





# Raghav Govind JHA

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iNSPIRE-HEP, ORCID: [0000-0003-2933-0102](https://orcid.org/0000-0003-2933-0102)

 Date of Birth: January 23, 1989    Citizenship: Indian

## Employment

from September 2022	Postdoctoral Researcher, Thomas Jefferson National Accelerator Facility (JLab), VA, USA
2019 - 2022	Postdoctoral Fellow, Perimeter Institute for Theoretical Physics, Canada

## Education

2013 – 2019	<b>Ph.D. Physics</b> , <i>Syracuse University</i> , Syracuse, New York, USA Thesis: <a href="#">Holography, large N, and supersymmetry on the lattice</a> defended on April 2, 2019
2011 – 2013	<b>M.Sc. Physics</b> , <i>St. Xavier's College &amp; Bose Institute</i> , Kolkata, India
2010 – 2011	<b>M.S. in Nanomaterials</b> , <i>Sorbonne Université</i> , Paris, France <sup>1</sup>
2007 – 2010	<b>B.Sc. Physics (Honours)</b> , <i>St. Stephen's College</i> , Delhi, India

## Publications and preprints (Authors are mostly listed in alphabetical order)

Total citations<sup>2</sup> (as per iNSPIRE HEP): 175, h-index: 8

1. Non-perturbative phase structure of the bosonic BMN matrix model  
[arXiv:2201.08791](#), *JHEP* 05 (2022) 169  
N. S. Dhindsa, R. G. Jha, A. Samlodia, A. Joseph, and D. Schaich
2. Thermal phase structure of dimensionally reduced super-Yang–Mills  
[arXiv:2201.03097](#)  
D. Schaich, R. G. Jha, A. Joseph
3. Tensor renormalization of three-dimensional Potts model  
[arXiv:2201.01789](#)  
R. G. Jha
4. Introduction to Monte Carlo for Matrix Models  
[arXiv:2111.02410](#), *SciPost Phys. Lect. Notes* 46 (2022)  
R. G. Jha
5. Large-N limit of two-dimensional Yang–Mills theory with four supercharges  
[arXiv:2109.01001](#)  
N. S. Dhindsa, R. G. Jha, A. Joseph, and D. Schaich
6. Tensor renormalization group study of the 3d O(2) model  
[arXiv:2105.08066](#), *Phys. Rev. D* 104, 094517 (2021)  
J. Bloch, R. G. Jha, R. Lohmayer, M. Meister

1. Before 2017, it was called UPMC Paris VI

2. For paper-wise citation, please refer to iNSPIRE

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7. 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, R. G. Jha, D. Schaich, T. Wiseman
  8. Positive geometries for all scalar theories from twisted intersection theory  
[arXiv:2006.15359](#), *Phys. Rev. Research* **2**, 033119 (2020)  
R. G. Jha, N. Kalyanapuram
  9. Critical analysis of two-dimensional classical XY model  
[arXiv:2004.06314](#), *J. Stat. Mech.* (2020) 083203  
R. G. Jha
  10. Thermal phase structure of a supersymmetric matrix model  
[arXiv:2003.01298](#), *PoS LATTICE2019* (2020) 069  
D. Schaich, R. G. Jha, A. Joseph
  11. Finite N unitary matrix models  
[arXiv:2003.00341](#)  
R. G. Jha
  12. 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, R. G. Jha, J. U-Yockey
  13. Lattice quantum gravity with scalar fields  
[arXiv:1810.09946](#), *PoS LATTICE2018* (2019) 043  
R. G. Jha, J. Laiho, J. U-Yockey
  14. The properties of D1-branes from lattice super Yang–Mills theory using gauge/gravity duality  
[arXiv:1809.00797](#), *PoS LATTICE2018* (2019) 308  
R. G. Jha
  15. 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, R. G. Jha
  16. Nonperturbative study of dynamical SUSY breaking in  $\mathcal{N} = (2, 2)$  Yang-Mills  
[arXiv:1801.00012](#), *Phys. Rev. D* **97**, 054504 (2018)  
S. Catterall, R. G. Jha, A. Joseph
  17. Truncation of lattice  $\mathcal{N} = 4$  super Yang-Mills  
*EPJ Web of Conferences* **175**, 11008 (2018)  
S. Catterall, J. Giedt, R. G. Jha
  18. Testing the holographic principle using lattice simulations  
[arXiv:1710.06398](#), *EPJ Web of Conferences* **175**, 08004 (2018)  
R. G. Jha, S. Catterall, D. Schaich, T. Wiseman
  19. Testing holography using lattice super-Yang-Mills on a 2-torus  
[arXiv:1709.07025](#), *Phys. Rev. D* **97**, 086020 (2018)  
S. Catterall, R. G. Jha, D. Schaich, T. Wiseman

### Invited Talks/Seminars/School Lectures

1. Some old problems on the lattice using tensors (August 26, 2022) at ICTS, Bengaluru, India [[Video \(YouTube\)](#)]
2. 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](#)]
3. 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\(PDF\)](#)]
4. Holography with large matrices on the lattice (March 24, 2022) at Institute of Nuclear Sciences, Universidad Nacional Autónoma de México, Mexico City, Mexico [[Slides\(PDF\)](#)]
5. Large N matrix models using Monte Carlo and Bootstrap (February 22, 2022) at University of Surrey, Surrey, UK [Online] [[Slides\(PDF\)](#)]
6. Introduction to tensor networks and spin systems (January 11, 2022) at Azim Premji University, Bengaluru, India
7. Tensor networks and spin models (December 7, 2021) at Indian Institute of Science Education and Research (IISER), Mohali, India [[Slides\(PDF\)](#)]
8. Real-space tensor renormalization for spin models in three dimensions (November 19, 2021) at Perimeter Institute, Waterloo, Canada
9. 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](#)]
10. Holographic gauge theories on the lattice at (June 23, 2021) [Online] at Dublin Institute for Advanced Studies, Dublin, Ireland [[Slides\(PDF\)](#)] [[Video \(YouTube\)](#)]
11. Old and new methods for new and old problems in Physics (March 8, 2021) [Online] at Indian Institute of Technology (IIT) Madras, India [[Slides\(PDF\)](#)]
12. Probing holographic dualities with lattice supersymmetric Yang-Mills theories (February 25, 2021) [Online] at Massachusetts Institute of Technology, Boston, USA [[Slides\(PDF\)](#)] [[Video \(YouTube\)](#)]
13. 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\(PDF\)](#)]
14. 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](#)]
15. Numerical Approaches to Holography (August 28, 2019) at Ashoka University, Sonapat, India [[Slides\(PDF\)](#)]
16. Numerical Approaches to Holography (August 8, 2019) at Indian Institute of Science Education and Research (IISER) Mohali, India
17. Holographic dualities and tensor renormalization group study of gauge theories (March 11, 2019) at Perimeter Institute, Waterloo, Canada [[Video \(PIRSA\)](#)]
18. Supersymmetry breaking and gauge/gravity duality on the lattice (April 6, 2018) at UC Boulder, Colorado, USA [[Slides\(PDF\)](#)]

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19. Recent results from lattice supersymmetry in  $2 \leq d < 4$  dimensions (January 31, 2018) at ICTS, Bengaluru, India [[Video \(YouTube\)](#)]
  20. Testing holography through lattice simulations (April 4, 2017) at Yukawa Institute for Theoretical Physics, Kyoto, Japan [[Slides\(PDF\)](#)]
  21. Supersymmetry on the lattice (April 17, 2016) at April Meeting 2016 - Salt Lake City, Utah, USA [[Slides\(PDF\)](#)]

### Contributed Talks and Posters

1. Testing holographic principle through lattice studies (June 22, 2017) at Lattice 2017, Granada, Spain
2. Lattice quantum gravity with scalar fields (July 23, 2018) at Lattice 2018, East Lansing, Michigan, USA
3. The properties of D1-branes from lattice super Yang–Mills theory using gauge/gravity duality (24 July 2018) at Lattice 2018, 36<sup>th</sup> Annual International Symposium on Lattice Field Theory [Poster]

### 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) 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) 2015
  - > Recitation Instructor for PHY 211 General Physics I 2014
  - > Lab Instructor for PHY 101 General Physics Fall 2013

### Academic 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

### Computer Skills

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- > Classical: C/C++, Python, Julia, Matlab, Mathematica,  $\text{\LaTeX}$ , and Bash
  - > Quantum: QisKit (IBM), Cirq (Google)

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## Professional Services and Grants

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- › Quantum Fields and Strings Seminar Organizer at Perimeter Institute [January 2020 - March 2021].
- › Referee for Physical Review D and Physical Review Letters (since 2020), European Physical Journal (EPJ) (since 2022), Machine Learning: Science and Technology (an IOP Journal) (since 2021)
- › Awarded DiRAC computing grant in 2022 for  $\approx 24$ M core-hours
- › Awarded USQCD computing grants of  $\approx 12$ M core-hours on Fermilab pi0 machine each year in 2017 & 2018.

## Mentorship Experience

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- › Nikhil Kalyanapuram (Perimeter Scholar International (PSI) student at Perimeter Institute, now PhD candidate at Penn State) 2019-2020
- › Navdeep Singh Dhindsa (PhD student at IISER Mohali) 2020-
- › Abhishek Samlodia (BS-MS student at IISER Mohali, now PhD candidate at Syracuse University) 2021-
- › Nikhil Bansal (BS-MS student at IISER Mohali) 2022-












## Work in progress

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- › Scattering in Ising Field Theory using Matrix Product States (MPS) [Expected in 2022]
- › Phase transition in  $\mathcal{N} = (2, 2)$  SYM at large  $N$  and finite temperatures [Expected in 2022]
- › Nonperturbative study of BMN matrix model at finite couplings at large  $N$  [Expected in 2022]
- › Tensor renormalization group approach to generalized XY model [Expected in 2022 or 2023]
- › Parallel software for large  $N$  supersymmetric gauge theories [Expected in 2023]

## References

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1. Simon Catterall - Professor of Physics, Syracuse University, NY, USA  
 [smcatter@syr.edu](mailto:smcatter@syr.edu)  +13154435978
2. Toby Wiseman - Professor of Theoretical Physics, Imperial College, London, UK  
 [t.wiseman@imperial.ac.uk](mailto:t.wiseman@imperial.ac.uk)  +442075947832
3. Pedro Vieira - Faculty at Perimeter Institute, Waterloo, Canada and ICTP-SAIFR, São Paulo, Brazil  
 [pedrogvieira@gmail.com](mailto:pedrogvieira@gmail.com)  +15195697600 (8611)
4. Joel Giedt - Associate Professor, Rensselaer Polytechnic Institute, Troy, NY, USA  
 [giedtj@rpi.edu](mailto:giedtj@rpi.edu)  +15182766455
5. David Schaich - Lecturer in Theoretical Particle Physics, University of Liverpool, Liverpool, UK  
 [david.schaich@liverpool.ac.uk](mailto:david.schaich@liverpool.ac.uk)  +447568168895
6. A. P. Balachandran - Emeritus Professor of Physics, Syracuse University, NY, USA  
 [balachandran38@gmail.com](mailto:balachandran38@gmail.com)

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