ABHINOVE NAGARAJAN S

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(He/Him)

EDUCATION

Indian Institute of Technology, Guwahati *2020 - 2022*
M.Sc. Physics Cumulative GPA 8.43/10
Dissertation: Superradiance in Black Hole Spacetimes

Loyola College (University of Madras) *2017 - 2020*
B.Sc. Physics Cumulative GPA: 9.33/10

PSBB Senior Secondary School *2016*
All India Senior School Certificate (High School Certificate) Aggregate score 476/500

PUBLICATIONS/PREPRINTS

- Saraswati Devi, **Abhinove Nagarajan S**, Sayan Chakrabarti and Bibhas Ranjan Majhi "Shadow of quantum extended Kruskal black hole and its super-radiance property",
Physics of the Dark Universe Volume 39, February 2023, 101173
- **Abhinove Nagarajan S**, Suddhasattwa Brahma, Jaime Calderón-Figueroa "Graviton Entanglement in de Sitter Spacetimes" (Manuscript in preparation)
- **Abhinove Nagarajan S**, Bibhas Ranjan Majhi, Sayan Chakrabarti "Revisit to thermodynamic description of scalar fluid in scalar-tensor gravity: From equivalent picture of thermodynamic and fluid descriptions of gravitational dynamics" (Manuscript in Preparation)

RESEARCH EXPERIENCE

Indian Institute of Technology, Guwahati Junior Research Fellow
PI(s): Dr. Bibhas Ranjan Majhi, Dr. Sayan Chakrabarti, Department of Physics *September 2022 - Present*

- Applying the fluid/gravity correspondence to study fluid thermodynamics in scalar-tensor gravity
- Utilizing Eckart's thermodynamics to provide an equivalent physical picture between the Einstein and Jordan frame descriptions by redefining the scalar energy momentum tensor
- *Manuscript in preparation*

University of Edinburgh Research Intern (Working Remotely)
PI: Dr. Suddhasattwa Brahma, School of Physics and Astronomy *June 2022 - Present*

- Investigated quantum mechanical aspects of gravitational interaction for massive particles in de Sitter backgrounds using tools from quantum field theory in curved spacetime and quantum information theory
- Determined the entanglement entropy and concurrence generated due to gravity for quantum harmonic oscillators and compared the same between oscillators in de Sitter and Minkowski
- *Manuscript in preparation*

Indian Institute of Technology Guwahati M.Sc. Dissertation
PI: Dr. Sayan Chakrabarti, Department of Physics *July 2021 - April 2022*

- Explored black hole superradiance in various backgrounds and derived the amplification factors analytically and numerically (using Mathematica)
- Investigated superradiance in rotating Ashtekar, Olmedo Singh black holes which include quantum corrections

· Discovered that for small black holes with very high angular momenta, scalar field superradiant amplification in AOS can exceed that of Kerr. Publication can be found here and thesis available here

Institute of Mathematical Sciences Research Intern
PI: Prof Sitabhra Sinha, Department of Physics *June 2021 - February 2022*

· Investigated ordering in the empirical brain network of the Macaque monkey, using the Ising model
· Implemented single spin and clustering algorithms using Monte Carlo methods on Python and Julia to simulate Ising dynamics
· Found that global ordering is preferred by the empirical network only during heightened brain activity, while otherwise undesirable. A report can be found here

Indian Institute of Science Indian Academy of Science Summer Research Fellow
PI: Dr. Arvind Ayyer, Department of Mathematics *April 2019 - June 2019*

· Developed a computer program using Python and SageMath to simulate Markov chains and all permutations of a deck of cards after a riffle shuffle

Indian Institute of Technology, Madras Research Science Initiative Summer Intern
PI: Dr. Rajesh Narayanan, Department of Physics *May 2015 - June 2015*

· Studied various thermodynamic quantities in the critical regime and determined critical exponents using finite size scaling

CONFERENCES AND SUMMER SCHOOLS

· Winter School on Physics of the Early Universe, ICTS Bengaluru, Jan 2022
· Kavli Asian Winter School on Strings, Particles and Cosmology, Jan 2022

RELEVANT COURSEWORK

Quantum Field Theory, Gravitation and Cosmology, High Energy Physics, Quantum Computation and Quantum Information, Statistical Mechanics, Solid State Physics, Electrodynamics I and II

ACADEMIC ACHIEVEMENTS AND HONORS

· Junior Research Fellow - Indian Institute of Technology, Guwahati
· All India Rank 211 among 17000 test takers in national level IIT JAM 2020 exam
· Selected as an Indian Academy of Science, Summer Research Fellow 2019
· Loyola Physics Association - Merit Scholarship

TEACHING AND WORK EXPERIENCE

Ashwa Education Content Development and Facilitator Intern
Formerly Warhorse Innovations Private Limited *October 2018 - March 2020*

· Designed and conducted experimental science classes for a class of 25+ high school students
· Researched and designed course content on scientific thinking, social welfare policy, debate and argumentation

PROGRAMMING SKILLS

- Python - NumPy, Matplotlib, Seaborn, Pandas
- Mathematica
- Julia
- LaTeX