

EMPLOYMENT

- | | |
|---|---|
| • Jefferson Lab (JLab)
Postdoctoral Researcher Staff | <i>September 2022 - today</i>
Newport News, VA, USA |
| • Perimeter Institute for Theoretical Physics
Postdoctoral Fellow | <i>September 2019 - August 2022</i>
Waterloo, ON, CANADA |

EDUCATION

- | | |
|---|-----------------------------------|
| • Ph.D. Physics , Syracuse University, NY, USA
GPA: 3.86/4.0 <u>Advisor</u> : Simon Catterall | <i>August 2013 - May 2019</i> |
| • M.Sc. Physics , St. Xavier's College & Bose Institute, Kolkata, INDIA | <i>August 2011 - May 2013</i> |
| • M.S. in Nanomaterials , Sorbonne Université, Paris, FRANCE | <i>September 2010 - July 2011</i> |
| • B.Sc. Physics (Honours) , St. Stephen's College, Delhi, INDIA | <i>July 2007 - May 2010</i> |

PUBLICATIONS

h-index: 11, Citations: 315+ [[Google Scholar](#), [INSPIRE HEP](#), [ORCID](#), [arXiv](#)]
(Authors are mostly listed in alphabetical order)

32. *Sparsity dependence of Krylov state complexity in the SYK model*
(to submit, *Phys. Rev. D*)
[arXiv:2407.20569](#)
Raghav G. Jha, R. Roy
31. *Thermal state preparation of the SYK model using a variational quantum algorithm*
(in review, *Phys. Rev. D*)
[arXiv:2406.15545](#)
J. Araz, **Raghav G. Jha**, F. Ringer, B. Sambasivam
30. *$SU(2)$ principal chiral model with tensor renormalization group on a cubic lattice*
(in review, *Phys. Rev. D*)
[arXiv:2406.10081](#)
S. Akiyama, **Raghav G. Jha**, J. U-Yockey
29. *Phase diagram of generalized XY model using tensor renormalization group*
(accepted, *Phys. Rev. D*)
[arXiv:2404.17504](#)
A. Samlodia, V. Longia, **Raghav G. Jha**, A. Joseph
28. *Hamiltonian simulation of minimal holographic sparsified SYK model*
(in review, *Phys. Rev. D*)
[arXiv:2404.14784](#)
Raghav G. Jha
27. *Tensor renormalization group study of 3D principal chiral model*
[PoS LATTICE2023 \(2023\) 355](#)
[arXiv:2312.11649](#)
S. Akiyama, **Raghav G. Jha**, J. U-Yockey
26. *Phase diagram of two-dimensional $SU(N)$ super-Yang-Mills theory with four supercharges*
(accepted, *Phys. Rev. D*)
[arXiv:2312.04980](#)
N. S. Dhindsa, **Raghav G. Jha**, A. Joseph, D. Schaich

25. *Sachdev-Ye-Kitaev model on a noisy quantum computer*
[arXiv:2311.17991](#), *Phys. Rev. D* **109**, 105002 (2024)
M. Asaduzzaman, **Raghav G. Jha**, B. 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, F. Ringer, G. Siopsis, S. Thompson
23. *Toward quantum computations of the $O(3)$ model using qumodes*
PoS LATTICE2023 (2023) 230
[arXiv:2308.06946](#)
Raghav G. Jha, F. Ringer, G. Siopsis, S. Thompson
22. *GPU-Acceleration of Tensor Renormalization with PyTorch using CUDA*
[arXiv:2306.00358](#), *Computer Physics Communications* 294 (2024) 108941
Raghav G. Jha, A. 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. (2023)
Raghav G. Jha
19. *Non-perturbative phase structure of the bosonic BMN matrix model*
[arXiv:2201.08791](#), *JHEP* 05 (2022) 169
N. S. Dhindsa, **Raghav G. Jha**, A. Samlodia, A. Joseph, and D. Schaich
18. *Thermal phase structure of dimensionally reduced super-Yang–Mills*
[arXiv:2201.03097](#)
D. Schaich, **Raghav G. Jha**, A. 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](#)
N. S. Dhindsa, **Raghav G. Jha**, A. Joseph, and D. Schaich
14. *Tensor renormalization group study of the 3d $O(2)$ model*
[arXiv:2105.08066](#), *Phys. Rev. D* 104, 094517 (2021)
J. Bloch, **Raghav G. Jha**, R. Lohmayer, M. Meister
13. *Three-dimensional super-Yang–Mills theory on the lattice and dual black branes*
[arXiv:2010.00026](#), *Phys. Rev. D* 102, 106009 (2020)
S. Catterall, J. Giedt, **Raghav G. Jha**, D. Schaich, T. Wiseman
12. *Positive geometries for all scalar theories from twisted intersection theory*
[arXiv:2006.15359](#), *Phys. Rev. Research* 2, 033119 (2020)
Raghav G. Jha, N. Kalyanapuram
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
D. Schaich, **Raghav G. Jha**, A. 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)
A. Bazavov, S. Catterall, **Raghav G. Jha**, J. U-Yockey
7. *Lattice quantum gravity with scalar fields*
[arXiv:1810.09946](#), PoS LATTICE2018 (2019) 043
Raghav G. Jha, J. Laiho, J. U-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)
S. Catterall, J 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)
S. Catterall, **Raghav G. Jha**, A. Joseph
3. *Truncation of lattice $\mathcal{N} = 4$ super Yang–Mills*
EPJ Web of Conferences 175, 11008 (2018)
S. Catterall, J 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, S. Catterall, D. Schaich, T. Wiseman
1. *Testing holography using lattice super–Yang–Mills on a 2-torus*
[arXiv:1709.07025](#), Phys. Rev. D 97, 086020 (2018)
S. Catterall, **Raghav G. Jha**, D. Schaich, T. Wiseman

TALKS/LECTURES

41. *Thermal state preparation and dynamics of random all-to-all fermionic model* (May 07, 2024) -
Talk at Massachusetts Institute of Technology (MIT), C2QA meeting, Boston, USA
40. *SYK model on a noisy quantum computer - dynamics and state preparation* (May 07, 2024) -
Seminar at Mandelstam Institute for Theoretical Physics (MITP) and the National Institute for
Theoretical and Computational Sciences (NITheCS), Johannesburg, South Africa [Online]
[\[YouTube\]](#)
39. *Introduction to tensor networks for classical computing of spin systems and gauge theories* (April
29-30 and May 02, 2024) - Set of four lectures at 14th Jo'burg School on String theory at
University of Pretoria, South Africa [Online]
38. *Quantum computing for quantum many-body systems* (April 17, 2024) - William & Mary, VA,
USA [\[Slides\]](#)
37. *Approaches to universal quantum computing for spin and gauge models* (April 16, 2024) -
University of Iowa - Junior QuLat meeting [Online] [\[Slides\]](#)

36. *Random dense Hamiltonians on current noisy quantum computers* (March 28, 2024) - University of Maryland, USA [[Slides](#)]
35. *Extracting Physics with IBM's 127-qubit quantum processor* (March 13, 2024) - Jefferson Lab, VA, USA [[Slides](#)]
34. *Real-time dynamics of SYK model on a noisy quantum computer* (March 05, 2024) - Workshop on 'Toward quantum simulation of gauge/gravity duality and lattice gauge theory', Queen Mary University of London, UK [Online] [[Slides](#)]
33. *SYK model on a noisy quantum computer* (February 06, 2024) - Indian Institute of Science, Bangalore, India [Online] [[Slides](#)] [[YouTube](#)]
32. *Quantum Computation of the $O(3)$ model using qumodes* (August 02, 2023) - Contributed Talk at Lattice 2023 at Fermilab, USA [[Slides](#)]
31. *Computation with Quantum Mechanics* (June 20, 2023) - Set of two lectures at Quantum Computing Bootcamp 2023, Jefferson Lab, USA [[Resource](#)]
30. *Can quantum computation improve our understanding of quantum fields?* (June 7, 2023) - Set of two lectures at HUGS 2023 Summer School, Jefferson Lab, USA [[YouTube](#), [Part 1](#)] [[Part 2](#)]
29. *Non-linear sigma models using quantum computation* (May 30, 2023) at C2QA Theory and Software Retreat, New York City, USA [[Slides](#)]
28. *Introduction to Quantum Computing methods in Physics* (April 27, 2023) at Tata Institute, Mumbai, India [Online] [[Slides](#)] [[YouTube](#)]
27. *Aspects of classical and quantum computing of quantum many-body systems* (February 10, 2023) at Ashoka University, Sonapat, India [Online] [[Slides](#)]
26. *Classical computation using tensor networks and quantum computation with qubits and qumodes* (November 14, 2022) at Jefferson Lab, USA [[Slides](#)] [[Video](#)]
25. *Application of tensor methods to real-space renormalization and real-time study of field theories* (October 31, 2022) at Brookhaven National Lab (BNL), USA [Online] [[Slides](#)]
24. *New tools for old problems in spin and gauge models on the lattice* (October 12, 2022) at IIT Hyderabad, India [Online] [[Slides](#)]
23. *Some old problems on the lattice using tensors* (August 26, 2022) at ICTS, Bangalore, India during NUMSTRINGS 2022 conference [[YouTube](#)]
22. *Introduction to Quantum Computation using QISKIT* (June 22 and 23, 2022) - Two lectures for Summer School 2022 at Rensselaer Polytechnic Institute, USA [Online] [[Lecture 1 & 2](#)] [[YouTube](#)]
21. *New approach to continuous spin models in two and three dimensions* (May 17, 2022) at Numerical Methods in Theoretical Physics conference, APCTP, Pohang, South Korea [Online] [[Slides](#)] [[YouTube](#)]
20. *Holography with large matrices on the lattice* (March 24, 2022) at Institute of Nuclear Sciences, Universidad Nacional Autónoma de México, Mexico City, Mexico [[Slides](#)]
19. *Large N matrix models using Monte Carlo and Bootstrap* (February 22, 2022) at University of Surrey, Surrey, UK [Online] [[Slides](#)]
18. *Introduction to tensor networks and spin systems* (January 11, 2022) at Azim Premji University, Bengaluru, India

17. *Tensor networks and spin models* (December 7, 2021) at Indian Institute of Science Education and Research (IISER), Mohali, India [[Slides](#)]
16. *Real-space tensor renormalization for spin models in three dimensions* (November 19, 2021) at Perimeter Institute, Waterloo, Canada
15. *Solving matrix models at large and finite N* (June 28 and 29, 2021) - Two lectures for Summer School 2021 at Rensselaer Polytechnic Institute, USA [Online] [[Lecture 1 & 2](#)]
14. *Holographic gauge theories on the lattice* (June 23, 2021) [Online] at Dublin Institute for Advanced Studies, Dublin, Ireland [[Slides](#)] [[YouTube](#)]
13. *Old and new methods for new and old problems in Physics* (March 8, 2021) [Online] at Indian Institute of Technology (IIT) Madras, India [[Slides](#)]
12. *Probing holographic dualities with lattice supersymmetric Yang-Mills theories* (February 25, 2021) [Online] at Massachusetts Institute of Technology, Boston, USA [[Slides](#)] [[YouTube](#)]
11. *New tool for old problems - Tensor network approach to spin models and gauge theories* (October 14, 2020) [Online] at University of Liverpool, Liverpool, UK [[Slides](#)]
10. *Tensor Networks: Algorithm & Applications* (June 10 and 11, 2020) - Two lectures for CyberTraining Summer School 2020 at Rensselaer Polytechnic Institute, USA [Online due to COVID-19 pandemic] [[Lecture 1 & 2](#)] [[Resource](#)] [[YouTube](#)]
9. *Holographic aspects of supersymmetric gauge theories* (October 4, 2019) at Perimeter Institute, Waterloo, Canada
8. *Numerical Approaches to Holography* (August 28, 2019) at Ashoka University, Sonapat, India [[Slides](#)]
7. *Numerical Approaches to Holography* (August 8, 2019) at Indian Institute of Science Education and Research (IISER) Mohali, India
6. *Holographic dualities and tensor renormalization group study of gauge theories* (March 11, 2019) at Perimeter Institute, Waterloo, Canada [[Video \(PIRSA, 19030108\)](#)]
5. *Supersymmetry breaking and gauge/gravity duality on the lattice* (April 6, 2018) at UC Boulder, Colorado, USA [[Slides](#)]
4. *Recent results from lattice supersymmetry in $2 \leq d < 4$ dimensions* (January 31, 2018) at ICTS, Bangalore, India [[YouTube](#)]
3. *Testing gauge/gravity duality using lattice simulations* (June 22, 2017) - Contributed Talk at Lattice 2017 Granada, Spain [[Slides](#)]
2. *Testing holography through lattice simulations* (April 4, 2017) at Yukawa Institute for Theoretical Physics, Kyoto, Japan [[Slides](#)]
1. *Supersymmetry on the lattice* (April 17, 2016) at April Meeting 2016 - Salt Lake City, Utah, USA [[Slides](#)]

TEACHING EXPERIENCE

- Recitation Instructor for PHY 216 (General Physics II for Honors and Majors) 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 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 introductory 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 UPMC, University of Paris VI [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

TECHNICAL SKILLS

- **Programming and Softwares:** C/C++, Python, Julia, Matlab, Bash, CUDA, MATHEMATICA, L^AT_EX, PyTorch, TensorFlow, SciKit-Learn, Keras, Pandas.
- **Quantum Programming:** Qiskit (IBM), Cirq (Google), PennyLane, and Strawberry Fields (Xanadu)

PROFESSIONAL SERVICES AND COMPUTING GRANTS

- Referee for Nature npj QI (Quantum Information) (since 2024), Physical Review D, Physical Review Letters, and Physical Review Research (since 2020), European Physical Journal (EPJ) (since 2022), IOP Machine Learning: Science and Technology (since 2021). Total papers reviewed: 8
- 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 $\approx 24\text{M}$ core-hours with D. Schaich, T. Wiseman, A. Joseph
- Awarded USQCD computing grants of $\approx 12\text{M}$ core-hours on Fermilab pi0 machine each year in 2017 & 2018 with S. Catterall, D. Schaich, and J. Giedt.

MENTORSHIP EXPERIENCE

1. Nikhil Kalyanapuram (Perimeter Scholar International (PSI) student at Perimeter Institute \rightarrow PhD Penn State \rightarrow Industry) [[1 publication](#)] 2019-2020
2. Navdeep S. Dhindsa (PhD IISER Mohali \rightarrow Postdoc at IMSc, Chennai) [[2 publications](#), [1 in preparation](#)] 2020-2023
3. Vamika Longia (PhD student at IISER Mohali) [[1 publication](#)] 2021-2022
4. Abhishek Samlodia (IISER Mohali \rightarrow PhD candidate at Syracuse University) [[3 publications](#)] 2021-
5. Nikhil Bansal (BS-MS IISER Mohali) [[1 in preparation](#)] 2022-2023
6. Shane Thompson (PhD University of Tennessee Knoxville \rightarrow Postdoc at U.S. Naval Research Lab, Washington DC) [[1 publication](#), [2 in preparation](#)] 2023- 2024
7. Bharath Sambasivam (PhD Syracuse University \rightarrow Postdoc at Virginia Tech, USA) [[2 publications](#), [1 in preparation](#)] 2023-
8. Ranadeep Roy (PhD student at The Ohio State University) [[1 publication](#)] 2023-
9. Victor Ale (PhD student at University of Tennessee Knoxville) [[2 in preparation](#)] 2024-

REFERENCES (IN ALPHABETICAL ORDER)

- SIMON CATTERALL
Professor, Syracuse University, USA [smcatter@syr.edu]
- ROBERT EDWARDS
Theory Center Senior Staff, Jefferson Lab, USA [edwards@jlab.org]
- JOHN PRESKILL
Richard P. Feynman Professor of Theoretical Physics, Caltech, USA [preskill@caltech.edu]
- GEORGE SIOPSIS
Professor, University of Tennessee Knoxville, USA [siopsis@tennessee.edu]
- PEDRO VIEIRA
Faculty at Perimeter Institute, Canada & ICTP-SAIFR, São Paulo, Brazil [pedrogvieira@gmail.com]
- TOBY WISEMAN
Professor of Theoretical Physics, Imperial College, London, UK [t.wiseman@imperial.ac.uk]