

EMPLOYMENT

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- **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

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- **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

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[[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, and 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, and 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

## TALKS/LECTURES

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43. *Scattering in Ising field theory* | UC BERKELEY/LBNL NUCLEAR THEORY SEMINAR, BERKELEY, CA, USA [ONLINE] | January 29, 2025 [Slides]
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

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- 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

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- 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 (11<sup>th</sup> in the university out of  $\approx 1200$  students) 2008
- NIUS (National Initiative on Undergraduate Sciences) Fellowship by Tata Institute of Fundamental Research (TIFR), Mumbai 2008

## PROFESSIONAL SERVICES AND COMPUTING GRANTS

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- Referee for Nature npj QI (Quantum Information), Physical Review A, Physical Review D, Physical Review Letters, and 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  $\approx 24$ M core-hours with David Schaich, Toby Wiseman, Anosh Joseph *and* USQCD computing grants of  $\approx 12$ M core-hours on Fermilab pi0 machine each year in 2017 & 2018



## MENTORING EXPERIENCE

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1. Nikhil Kalyanapuram (Perimeter Scholar International (PSI) student at Perimeter Institute → PhD Penn State → Industry) 2019-2020
2. Navdeep S. Dhindsa (PhD IISER Mohali → Postdoc at IMSc, Chennai) 2020-2023
3. Vamika Longia (PhD student at IISER Mohali) 2021-2022
4. Abhishek Samlodia (BS-MS IISER Mohali → PhD candidate at Syracuse University) 2021-
5. Nikhil Bansal (BS-MS IISER Mohali) 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-
8. Ranadeep Roy (PhD student at The Ohio State University) 2023-
9. Victor Ale (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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