林胤

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Center for Theoretical Physics, Massachusetts Institute of Technology, Cambridge, MA 02139 USA

EMPLOYMENT

Postdoctoral Associate in Theoretical Physics   2021 - 2024
Center for Theoretical Physics
Massachusetts Institute of Technology, Cambridge, MA USA

EDUCATION

Ph.D. in Theoretical Physics   2015 - 2021
The University of Chicago, Chicago, IL USA

B.Sc. in Physics   2011 - 2015
Arnold Nordsieck Award, Physics Highest Academic Honors, Valedictorian
University of California Santa Barbara, Santa Barbara, CA USA

RESEARCH INTERESTS

High-energy particle theory, lattice quantum chromodynamics (LQCD), artificial intelligence, nuclear physics, high-performance computing

RESEARCH PROJECTS

Lattice Quantum Chromodynamics (LQCD) and Machine Learning   2021 - present
Center for Theoretical Physics, Massachusetts Institute of Technology
– Apply machine learning techniques to accelerate the convergence of iterative solvers for linear equations.

LQCD and Nucleon Physics   2017 - present
Advisor: Andreas S. Kronfeld, Fermilab/University of Chicago
– Solved the long-standing theoretical issues with simulating nucleons with staggered fermion discretization in lattice quantum chromodynamics that enabled more efficient Monte-Carlo simulation and implemented the solutions in high-performance software.
– Optimized the software performance in systems with GPU accelerators by adapting a hybrid OpenMP-MPI programming paradigm.
– Analyzed Monte-Carlo dataset with Bayesian statistics to infer the internal structure of nucleons crucial to the future neutrino scattering experiments.

Theoretical Cosmology   2014 - 2015
Advisor: Siang Peng Oh, University of California Santa Barbara
– Performed 21cm simulations during the cosmic reionization to understand the morphology of ionized intergalactic medium, aka the bubbles.
– Compared different schemes in characterizing the bubble sizes and proposed a new method, the Watershed algorithm, based on the image segmentation technique to properly capture their physical size distribution.

Experimental Astrophysics   2013 - 2014
Advisor: Ben Mazin, University of California Santa Barbara
– Designed and implemented an astrometry library in Python to calibrate telescope position using reference images so the captured images can be properly aligned and passed to the next stage in the processing pipeline.

PUBLICATIONS

[1] **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,"* Phys. Rev. D **103**, 054510 (2021), arXiv:2010.10455 [hep-lat] .

[2] **Y. Lin**, A. S. Meyer, C. Hughes, A. S. Kronfeld, J. N. Simone, and A. Strelchenko, *"Nucleon mass with highly improved staggered quarks,"* Phys. Rev. D **103**, 034501 (2021), 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] .

[4] **Y. Lin**, S. P. Oh, S. R. Furlanetto, and P. M. Sutter, *"The Distribution of Bubble Sizes During Reionization,"* Mon. Not. Roy. Astron. Soc. **461**, 3361 (2016), arXiv:1511.01506 [astro-ph.CO] .

[5] 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 ARCON Pipeline: Data Reduction For MKID Arrays,"* The Astrophysical Journal Supplement Series **219**, 14 (2015).

SELECTED PRESENTATIONS

Staggering Nucleon Matrix Elements   2020
2020 MIT Virtual Lattice Field Theory Colloquium
http://ctp.lns.mit.edu/latticecolloq/

Nucleon Mass and Omega Mass with All-HISQ Fermions at the Physical Point   2019
The 37th International Symposium on Lattice Field Theory, Wuhan, China
https://indico.cern.ch/event/764552/contributions/3420488/

Nucleon Physics with All HISQ Fermions   2018
The 36th International Symposium on Lattice Field Theory, East Lansing, USA
https://indico.fnal.gov/event/15949/contributions/34661/

TEACHING AND OUTREACH

Data Visualization Workshop   2020
Lecturer for data visualization of COVID-19 data with Python for Chicago public high-school students.
https://github.com/yling10095/Data_visualization_2020

Analog and Digital Electronics   2017
Teaching assistant for the undergraduate analog and digital electronics lab at the University of Chicago. Held two lab sessions weekly.

Introductory Physics   2015-2016
Teaching assistant for the introductory physics classes at the University of Chicago. Held weekly discussion sessions and office hours.

AWARDS AND HONORS

URA Visiting Scholars   2017 & 2021
Fermilab

Arnold Nordsieck Award   2015
University of California Santa Barbara

Physics Highest Academic Honors   2015
University of California Santa Barbara

CCS Summer Undergraduate Fellowship   2014
University of California Santa Barbara

Worster Summer Research Fellowship   2014
University of California Santa Barbara

RESOURCES SECURED

USQCD Type-A Allocation 2021-2022
Project: Nucleon Axial Charge with All-Staggered Lattice QCD
– 3.5M Skylake core-hours on Brookhaven National Laboratory cluster
– 84K K80-GPU-hours on Brookhaven National Laboratory cluster

Project: Scale Setting Studies on the MILC HISQ Ensembles
– 14.2M KNL-core-hours on Brookhaven National Laboratory cluster

The ASCR Leadership Computing Challenge 2020-2021
Project: Nucleon Axial Charge with All-Staggered Lattice QCD
– 200K KNL-node-hours on Theta supercomputer
– 870K KNL-node-hours on Cori supercomputer

USQCD Type-A Allocation 2020-2021
Project: Nucleon Axial Form Factor with HISQ Ensembles
– 1.1M Skylake core-hours on Brookhaven National Laboratory cluster
– 100K K80-GPU-hours on Brookhaven National Laboratory cluster

USQCD Type-A Allocation 2019-2020
Project: Nucleon Axial Form Factor with HISQ Ensembles
– 1M Skylake core-hours on Fermilab cluster
– 120K K80-GPU-hours on Brookhaven National Laboratory cluster

USQCD Type-A Allocation 2018-2019
Project: Nucleon Axial Form Factor with HISQ Ensembles
– 1.8M Skylake core-hours on Brookhaven National Laboratory cluster
– 105K K80-GPU-hours on Brookhaven National Laboratory cluster