

# ABHIJIT CHAKRABORTY

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[Google Scholar Profile](#)

## Education

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**Ph.D. in Physics**, GPA 4.0/4.0

2017 - 2022

University of Houston, Houston, TX 77004, USA

*Thesis: Conformal Quantum Mechanics and Acceleration Radiation: A Quantum Optics Approach*

**BS-MS Dual Degree in Physics**, GPA 9.6/10

2012 - 2017

Indian Institute of Science Education and Research Kolkata, India

## Research Experience

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**Postdoctoral Fellow**

2022 – Current

Transformative Quantum Technologies, Institute for Quantum Computing,  
ON N2L 3G1, Canada

- Developed applications of classical machine learning (generative models) in quantum computing to improve efficiency of quantum algorithms and tomography.
- Designed new algorithms for simulating Lattice Gauge Theories on available quantum devices like IBM superconducting platform and Innsbruck trapped ion platform.
- 6+ months of experience of collaborating with an experimental group developing neutral atom quantum computers, offering theoretical and computational expertise in simulating quantum system dynamics.
- Mentored 2 undergraduate summer students and 2 undergraduate research students.

**Graduate Research Assistant**

2017 – 2022

University of Houston, TX 77204, USA

- 4+ years of research experience on relativistic quantum information, quantum optics, and ultracold atoms with 8 peer-reviewed publications in reputed journals.
- Co-authored a pedagogical article on ion-trap quantum computation targeting senior undergraduate students in physics, with the goal of bridging the gap between theoretical concepts and experimental platforms.
- 1+ year research experience on modeling the effects of heterogeneity in the firing dynamics of balanced cortical neural networks using analytical and computational methods resulting in a manuscript under preparation.

- Managed collaborative research with professors at Texas A&M University, University of North Carolina at Chapel Hill, and University of San Francisco.
- Co-wrote a grant proposal, which received funding from the Air Force Office of Scientific Research, USA.

### **Master's Thesis**

2016 – 2017

IISER Kolkata, West Bengal, 741246, India

- 1+ year of working experience on dynamical system analysis of dark energy models and cosmology using computational and theoretical methods resulting in 2 peer-reviewed publications in reputed journals.

### **DAAD-WISE Fellowship**

2015

University of Heidelberg, 69117 Heidelberg, Germany

- 3 months research experience on simulations of 3-body encounter of a binary super-massive black hole with stars from a globular cluster.
- Managed and modified 500 GB database containing simulation data.

## **Teaching Experience**

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### **Graduate Teaching Assistant**

2017 – 2022

University of Houston, TX 77004, USA

- Prepared study materials and taught graduate-level quantum computation course.
- Graded graduate-level courses and proctored exams.
- Mentored 2 graduate students and 1 master's student.
- Implemented interactive inquiry-based teaching method for a lab class of 24 students for the course General Physics about experiments on electricity, magnetism, and optics for 8 semesters.
- Instructed undergraduate and graduate-level physics courses including quantum mechanics, electromagnetism, classical mechanics, mathematical methods in physics, and quantum field theory.
- Obtained an average rating of 4.42/5 for teaching, 14% higher than the department average.

### **Undergraduate Teaching Assistant**

2017

IISER Kolkata, West Bengal, 741246, India

- Graded and proctored the exams for the undergraduate course on general relativity.
- Conducted recitation classes on general relativity, providing comprehensive instruction and guidance to students in understanding the principles and concepts of the subject.

## **Leadership and Outreach**

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- Part of the core volunteer team at Sci-Roi Global, a non-profit organization which connects the Indian academic diaspora around the world and help them access job opportunities across academic and private sectors in India and the United States.
- Part of founding members team for the APS Chapters Pilot Program at the University of Houston in 2021 which supports professional development of graduate students and early career scientists in a university. Co-organized a panel discussion on academia and industry job applications in collaboration with APS Women in Physics Society in UH.
- Designed course notes for a graduate-level introductory quantum computation course with a focus on ion traps. This is the first time a Physics course is offered on this topic at the University of Houston to motivate students to pursue this research area. This initiative led to a pedagogical article publication.
- Created and organized the event 'Science-in-a-minute' for explaining science in layman's term in 2018 for Inquivesta at IISER Kolkata, the largest science festival in India at that time.

## Achievements

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- Received *Cullen Graduate Student Success Fellowship* from the University of Houston, 2022.
- Received *DPF Travel Award* and *FGSA Travel Award* for presenting my research in APS April Meeting (International) at New York, 2022.
- *Best poster prize* in Physics department research showcase event, 2022.
- Nominated for the Weinberg award in TSAPS Meeting, 2021.
- *Best poster prize* for graduate research showcase event at University of Houston in 2021.
- Represented Department of Physics at University of Houston in 3-minute thesis competition in 2019.
- Received the prestigious *DAAD-WISE fellowship* for a summer internship at the University of Heidelberg, Germany.
- Received *KVPY scholarship* given by Govt. of India to nurture young talents from 2011-2017.

## Conference and Workshops

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- Participated in the Quantum Simulators for Fundamental Physics workshop in Perimeter Institute for Theoretical Physics, Canada, 2023.
- Invited to present a talk at the University of Houston on practical quantum advantages, 2023.
- Invited to present a talk at the Institute for Quantum Computing, Waterloo, Canada, 2022.
- Presented a talk at the American Physical Society Texas Section meeting (TSAPS), 2021.
- Invited to present a talk at Texas A&M University, 2021.
- Participated in the Summer School on Quantum Information and Quantum Technology, IISER Kolkata, India, 2021.
- Attended and completed the Gravitational Waves Workshop Challenge by LIGO, 2021.
- Presented work in the Zonal meeting of American Physical Society, 2021.
- Work featured in the conference on Unruh radiation at Princeton Center for Theoretical Physics, USA, 2020.
- Presented talk at the Pacific Coast Gravity Meeting, 2020.
- Presented talk at the TSAPS meeting, 2020.

- Participated in the Workshop on Ultra-Quantum Matter at Perimeter Institute, Canada, 2020.
- Invited to present a talk at Texas A&M university, 2019.
- Presented talk at the American Physical Society March meeting, 2019.

## Certificates

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- IBM quantum computing - IBM Certified Associate Developer - Qiskit v0.2x, 2022.
- Udemy - Python for Data Science and Machine Learning Bootcamp, 2021.
- IBM Data Science Professional Certificate (4/10 completed), 2022.
- SQL for Data Science Certificate from UC Davis, 2022.

## Software and Skills

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**Programming Language/Tools:** C, Python, Git, Tensorflow, SQL, Keras, Gnuplot, Qiskit, Mathematica.

**Data Science:** Exploratory Data Analysis, Data Visualization, Machine Learning (Regression, Classification, K-means Clustering, Deep Neural Network), Large Language Models, Quantum Machine Learning.

**Markup Language/Tools:** Tex, Word, Jupyter Notebook.

## List of Publications

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**Note:** For [1, 2, 4 - 9] in the publication list, the author names are alphabetically listed.

1. H. E. Camblong, [A. Chakraborty](#), P. L. Duque, & C. R. Ordóñez, Spectral properties of the symmetry generators of conformal quantum mechanics: a path-integral approach, Journal of Mathematical Physics, 64, 092302 (2023).
2. F. Bernardini, [A. Chakraborty](#), & C. R. Ordóñez, Quantum computing with trapped ions: a beginner's guide, arXiv:2303.16358, European Journal of Physics C, In Press (2023).
3. [A. Chakraborty](#), H. E. Camblong, C. R. Ordóñez, Thermal effect in a causal diamond: open quantum systems approach, Physical Review D, 106, 045027 (2022).
4. A. Azizi, H. E. Camblong, [A. Chakraborty](#), C. R. Ordóñez, & M. O. Scully, Quantum optics meets black hole thermodynamics via conformal quantum mechanics: I. Master equation for acceleration radiation. Physical Review D, 104, 084086 (2021).
5. A. Azizi, H. E. Camblong, [A. Chakraborty](#), C. R. Ordóñez, & M. O. Scully, Quantum optics meets black hole thermodynamics via conformal quantum mechanics: II. Thermodynamics of acceleration radiation. Physical Review D, 104, 084085 (2021).

6. A. Azizi, H. E. Camblong, A. Chakraborty, C. R. Ordóñez, & M. O. Scully, Acceleration radiation of an atom freely falling into a Kerr black hole and near-horizon conformal quantum mechanics. *Physical Review D*, 104, 065006 (2021).
7. H. E. Camblong, A. Chakraborty, W. S. Daza, J. E. Drut, C. L. Lin, & C. R. Ordóñez, Quantum anomaly and thermodynamics of one-dimensional fermions with antisymmetric two-body interactions. *Annals of Physics*, 429, 168466 (2021).
8. H. E. Camblong, A. Chakraborty, & C. R. Ordóñez, Near-horizon aspects of acceleration radiation by free fall of an atom into a black hole. *Physical Review D*, 102, 085010 (2020).
9. H. E. Camblong, A. Chakraborty, W. S. Daza, J. E. Drut, C. L. Lin, & C. R. Ordóñez, Spectral density, Levinson's theorem, and the extra term in the second virial coefficient for the one-dimensional  $\delta$ -function potential. *Physical Review A*, 100, 062110 (2019).
10. A. Chakraborty, A. Ghosh, & N. Banerjee, Dynamical systems analysis of a k-essence model. *Physical Review D*, 99, 103513 (2019). doi: 10.1103/PhysRevD.99.103513
11. A. Chakraborty, N. Banerjee, & A. Ghosh, Thawing versus tracker solutions: a dynamical systems approach. *General Relativity and Gravitation*, 51(1), 5 (2019).