SUCHETANA PAL

CURRICULUM VITAE

INFORMATION

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EDUCATION

Research fellow | ***Quantum Computing*** 2024 – 2025
Center for Quantum Science and Technology (CQST) and Batoi Systems Pvt Ltd Odisha, India

Doctor of Philosophy | ***Physics*** 2015 – 2022
Indian Institute of Science Education and Research Kolkata West Bengal, India

Master of Science | ***Physics*** 2013 – 2015
Savitribai Phule Pune University Pune, India

Bachelor of Science | ***Major: Physics*** 2010 – 2013
Lady Brabourne College, University of Calcutta West Bengal, India

RESEARCH INTERESTS

- My research applies principles from mathematical and theoretical physics to solve practical challenges in quantum information science. I am focused on developing novel methods to enhance the security and reliability of quantum systems, with specific interests in **Quantum Key Distribution (QKD)**, **Post-Quantum Cryptography**, and the **characterization of quantum hardware**.

RESEARCH EXPERIENCE

Postdoctoral experience Industry funded research fellow

Institute CQST, S'O'A
Batoi Systems Pvt Ltd

- Designing a hybrid quantum-classical model for binary image classification, where features are extracted via **quantum unsharp measurements (POVMs)** and subsequently used to train a classical Neural Network.
- Certifying the quality of randomness from **Quantum Random Number Generators (QRNGs)**.
- Applying **Random Matrix Theory (RMT)** for characterizing and detecting noise in quantum channels.

Doctoral Thesis Features of the holographic superconductors

Institute IISER Kolkata

- The unification of all four fundamental interactions remains the most significant challenge. The strong, weak, and electromagnetic interactions can be explained by gauge theories, which are inherently quantum mechanical. On the other hand, gravity is classical in nature. A quantum version of the theory of gravity would help us understand the properties of spacetime (whether it's continuous or discrete), the origin of the universe, and black hole physics in greater depth. Crudely, we can say string theory is a theory of quantum gravity. Currently, superstring theory stands as a leading candidate for such unification. The AdS/CFT correspondence, a consequence of superstring theory, takes us a step closer to achieving this unification. Also known as gauge/gravity duality, AdS/CFT relates string theory to other quantum field theories. This conjecture asserts that a gravity theory in (d+1)-dimensional AdS spacetime (bulk) is equivalent to a gauge theory in d-dimensions (boundary) under specific coupling limits.
  This duality has the remarkable ability to address issues in strongly coupled systems by exploiting the results obtained in a weakly coupled gravitational system. By studying black hole phase transition in dual gravitational theory, it is possible to extract information about phase transitions in strongly coupled systems. The first-order Hawking-Page Phase transition (from AdS-Schwarzschild black hole geometry to thermal AdS spacetime), characterized by discontinuous entropy, is dual to the confinement/deconfinement phase transition in QCD. To describe a second-order phase transition where the change in entropy is continuous, we need to find a transition from one black hole geometry to another. The corresponding dual theory is associated with phase transition in strongly coupled superconductors. This dual description is known as 'Holographic superconductors.' The term 'holographic' is employed because the dual gravity theory exists in one higher spatial dimension. My doctoral thesis "Features of The Holographic Superconductors" covers studies on holographic superconductors which are gravitational duals to strongly coupled high Tc superconductors. It involves a revision of how string theory motivated the AdS/CFT correspondence, a brief review of the AdS/CFT dictionary, and a discussion on how to construct a holographic superconductor model. We have investigated second order phase transition, conductivity, and Meissner like effect in holographic superconductors using several analytical as well as numerical techniques.

PROJECTS

Masters project Quantum random walk
Institute Pune University
- Simulated quantum random walk problem

Other project Analyzing code-mixed sentences
Collaborator Kripabandhu Ghosh, IISER Kolkata
- Provided data (code mixed sentences in English and Spanish) for the computational project

PUBLICATIONS

1. An analytical approach to compute conductivity of p-wave holographic superconductors 2022

Suchetana Pal, Diganta Parai, Sunandan Gangopadhyay
Phys. Rev. D 105, 065015, March-2022

2. Meissner like effect in holographic superconductors with back reaction 2020

Suchetana Pal, Saumya Ghosh, Sunandan Gangopadhyay
Annals of Physics, 414, 168078, March-2020

3. Noncommutative effects on holographic superconductors with power Maxwell electrodynamics 2018

Suchetana Pal, Sunandan Gangopadhyay
Annals of Physics, 388, 472-484, January-2018

4. Effects of massive gravity on s-wave holographic superconductor 2023

Diganta Parai, **Suchetana Pal**, Sunandan Gangopadhyay
International Journal of Modern Physics A, Vol. 38, No. 04n05, 2350032 (2023)

Conferences and Workshops

1. **Quantum Science and Quantum Technology** July. 2025
   Center for Quantum science and Technology, S'O'A, Hybrid mode |Speaker and Organizer
2. **Introduction to quantum computing with Qiskit (IQCQ)** January. 2024
   Center for excellence in quantum technology |Participant
3. **2023-06 NITheCS Mini-school: A short introduction to path integral approach** June. 2023
   Virtual meeting |Participant
4. **Future Trends in Gravitational Physics** Feb. 2022
   Virtual meeting |Delivered a Talk
5. **Current Developments in Quantum Field Theory and Gravity** Dec. 2018
   S. N. Bose National Centre for Basic Sciences, Kolkata, India |Delivered a Talk
6. **Space Astronomy and Telescope Making Workshop** Mar. 2017
   IISER Kolkata, India
7. **Global Initiative of Academic Networks (GIAN)** Dec. 2016
   IISER Kolkata, India
8. **International Conference on Light Quanta : Modern Perspectives & Applications** Dec. 2015
   Physics Department, University of Allahabad, India

Honors and Awards

1. **Senior Research Fellowship** 2017- 2020
   Awarded by Council of Scientific and Industrial Research(**CSIR**),Govt. of India
2. **Junior Research Fellowship** 2015- 2016
   Awarded by Council of Scientific and Industrial Research(**CSIR**),Govt. of India
3. **Qualified eligibility for Lectureship (Physical Sciences) in the National Eligibility Test** 2014
   Conducted by Council of Scientific and Industrial Research (**CSIR**), Govt. of India
4. **Innovation in Science Pursuit for Inspired Research (INSPIRE Scholarship)** 2010- 2015
   Among the **top 1%** students nationwide, awarded from DST, Govt. of India

Teaching Assistantship

1. **Basic Electromagnetism and Optics course** Autumn 2018
   IISER Kolkata, India
2. **Introduction to Computer Programming: python Laboratory course** Spring 2018
   IISER Kolkata, India

Programming skills

Proficient in **Python, Machine learning, Data analysis, Matlab, FORTRAN, C, Wolfram Mathematica**

Language Proficiency

Fluent in **English**

Fluent in **Bengali** and **Hindi** (Indian languages).

Good communication skill in **German** (level A2) and **Spanish**.

INTERESTS

1. **Trekking and Hiking**
   Summited **10 peaks in the Himalayas** (India and Nepal), Highest summited peak Mt. Kanamo (altitude: 5974m)
2. **Rock Climbing**
   Completed a **basic course on rock climbing**, organized by Climbers' Circle.
3. **Other interests**
   Playing chess, Running, and sketching, love interacting with people from different cultural backgrounds.

REFERENCES

1. Prof. P. K. Panigrahi

Department of Physical Sciences

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Siksha 'O' Anusandhan

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2. Prof. Subir Ghosh

Physics and Applied Mathematics Unit

Indian Statistical Institute

Kolkata 700108, India.

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Phone Number: + 91-9830523168

3. Dr. Shreya Banerjee

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