

EMPLOYMENT

- **Jefferson National Lab (JLab)** *September 2022 - today*
Postdoctoral Researcher Staff Newport News, VA, USA
- **Perimeter Institute for Theoretical Physics** *September 2019 - August 2022*
Postdoctoral Fellow Waterloo, ON, CANADA

EDUCATION

- **Ph.D. Physics**, Syracuse University, NY, USA *August 2013 - May 2019*
- **M.Sc. Physics**, St. Xavier's College & Bose Institute, Kolkata, INDIA *August 2011 - May 2013*
- **M.S. in Nanomaterials**, Sorbonne Université, Paris, FRANCE *September 2010 - July 2011*
- **B.Sc. Physics (Honours)**, St. Stephen's College, Delhi, INDIA *July 2007 - May 2010*

PUBLICATIONS

[[Google Scholar](#), [INSPIRE](#), [ORCID](#)]

(Authors are mostly listed in alphabetical order)

34. *Real-Time Scattering in Ising Field Theory using Matrix Product States*
(in review)
[arXiv:2411.13645](#)
Raghav G. Jha, Ashley Milsted, Dominik Neuenfeld, John Preskill, Pedro Vieira
33. *Quantum computation of $SU(2)$ lattice gauge theory with continuous variables*
(in review)
[arXiv:2410.14580](#)
Victor Ale, Nora Bauer, **Raghav G. Jha**, Felix Ringer, George Siopsis
32. *Sparsity dependence of Krylov state complexity in the SYK model*
(in review)
[arXiv:2407.20569](#)
Raghav G. Jha, Ranadeep Roy
31. *Thermal state preparation of the SYK model using a variational quantum algorithm*
(in review)
[arXiv:2406.15545](#)
Jack Araz, **Raghav G. Jha**, Felix Ringer, Bharath Sambasivam
30. *$SU(2)$ principal chiral model with tensor renormalization group on a cubic lattice*
[arXiv:2406.10081](#), *Phys. Rev. D* **110**, 034519 (2024)
Shinichiro Akiyama, **Raghav G. Jha**, Judah Unmuth-Yockey
29. *Phase diagram of generalized XY model using tensor renormalization group*
[arXiv:2404.17504](#), *Phys. Rev. D* **110**, 034504 (2024)
Abhishek Samlodia, Vamika Longia, **Raghav G. Jha**, Anosh Joseph
28. *Hamiltonian simulation of minimal holographic sparsified SYK model*
[arXiv:2404.14784](#), *Nucl. Phys. B* 1012 (2025) 116815
Raghav G. Jha

27. *Tensor renormalization group study of 3D principal chiral model*
[arXiv:2312.11649](#), [PoS LATTICE2023 \(2023\) 355](#)
 Shinichiro Akiyama, **Raghav G. Jha**, Judah Unmuth-Yockey
26. *Nonperturbative phase diagram of two-dimensional $\mathcal{N} = (2, 2)$ super-Yang–Mills*
[arXiv:2312.04980](#), [Phys. Rev. D **110**, 054507 \(2024\)](#)
 Navdeep S. Dhindsa, **Raghav G. Jha**, Anosh Joseph, David Schaich
25. *Sachdev-Ye-Kitaev model on a noisy quantum computer*
[arXiv:2311.17991](#), [Phys. Rev. D **109**, 105002 \(2024\)](#)
 Muhammad Asaduzzaman, **Raghav G. Jha**, Bharath Sambasivam
24. *Continuous variable quantum computation of the $O(3)$ model in 1+1 dimensions*
[arXiv:2310.12512](#), [Phys. Rev. A **109**, 052412 \(2024\)](#)
Raghav G. Jha, Felix Ringer, George Siopsis, Shane Thompson
23. *Toward quantum computations of the $O(3)$ model using qumodes*
[arXiv:2308.06946](#), [PoS LATTICE2023 \(2023\) 230](#)
Raghav G. Jha, Felix Ringer, George Siopsis, Shane Thompson
22. *GPU-Acceleration of Tensor Renormalization with PyTorch using CUDA*
[arXiv:2306.00358](#), [Computer Physics Communications **294** \(2024\) 108941](#)
Raghav G. Jha, Abhishek Samlodia
21. *Notes on Quantum Computation and Information*
[arXiv:2301.09679](#)
Raghav G. Jha
20. *Supersymmetric Wilson loops on the lattice in the large N limit*
[Eur. Phys. J. Spec. Top. **232**:355–358 \(2023\)](#)
Raghav G. Jha
19. *Non-perturbative phase structure of the bosonic BMN matrix model*
[arXiv:2201.08791](#), [JHEP **05** \(2022\) 169](#)
 Navdeep S. Dhindsa, **Raghav G. Jha**, Abhishek Samlodia, Anosh Joseph, David Schaich
18. *Thermal phase structure of dimensionally reduced super-Yang–Mills*
[arXiv:2201.03097](#), [PoS LATTICE2021 \(2022\) 187](#)
 David Schaich, **Raghav G. Jha**, Anosh Joseph
17. *Tensor renormalization of three-dimensional Potts model*
[arXiv:2201.01789](#)
Raghav G. Jha
16. *Introduction to Monte Carlo for Matrix Models*
[arXiv:2111.02410](#), [SciPost Phys. Lect. Notes **46** \(2022\)](#)
Raghav G. Jha
15. *Large- N limit of two-dimensional Yang–Mills theory with four supercharges*
[arXiv:2109.01001](#), [PoS LATTICE2022 \(2022\) 433](#)
 Navdeep S. Dhindsa, **Raghav G. Jha**, Anosh Joseph, David Schaich
14. *Tensor renormalization group study of the 3d $O(2)$ model*
[arXiv:2105.08066](#), [Phys. Rev. D **104**, 094517 \(2021\)](#)
 Jacques Bloch, **Raghav G. Jha**, Robert Lohmayer, Maximilian Meister

13. *Three-dimensional super-Yang-Mills theory on the lattice and dual black branes*
[arXiv:2010.00026](#), *Phys. Rev. D* 102, 106009 (2020)
Simon Catterall, Joel Giedt, **Raghav G. Jha**, David Schaich, Toby Wiseman
12. *Positive geometries for all scalar theories from twisted intersection theory*
[arXiv:2006.15359](#), *Phys. Rev. Research* 2, 033119 (2020)
Nikhil Kalyanapuram, **Raghav G. Jha**
11. *Critical analysis of two-dimensional classical XY model*
[arXiv:2004.06314](#), *J. Stat. Mech.* (2020) 083203
Raghav G. Jha
10. *Thermal phase structure of a supersymmetric matrix model*
[arXiv:2003.01298](#), *PoS LATTICE2019* (2020) 069
David Schaich, **Raghav G. Jha**, Anosh Joseph
9. *Finite N unitary matrix models*
[arXiv:2003.00341](#)
Raghav G. Jha
8. *Tensor renormalization group study of the non-Abelian Higgs model in two dimensions*
[arXiv:1901.11443](#), *Phys. Rev. D* 99, 114507 (2019)
Alexei Bazavov, Simon Catterall, **Raghav G. Jha**, Judah Unmuth-Yockey
7. *Lattice quantum gravity with scalar fields*
[arXiv:1810.09946](#), *PoS LATTICE2018* (2019) 043
Raghav G. Jha, Jack Laiho, Judah Unmuth-Yockey
6. *The properties of D1-branes from lattice super Yang-Mills theory using gauge/gravity duality*
[arXiv:1809.00797](#), *PoS LATTICE2018* (2019) 308
Raghav G. Jha
5. *Removal of the trace mode in lattice $\mathcal{N} = 4$ super Yang-Mills theory*
[arXiv:1808.04735](#), *Phys. Rev. D* 98, 095017 (2018)
Simon Catterall, Joel Giedt, **Raghav G. Jha**
4. *Nonperturbative study of dynamical SUSY breaking in $\mathcal{N} = (2, 2)$ Yang-Mills*
[arXiv:1801.00012](#), *Phys. Rev. D* 97, 054504 (2018)
Simon Catterall, **Raghav G. Jha**, Anosh Joseph
3. *Truncation of lattice $\mathcal{N} = 4$ super Yang-Mills*
EPJ Web of Conferences 175, 11008 (2018)
Simon Catterall, Joel Giedt, **Raghav G. Jha**
2. *Testing the holographic principle using lattice simulations*
[arXiv:1710.06398](#), *EPJ Web of Conferences* 175, 08004 (2018)
Raghav G. Jha, Simon Catterall, David Schaich, Toby Wiseman
1. *Testing holography using lattice super-Yang-Mills on a 2-torus*
[arXiv:1709.07025](#), *Phys. Rev. D* 97, 086020 (2018)
Simon Catterall, **Raghav G. Jha**, David Schaich, Toby Wiseman

47. *Quantum gravity on noisy quantum computers* | APS GLOBAL SUMMIT, ANAHEIM, CA, USA | March 17, 2025
46. *Real-time scattering in Ising field theory* | BROOKHAVEN NATIONAL LABORATORY, UPTON, NY, USA | February 13, 2025 [[Slides](#)]
45. *Krylov complexity for quantum chaos on quantum computer (KC for QC on QC)* | CFNS WORKSHOP, STONY BROOK UNIVERSITY, NY, USA | February 12, 2025
44. *Scattering in Ising field theory* | UC BERKELEY/LBNL NUCLEAR THEORY SEMINAR, BERKELEY, CA, USA [ONLINE] | January 29, 2025 [[Slides](#)]
43. *Probing fundamental physics in a new era of computation* | UNIVERSITY OF MIAMI, USA | January 22, 2025
42. *State preparation and operator growth of SYK model on IBM quantum computer* | TENSOR NETWORK 2024 WORKSHOP, ISHIKAWA, JAPAN [ONLINE] | November 17, 2024 [[Slides](#)]
41. *Thermal state preparation and dynamics of random all-to-all fermionic model* | C2QA MEETING, MASSACHUSETTS INSTITUTE OF TECHNOLOGY, BOSTON, USA | July 17, 2024 [[Slides](#)]
40. *SYK model on a noisy quantum computer - dynamics and state preparation* | MANDELSTAM INSTITUTE FOR THEORETICAL PHYSICS (MITP) AND THE NATIONAL INSTITUTE FOR THEORETICAL AND COMPUTATIONAL SCIENCES (NITheCS), JOHANNESBURG, SOUTH AFRICA [ONLINE] | May 07, 2024 [[YouTube](#)]
39. *Introduction to tensor networks for classical computing of spin systems and gauge theories* | SET OF FOUR LECTURES AT 14TH JO'BURG SCHOOL ON STRING THEORY AT UNIVERSITY OF PRETORIA, SOUTH AFRICA [ONLINE] | April 29-30 and May 02, 2024 [[YouTube](#)]
38. *Quantum computing for quantum many-body systems* | WILLIAM & MARY, WILLIAMSBURG, USA | April 17, 2024 [[Slides](#)]
37. *Approaches to universal quantum computing for spin and gauge models* | UNIVERSITY OF IOWA [ONLINE] | April 16, 2024 [[Slides](#)]
36. *Random dense Hamiltonians on current noisy quantum computers* | UNIVERSITY OF MARYLAND, USA | March 28, 2024 [[Slides](#)]
35. *Extracting Physics with IBM's 127-qubit quantum processor* | JEFFERSON LAB, VA, USA | March 13, 2024 [[Slides](#)]
34. *Real-time dynamics of SYK model on a noisy quantum computer* | WORKSHOP ON 'TOWARD QUANTUM SIMULATION OF GAUGE/GRAVITY DUALITY AND LATTICE GAUGE THEORY' | March 05, 2024 [[Slides](#)]
33. *SYK model on a noisy quantum computer* | INDIAN INSTITUTE OF SCIENCE, BANGALORE, INDIA [ONLINE] | February 06, 2024 [[Slides](#)] [[YouTube](#)]
32. *Quantum Computation of the $O(3)$ model using qumodes* | CONTRIBUTED TALK AT LATTICE 2023 AT FERMILAB, USA | August 02, 2023 [[Slides](#)]
31. *Computation with Quantum Mechanics* | SET OF TWO LECTURES AT QUANTUM COMPUTING BOOTCAMP 2023, JEFFERSON LAB, USA | June 20, 2023 [[Resource](#)]

30. *Can quantum computation improve our understanding of quantum fields?* | SET OF TWO LECTURES AT HUGS 2023 SUMMER SCHOOL, JEFFERSON LAB, USA | June 7, 2023 [[YouTube, Part 1](#)] [[Part 2](#)]
29. *Non-linear sigma models using quantum computation* | C2QA THEORY AND SOFTWARE RETREAT, NEW YORK CITY, USA | May 30, 2023 [[Slides](#)]
28. *Introduction to Quantum Computing methods in Physics* | TATA INSTITUTE, MUMBAI, INDIA [ONLINE] | April 27, 2023 [[Slides](#)] [[YouTube](#)]
27. *Aspects of classical and quantum computing of quantum many-body systems* | ASHOKA UNIVERSITY, SONEPAT, INDIA [ONLINE] | February 10, 2023 [[Slides](#)]
26. *Classical computation using tensor networks and quantum computation with qubits and qumodes* | JEFFERSON LAB, USA | November 14, 2022 [[Slides](#)] [[Video](#)]
25. *Application of tensor methods to real-space renormalization and real-time study of field theories* | BROOKHAVEN NATIONAL LAB (BNL), USA [ONLINE] | October 31, 2022 [[Slides](#)]
24. *New tools for old problems in spin and gauge models on the lattice* | IIT HYDERABAD, INDIA [ONLINE] | October 12, 2022 [[Slides](#)]
23. *Some old problems on the lattice using tensors* | NUMSTRINGS 2022 , ICTS, BANGALORE, INDIA | August 26, 2022 [[YouTube](#)]
22. *Introduction to Quantum Computation using QISKIT* | TWO LECTURES FOR SUMMER SCHOOL 2022 AT RENSSELAER POLYTECHNIC INSTITUTE, USA [ONLINE] | June 22 and 23, 2022 [[Lecture 1 & 2](#)] [[YouTube](#)]
21. *New approach to continuous spin models in two and three dimensions* | NUMERICAL METHODS IN THEORETICAL PHYSICS CONFERENCE, APCTP, POHANG, SOUTH KOREA [ONLINE] | May 17, 2022 [[Slides](#)] [[YouTube](#)]
20. *Holography with large matrices on the lattice* | INSTITUTE OF NUCLEAR SCIENCES, UNIVERSIDAD NACIONAL AUTÓNOMA DE MÉXICO, MEXICO CITY, MEXICO | March 24, 2022 [[Slides](#)]
19. *Large N matrix models using Monte Carlo and Bootstrap* | UNIVERSITY OF SURREY, SURREY, UK [ONLINE] | February 22, 2022 [[Slides](#)]
18. *Introduction to tensor networks and spin systems* | AZIM PREMJI UNIVERSITY, BENGALURU, INDIA | January 11, 2022
17. *Tensor networks and spin models* | INDIAN INSTITUTE OF SCIENCE EDUCATION AND RESEARCH (IISER), MOHALI, INDIA | December 7, 2021 [[Slides](#)]
16. *Real-space tensor renormalization for spin models in three dimensions* | PERIMETER INSTITUTE, WATERLOO, CANADA | November 19, 2021
15. *Solving matrix models at large and finite N* | TWO LECTURES FOR SUMMER SCHOOL 2021 AT RENSSELAER POLYTECHNIC INSTITUTE, USA [ONLINE] | June 28 and 29, 2021 [[Lecture 1 & 2](#)]
14. *Holographic gauge theories on the lattice* | DUBLIN INSTITUTE FOR ADVANCED STUDIES, DUBLIN, IRELAND | June 23, 2021 [[Slides](#)] [[YouTube](#)]
13. *Old and new methods for new and old problems in Physics* | INDIAN INSTITUTE OF TECHNOLOGY (IIT) MADRAS, INDIA | March 8, 2021 [[Slides](#)]

12. *Probing holographic dualities with lattice supersymmetric Yang-Mills theories* | MASSACHUSETTS INSTITUTE OF TECHNOLOGY, BOSTON, USA [ONLINE] | February 25, 2021 [[Slides](#)] [[YouTube](#)]
11. *New tool for old problems - Tensor network approach to spin models and gauge theories* | UNIVERSITY OF LIVERPOOL, LIVERPOOL, UK [ONLINE] | October 14, 2020 [[Slides](#)]
10. *Tensor Networks: Algorithm & Applications* | TWO LECTURES FOR CYBERTRAINING SUMMER SCHOOL 2020 AT RENSSELAER POLYTECHNIC INSTITUTE, USA [ONLINE] | June 10 and 11, 2020 [[Lecture 1 & 2](#)] [[Resource](#)] [[YouTube](#)]
9. *Holographic aspects of supersymmetric gauge theories* | PERIMETER INSTITUTE, WATERLOO, CANADA | October 4, 2019
8. *Numerical Approaches to Holography* | ASHOKA UNIVERSITY, SONEPAT, INDIA | August 28, 2019 [[Slides](#)]
7. *Numerical Approaches to Holography* | INDIAN INSTITUTE OF SCIENCE EDUCATION AND RESEARCH (IISER) MOHALI, INDIA | August 8, 2019
6. *Holographic dualities and tensor renormalization group study of gauge theories* | PERIMETER INSTITUTE, WATERLOO, CANADA | March 11, 2019 [[Video \(PIRSA, 19030108\)](#)]
5. *Supersymmetry breaking and gauge/gravity duality on the lattice* | UNIVERSITY OF COLORADO BOULDER, USA | April 6, 2018 [[Slides](#)]
4. *Recent results from lattice supersymmetry in $2 \leq d < 4$ dimensions* | ICTS, BANGALORE, INDIA | January 31, 2018 [[YouTube](#)]
3. *Testing gauge/gravity duality using lattice simulations* | CONTRIBUTED TALK AT LATTICE 2017 GRANADA, SPAIN | June 22, 2017 [[Slides](#)]
2. *Testing holography through lattice simulations* | YUKAWA INSTITUTE FOR THEORETICAL PHYSICS, KYOTO, JAPAN | April 4, 2017 [[Slides](#)]
1. *Supersymmetry on the lattice* | APRIL MEETING 2016 - SALT LAKE CITY, UTAH, USA | April 17, 2016 [[Slides](#)]

TEACHING EXPERIENCE

- Recitation Instructor for PHY 216 (General Physics II for Honors and Majors) [[Evaluation report](#)] and Grader for PHY 662 (Quantum Mechanics II) Spring 2019
- Recitation Instructor for PHY 215 (General Physics I for Honors and Majors) and Grader for PHY 312 (Relativity & Cosmology) Spring 2018
- Grader for PHY 424 (Electromagnetism) and PHY 360 (Waves and Oscillations) Fall 2016
- Recitation Instructor for PHY 212 General Physics II Spring 2016
- Grader for PHY 641 (Statistical Mechanics) and PHY 731 (Electromagnetic theory) Fall 2015
- Recitation Instructor for PHY 211 General Physics I Fall 2014
- Recitation Instructor for PHY 211 General Physics I [[Evaluation report](#)] Spring 2014
- Lab Instructor for PHY 101 General Physics Fall 2013

AWARDS

- Henry Levinstein Fellowship for Outstanding Senior Graduate Student - Department of Physics, Syracuse University [USD 2000] 2017
- College of Arts and Sciences Fellowship for best performance in Graduate Courses - Syracuse University [USD 1700] 2014
- CSIR/UGC-NET - Junior Research Fellowship (JRF) by Government of India 2013
- Erasmus Mundus Scholarship for pursuing M.S at Sorbonne Université [EUR 12000] 2010
- National Top 25 Students (out of 5153 students) in National Graduate Physics Examination (NGPE) conducted by Indian Association of Physics Teachers (IAPT) 2009
- KVPY (Kishore Vaigyanik Protsahan Yojana) Scholarship by Department of Science & Technology, Government of India [about USD 3500 in two years] 2008
- Merit certificate by University of Delhi (11th in the university out of ≈ 1200 students) 2008
- NIUS (National Initiative on Undergraduate Sciences) Fellowship by Tata Institute of Fundamental Research (TIFR), Mumbai 2008

PROFESSIONAL SERVICES AND COMPUTING GRANTS

- Referee for Nature npj QI (Quantum Information), Physical Review A, Physical Review D, Physical Review Letters, Physical Review Research, European Physical Journal (EPJ), IOP Machine Learning: Science and Technology. *Total papers reviewed:* 10
- Chair of parallel session on ‘Quantum Computation and Information’ in the 40th Annual Lattice conference at Fermilab, USA [1 August 2023]
- Co-organizer of ‘Quantum Computing Bootcamp’ at Jefferson Lab, USA from June 20-30, 2023 funded by Quantum Horizons, Department of Energy (DOE).
- Quantum Fields and Strings Seminar Organizer at Perimeter Institute [January 2020 - March 2021].
- Awarded DiRAC computing grant in 2022 for ≈ 24 M core-hours with David Schaich, Toby Wiseman, Anosh Joseph *and* USQCD computing grants of ≈ 12 M core-hours on Fermilab pi0 machine each year in 2017 & 2018

MENTORING EXPERIENCE

1. Nikhil Kalyanapuram (Perimeter Scholar International (PSI) student at Perimeter Institute \rightarrow PhD Penn State \rightarrow Industry) 2019-2020
2. Navdeep S. Dhindsa (PhD IISER Mohali \rightarrow Postdoc at IMSc, Chennai) 2020-2023
3. Vamika Longia (PhD student at IISER Mohali) 2021-2022
4. Abhishek Samlodia (BS-MS IISER Mohali \rightarrow PhD candidate at Syracuse University) 2021-2024
5. Nikhil Bansal (BS-MS IISER Mohali \rightarrow PhD candidate at University of Warwick)) 2022-2023

6. Shane Thompson (PhD University of Tennessee Knoxville → Postdoc at U.S. Naval Research Lab, Washington DC) 2023-2024
7. Bharath Sambasivam (PhD Syracuse University → Postdoc at Virginia Tech, USA) 2023-2024
8. Ranadeep Roy (PhD student at The Ohio State University) 2023-
9. Victor Ale (PhD student at University of Tennessee Knoxville) 2024-
10. Nora Bauer (PhD student at University of Tennessee Knoxville) 2024-

REFERENCES (IN ALPHABETICAL ORDER)

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[\[smcatter@syr.edu\]](mailto:smcatter@syr.edu)
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