

## EMPLOYMENT

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- **Jefferson 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*  
Thesis title: Holography, large  $N$ , and supersymmetry on the lattice  
Advisor: Simon Catterall.
- **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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Total citations: 276, h-index: 11 [[Google Scholar](#), [INSPIRE HEP](#), [arXiv](#)]  
(Authors are listed in alphabetical order)

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*  
(Submitted to JHEP)  
[arXiv:2312.04980](#)  
N. S. Dhindsa, **Raghav G. Jha**, A. Joseph, D. Schaich
25. *A model of quantum gravity on a noisy quantum computer*  
(Preparing to submit to Phys. Rev.)  
[arXiv:2311.17991](#)  
M. Asaduzzaman, **Raghav G. Jha**, B. Sambasivam
24. *Continuous variable quantum computation of the  $O(3)$  model in 1+1 dimensions*  
(Submitted to Phys. Rev. A)  
[arXiv:2310.12512](#)  
**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

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## TALKS/LECTURES

35. *Extracting some 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](#)]
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](#)]
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

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- 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

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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 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 (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

## TECHNICAL SKILLS

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- **Programming and Softwares:** C/C++, Python, Julia, Matlab, Bash, CUDA, MATHEMATICA, L<sup>A</sup>T<sub>E</sub>X, PyTorch, TensorFlow, SciKit-Learn, Keras, Pandas.
- **Quantum Programming:** QisKit (IBM), Cirq (Google), PennyLane, and Strawberry Fields (Xanadu)
- **Tools & OS:** Git, Jupyter, Google Colab, Linux, Mac OS, Windows

## PROFESSIONAL SERVICES AND GRANTS

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- 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).
- Referee for Physical Review D and Physical Review Letters (since 2020), European Physical Journal (EPJ) (since 2022), IOP Machine Learning: Science and Technology (since 2021). Total papers reviewed: 5
- 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 D. Schaich, T. Wiseman, A. Joseph
- Awarded USQCD computing grants of  $\approx 12$ M core-hours on Fermilab pi0 machine each year in 2017 & 2018 with S. Catterall, D. Schaich, and J. Giedt.

## MENTORSHIP EXPERIENCE

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1. Nikhil Kalyanapuram (Perimeter Scholar International (PSI) student at Perimeter Institute → PhD Penn State → Industry) [[1 publication](#)] 2019-2020
2. Navdeep Singh Dhindsa (PhD IISER Mohali → Postdoc at IMSc, Chennai, India) [[2 publications](#)] 2020-2023
3. Vamika Longia (PhD student at IISER Mohali) [[1 manuscript in preparation](#)] 2021-2022
4. Abhishek Samlodia (IISER Mohali → PhD candidate at Syracuse University) [[2 publications](#)] 2021-
5. Nikhil Bansal (BS-MS IISER Mohali) 2022-2023
6. Bharath Sambasivam (PhD student at Syracuse University) [[1 publication](#)] 2023-

## REFERENCES

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- SIMON CATTERALL - Professor, Syracuse University, NY, USA  
[smcatter@syrr.edu](mailto:smcatter@syrr.edu)
- TOBY WISEMAN - Professor of Theoretical Physics, Imperial College, London, UK  
[t.wiseman@imperial.ac.uk](mailto:t.wiseman@imperial.ac.uk)
- PEDRO VIEIRA - Faculty at Perimeter Institute, Waterloo, Canada & ICTP-SAIFR, São Paulo, Brazil  
[pedroqvieira@gmail.com](mailto:pedroqvieira@gmail.com)
- ROBERT EDWARDS - Theory Center Senior Staff, Jefferson Lab  
[edwards@jlab.org](mailto:edwards@jlab.org)
- DAVID SCHAICH - Lecturer in Theoretical Particle Physics, University of Liverpool, Liverpool, UK  
[david.schaich@liverpool.ac.uk](mailto:david.schaich@liverpool.ac.uk)
- GEORGE SIOPSIS - Professor, University of Tennessee Knoxville  
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- A. P. BALACHANDRAN - Emeritus Professor of Physics, Syracuse University, NY, USA  
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