

# CURRICULUM VITAE

## ANANDA ROY

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### EDUCATION:

- Ph. D** in Applied Physics (2016), Yale University, USA
- M. S.** in Applied Physics (2013), Yale University, USA
- M. Phil.** in Applied Physics (2013), Yale University, USA
- M. Sc. (Five-year Integrated)** in Physics (2010), Indian Institute of Technology Kanpur, India

### RESEARCH POSITIONS:

1. **Assistant Professor** (Sep 2021 –)  
Department of Physics and Astronomy, Rutgers University
2. **Postdoctoral researcher** (Dec 2018 – Aug 2021)  
Department of Physics, Technische Universität München, Germany  
Advisor: Frank Pollmann
3. **Visiting researcher** (June 2018 – December 2018)  
Institut de Physique Théorique, CEA Saclay, France  
Advisor: Hubert Saleur
4. **Postdoctoral researcher** (September 2016 – May 2018)  
Institute for Quantum Information, RWTH Aachen University, Germany  
Advisor: Barbara M. Terhal and David P. DiVincenzo
5. **Graduate Researcher** (August 2010 – August 2016):  
Department of Applied Physics, Yale University, USA  
Advisor: Michel Devoret and A. Douglas Stone
6. **Research Assistant** (May 2009- January 2010):  
Department of Physics, École Polytechnique Fédérale de Lausanne, Switzerland  
Advisor: Mikhail Shaposhnikov
7. **Summer Research Assistant** (May 2008- July 2008):  
Department of Physics, École Polytechnique, France  
Advisor: Christoph Kopper

## STUDENTS AND POSTDOCS:

### Graduate students (current):

Chris Lamb, Liam LH Lau, Prathu Narasimhan, Gavin Rockwood, David Rogerson, Madhav Sinha, Yicheng Tang

## GRANTS:

Subaward from Brookhaven National Laboratory (July 2023 – August 2024),  
Original Grant: Spin Chain Bootstrap for Quantum Computation, US Department of Energy

## AWARDS/FELLOWSHIPS:

1. Rutgers Society of Physics Students Outstanding Teacher Award, 2022-2023
2. Simons Junior Faculty Fellowship (September 2021 – August 2024)
3. Alexander von Humboldt Fellowship for Postdoctoral Researchers (2017-2019)
4. Jawaharlal Nehru Memorial Fund Award for best academic performance (2010) at Indian Institute of Technology Kanpur
5. Fellowship to conduct research during the final year of M. Sc. (academic year 2009-2010) at École Polytechnique Fédérale de Lausanne, Switzerland, initiating a student exchange program between Indian Institute of Technology Kanpur and École Polytechnique Fédérale de Lausanne
6. Academic Excellence Award from Indian Institute of Technology Kanpur for the academic years 2006-2007 and 2007-2008
7. Kishore Vaigyanik Protsahan Yojna (KVPY) fellowship for the years 2006-2010 from the Department of Science and Technology, Government of India

## INVITED SEMINARS:

1. *Soliton Confinement in a Quantum Circuit*, Exactly Solved Models and Quantum Computing, Leiden, Netherlands, March 2024
2. *Entanglement Entropy in Conformal Field Theories with Topological Defects*, University of Hamburg, March, 2024
3. *Efficient Quantum Circuits for Simulation of Quantum Field Theories*, Virginia Tech, January, 2024
4. *Efficient Quantum Circuits based on the Quantum Natural Gradient*, Rutgers Computer Science and University of Wuppertal Joint Seminar, November 2023
5. *Efficient Quantum Circuits based on the Quantum Natural Gradient*, Spin Chain Bootstrap Meeting, Brookhaven National Laboratory and Stony Brook University, October 2023
6. *The Next Quantum Revolution: entanglement is not spooky, it's a resource*, Rutgers Society of Physics Students, Rutgers University, April 2023
7. *Analog Simulation of Soliton Confinement in a perturbed sine-Gordon model*, Brookhaven National Laboratory, October 2022
8. *Integrable quantum field theories and quantum electronic circuits*, University of Wuppertal, November 2021
9. *Entanglement in conformal field theories with boundaries and interfaces*, APS Division of Nuclear Physics Fall Meeting, October 2021
10. *Entanglement in conformal field theories with boundaries*, Quantum Field Theory at the

- Boundary, Mainz Virtual Workshop, September 2021
11. *Integrable quantum field theories and quantum electronic circuits*, The Art of Mathematical Physics, Hubert Saleur's 60<sup>th</sup> Birthday Conference, CEA Saclay, September 2021
  12. *Entanglement in critical quantum spin chains with defects*, Condensed Matter Theory Seminar, Rutgers University, September 2021
  13. *Superconducting quantum circuits as analog simulators for quantum fields*, Quantum Simulation of Strong Interactions (QuaSI) Workshop 2, June, 2021
  14. *Simulating quantum field theories with quantum circuits*, University of Washington, March 2020
  15. *The quantum sine-Gordon model with quantum circuits*, Boston University, November 2020
  16. *The quantum sine-Gordon model with quantum circuits*, Exotic Quantum Phases Seminar Series, Budapest University of Technology and Economics, November 2020
  17. *The quantum sine-Gordon model with quantum circuits*, Max Planck Institute for Quantum Optics, September 2020
  18. *The quantum sine-Gordon model with quantum circuits*, Brookhaven National Labs, September 2020
  19. *Quantum Electronic Circuit Simulation of Quantum Field Theories*, SISSA/International Center for Theoretical Physics, June 2020
  20. *Simulating Quantum Field Theories with Quantum Circuits*, Max Planck Institute for Gravitational Physics, June 2020
  21. *Quantum Simulation of Integrable Quantum Field Theories*, Yale University, June, 2019
  22. *Quantum Information Processing with Josephson Circuits*, Institut de Physique Théorique, CEA Saclay, April 2019
  23. *Concurrent Remote Entanglement with Continuous Variables*, University of Regensburg, July 2018
  24. *Quantum Phase Transitions of the Majorana Toric Code in the Presence of Cooper-pair tunneling*, Technische Universität München, April 2018
  25. *Concurrent Remote Entanglement with Continuous Variables*, Aachen University, March 2016
  26. *Concurrent Remote Entanglement with Continuous Variables*, McGill University, March 2016

## **PRESENTATIONS AT CONFERENCES AND WORKSHOPS:**

1. *Efficient Quantum Circuits based on the Quantum Natural Gradient*, American Physical Society March Meeting, Minneapolis, MN, March 2024
2. *Spectroscopy of Ising Mesons on a Noisy Quantum Simulator*, American Physical Society Topical Group on Hadronic Physics Workshop, April 2023
3. *Entanglement Entropy in the Ising Model with Topological Defects*, American Physical Society March Meeting, Chicago, IL, March 2022
4. *The quantum sine-Gordon model with quantum circuits*, American Physical Society March Meeting, Virtual, March 2021
5. *Topological Phases in a One-dimensional Majorana-Bose-Hubbard Model*, American Physical Society March Meeting, Denver, CO, March 2020
6. *An integrable multi-field sine-Gordon model with Josephson circuits*, American Physical Society March Meeting, Boston, MA, March 2019
7. *An integrable multi-field sine-Gordon model with Josephson circuits*, Deutsche Physikalische Gesellschaft Meeting, Regensburg, Germany, July 2019
8. *Quantum Phase Transitions of the Majorana Toric Code in the Presence of Cooper-pair tunneling*, American Physical Society March Meeting, Los Angeles, CA, March 2018

9. *Continuous Generation and Stabilization of Schrödinger Cat States in a Quantum Circuit*, American Physical Society March Meeting, San Antonio, TX, March 2015

## **ACADEMIC SERVICES:**

Editorial Services: Advisory Editor, Nuclear Physics B

Peer Review: Physical Review Letters, Physical Review A, Physical Review B, Physical Review E, Nature Communications, Nature Physics, Nuclear Physics B, Quantum Information Processing, SciPost Physics

PhD Committee Service: Chad Ummel (Rutgers University)

## **TEACHING FELLOW POSITIONS:**

Advanced Quantum Optics (Winter 2016), Electromagnetism (Spring 2016), Thermal and Statistical Physics (Fall 2015), Quantum Optics (Spring 2014), Ordinary and Partial Differential Equations (Fall 2014), Intensive Introductory Physics (Fall 2013), University Physics (Spring 2013), Noise: Dissipation and Amplification (Fall 2012), Multivariable Calculus for Engineers (Fall 2011)

## **TEACHING:**

1. Introduction to Quantum Computing, Spring 2024, Rutgers University
2. Advanced Topics in Solid State Physics – Quantum Computing, Fall 2023, Rutgers University
3. Classical Mechanics, Fall 2022, Rutgers University
4. Analytical Physics, Spring 2021, Rutgers University
5. Exactly Solvable Models in Statistical Mechanics (Summer 2020 and Summer 2021, Technische Universität München)

## **REFERENCES:**

Prof. A. Douglas Stone (Graduate Advisor)  
Department of Applied Physics,  
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Prof. Barbara Terhal (Post-doctoral advisor)  
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## PUBLICATIONS:

1. *Topological Interfaces of Luttinger Liquids*, **Ananda Roy** and Hubert Saleur, arXiv:2312.05566
2. *Lattice Realizations of Topological Defects in the critical (1+1)-d Three-State Potts Model*, Madhav Sinha, Fei Yan, Linnea Grans-Samuelsson, **Ananda Roy**, Hubert Saleur, arXiv:2310.19703 (2023)
3. *Efficient Quantum Circuits based on the Quantum Natural Gradient*, **Ananda Roy**, Sameer Erramilli, Robert M. Konik, arXiv:2310.10538 (2023)
4. *Simulating the Transverse Field Ising Model on the Kagome Lattice using a Programmable Quantum Annealer*, Pratyankara Narasimhan, Stephan Humeniuk, **Ananda Roy**, Victor Drouin-Touchette, arXiv:2310.06698 (2023)
5. *Quantum Electronic Circuits for Multicritical Ising Models*, **Ananda Roy**, Phys. Rev. B 108, 235414 (2023), arXiv:2306.04346
6. *Ising Meson Spectroscopy on a Noisy Digital Quantum Simulator*, Chris Lamb, Yicheng Tang, Robert Davis and **Ananda Roy**, arXiv:2303.03311 (2023)
7. *Soliton Confinement in a Quantum Circuit*, **Ananda Roy** and Sergei L. Lukyanov, Nature Communications 14, 7433 (2023), arXiv: 2302.06289

8. *Entanglement entropy and negativity in the Ising model with defects*, David Rogerson, Frank Pollmann, and **Ananda Roy**, JHEP 06, 165 (2022), arXiv:2204.03601
9. *Entanglement entropy in critical quantum spin chains with boundaries and defects*, **Ananda Roy** and Hubert Saleur, Book chapter in Entanglement in Spin Chains - Theory and Quantum Technology Applications, Springer, arXiv: 2111.04534, (2021)
10. *Entanglement entropy in the Ising model with topological defects*, **Ananda Roy** and Hubert Saleur, Phys. Rev. Lett. 128, 090603 (2022), arXiv: 2111.04534
11. *The quantum sine-Gordon model with quantum circuits*, **Ananda Roy**, Dirk Schuricht, Johannes Hauschild, Frank Pollmann, and Hubert Saleur, Nucl. Phys. B 968, 115445 (2021), arXiv:2007.06874
12. *Entanglement Hamiltonian of the 1+1-dimensional free, compactified boson conformal field theory*, **Ananda Roy**, Frank Pollmann, and Hubert Saleur, J. Stat. Mech 083104 (2020), arXiv: 2004.14370
13. *Quantum phases of a one-dimensional Majorana-Bose-Hubbard model*, **Ananda Roy**, Johannes Hauschild, and Frank Pollmann, Phys. Rev. B 101, 075419 (2020), arXiv: 1911.08120
14. *The critical properties of the Ising model in hyperbolic space*, Nikolas Breuckmann, Benedikt Placke, and **Ananda Roy**, Phys. Rev. E 101, 022124 (2020), arXiv: 1909.12107
15. *Topological ordering in the Majorana toric code*, Alexander Ziesen, Fabian Hassler, and **Ananda Roy**, Phys. Rev. B 100, 104508 (2019), arXiv: 1906.05158
16. *Quantum electronic circuit simulation of generalized sine-Gordon models*, **Ananda Roy** and Hubert Saleur, Phys. Rev. B 100, 155425 (2019), arXiv:1902.09530
17. *Dynamical structure factor in the non-Abelian phase of the Kitaev honeycomb model in the presence of quenched disorder*, Daniel Otten, **Ananda Roy** and Fabian Hassler, Phys. Rev. B 99, 035137 (2019), arXiv: 1810.01426
18. *Dual Shapiro steps of a phase-slip junction in the presence of a parasitic capacitance*, Lisa Arndt, **Ananda Roy** and Fabian Hassler, Phys. Rev. B. 98, 014925 (2018), arXiv:1802.08123
19. *Quantum-limited parametric amplification with Josephson circuits in the regime of pump depletion*, **Ananda Roy** and Michel Devoret, Phys. Rev. B. 98, 045405 (2018), arXiv: 1801.10115
20. *Charge-response of the Majorana toric code*, **Ananda Roy** and Fabian Hassler, Phys. Rev. B. 97, 024512 (2018), arXiv:1710.04168
21. *Quantum phase transitions of the Majorana toric code in the presence of finite Cooper-pair tunneling*, **Ananda Roy**, Barbara M. Terhal, and Fabian Hassler, Phys. Rev. Lett. 119, 180508 (2017), arXiv: 1705.02864

22. *Topological Quantum Computing*, **Ananda Roy** and David P. DiVincenzo, in *Topological Matter: Topological Insulators, Skyrmions and Majoranas*, Lecture notes of the 48th IFF Spring School 2017, eds. S. Bluegel, Y. Mokuřsov, T. Schaeppers, and Y. Ando (Forschungszentrum Juelich, Key Technologies, Vol. 139, 2017), Sec. D7, arXiv:1701.05052
23. *Concurrent remote entanglement with quantum error correction against photon losses*, **Ananda Roy**, A. Douglas Stone, and Liang Jiang, *Phys. Rev. A* 94, 032333 (2016)
24. *Introduction to quantum-limited parametric amplification of quantum signals with Josephson circuits*, **Ananda Roy** and Michel Devoret, *Comptes Rendus Physique*, 17, 7, 740 (2016)
25. *Remote entanglement by coherent multiplication of concurrent quantum signals*, **Ananda Roy**, Liang Jiang, A. Douglas Stone, and Michel Devoret, *Phys. Rev. Lett.* 115, 150503 (2015)
26. *Continuous generation and stabilization of mesoscopic field superposition states in a quantum circuit*, **Ananda Roy**, Zaki Leghtas, A. Douglas Stone, Michel Devoret, and Mazyar Mirrahimi, *Phys. Rev. A* 91, 013810 (2015)
27. *Asymmetric frequency conversion in nonlinear systems driven by a biharmonic pump*, Archana Kamal, **Ananda Roy**, John Clarke and Michel Devoret, *Phys. Rev. Lett.* 113, 247003 (2014)
28. *Three-wave mixing with three incoming waves: Signal-Idler Coherent Cancellation and Gain Enhancement in a Parametric Amplifier*, Flavius Schakert, **Ananda Roy**, Michael Hatridge, A. Douglas Stone and Michel Devoret, *Phys. Rev. Lett.* 111, 073903 (2013)
29. *Resonant production of the sterile neutrino dark matter and fine-tunings in the neutrino minimal standard model*, **Ananda Roy** and Mikhail Shaposhnikov, *Phys. Rev. D* 82, 065014 (2010)
30. *Renormalization of masses of sterile neutrinos in the neutrino minimal standard model*, **Ananda Roy**, arXiv:1006.4007