SWAMI VIVEKANANDA UNIVERSITY

NEWSLETTER

SCHOOL OF BASIC SCIENCES

VOL II, ISSUE II

March-April

2025

MESSAGE FROM THE HOD

Dr. SUBHABRATA MONDAL
HOD and Assistant Professor
School of Basic Sciences

It gives me immense pleasure to connect with you through this edition of our newsletter. The School of Basic Sciences continues to uphold its commitment to academic excellence, research, and innovation. Our dedicated faculty and bright students are making remarkable strides in their respective fields, contributing to the ever-expanding frontiers of knowledge. This year, we have witnessed significant achievements, from groundbreaking research publications to student accomplishments in national and international forums. Our department remains focused on fostering a culture of inquiry, curiosity, and collaboration, ensuring that our students receive the best foundation in the fundamental sciences. I take this opportunity to extend my heartfelt gratitude to our faculty, researchers, and students for their unwavering dedication. Let us continue to strive for excellence and work towards making meaningful contributions to science and society.

MESSAGE FROM THE CONVENOR

Dr. KAZI HASIBUR RAHMAN
Assistant Professor
School of Basic Sciences

The School of Basic Sciences is committed to fostering a culture of curiosity, innovation, and academic excellence. As we embark on another exciting semester, I encourage everyone to explore the wonders of science, collaborate across disciplines, and push the boundaries of knowledge. Let’s make the most of the opportunities ahead, whether in the lab, classroom, or beyond. Together, we can achieve remarkable milestones and contribute meaningfully to the scientific community. Wishing you all a productive and inspiring term ahead!

Editor's Note

TEACHER EDITOR'S

We would like to thanks to HOD Sir, Senior Teachers, Members of Editorial team a n d Contributors of articles for their contribution for second edition of Newsletter in 2025.

The content of this Newsletter includes latest developments in Science and interesting Articles.

It is proud moment for us to be part of Editorial team. This Newsletter provides a source of inspiration to students to find absorbing interest in Science.

Dr. Sagar Chakraborty

Assistant Professor
School of Basic Sciences

Mr. Tanmoy Pal

Assistant Professor
School of Basic Sciences

Dr. Shilpa Maity

Assistant Professor
School of Basic Sciences

Events

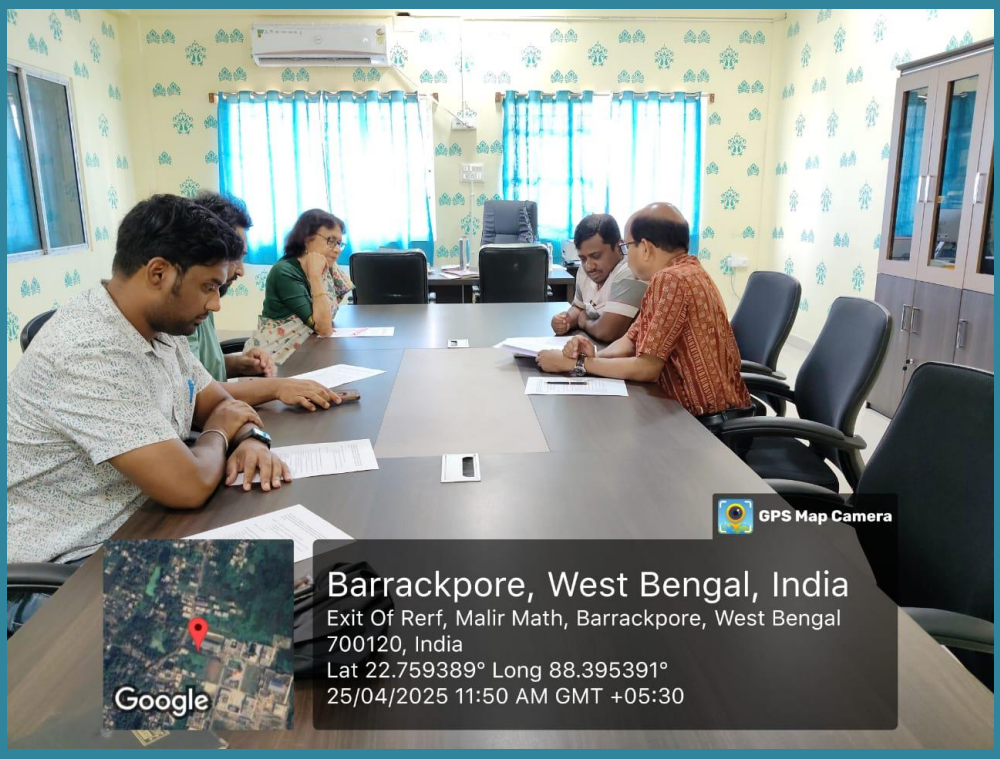
Thesis Submission of First Scholar from Department of Mathematics

5th March, 2025

Thesis Submission of Mr. Asim Biswas from Department of Mathematics, under the supervision of Dr. Subhabrata Mondal.

Board of Studies (BoS) Meetings

25th April, 2025



Board of Studies (BoS) meetings play a pivotal role in shaping academic curricula, recommending textbooks, and ensuring that course structures align with current educational standards. These meetings often address various aspects such as syllabus revisions, inclusion of emerging topics, and the integration of industry-relevant content.

Board of Studies (BoS) Meetings

2nd May, 2025

BOS Meeting. 02.05.2025 in the room of Prof. Anuradha Mukhopadhyay (Director, School of Science, SVU) External Members:Dr. Krishanu Chatterjee (Associate Professor and HOD, Department of Physics, Techno India University) Dr. Rituparna Mondal (Assistant Professor, Department of Physics, Jadavpur University)

Articles

Writeups That Inspire

Journal Article

Effect of fear in a fractional order prey–predator model with time delayed carrying capacity

Results in Control and Optimization 19 (2025) 100567

Contents lists available at ScienceDirect

Results in Control and Optimization

journal homepage: www.elsevier.com/locate/rico

Effect of fear in a fractional order prey–predator model with time delayed carrying capacity

Pramodh Bharati [a,b,1], Subrata Paul [c,1], Animesh Mahata [d,*,1], Supriya Mukherjee [e,1], Subhabrata Mondal [b,1], Banamali Roy [f,1]

ARTICLE INFO

ABSTRACT

1. Introduction

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Publisher : Elsevier
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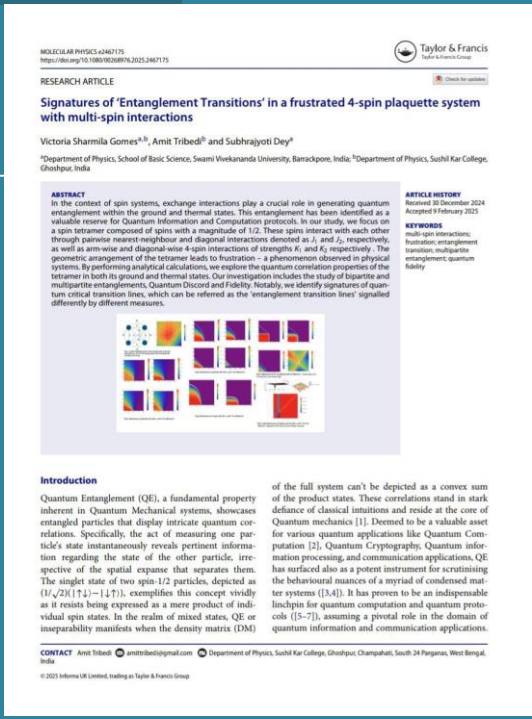
DESCRIPTION

The Caputo technique is used in this article to analyze the fractional-order predator–prey scenario. Incorporating a delayed carrying capacity for the prey population and posing the impact of individual prey fear on predators are two aspects of this. We first provide the model's formulation in terms of an integer order derivative, and subsequently we expand it to a fractional order system in terms of the Caputo derivative. The article contains a number of conclusions about the prerequisites for the model's existence and uniqueness as well as the restrictions on the boundedness and positivity of the solution.

Journal Article

Signatures of ‘Entanglement Transitions’ in a frustrated 4-spin plaquette system with multi-spin interactions



MOLECULAR PHYSICS e2467175
https://doi.org/10.1080/00268976.2025.2467175

Taylor & Francis
Taylor & Francis Group

RESEARCH ARTICLE

Check for updates

Signatures of ‘Entanglement Transitions’ in a frustrated 4-spin plaquette system with multi-spin interactions

Victoria Sharmila Gomes[a,b], Amit Tribedi[b] and Subhrajyoti Dey[a]

[a]Department of Physics, School of Basic Science, Swami Vivekananda University, Barrackpore, India; [b]Department of Physics, Sushil Kar College, Ghoshpur, India

ABSTRACT

In the context of spin systems, exchange interactions play a crucial role in generating quantum entanglement within the ground and thermal states. This entanglement has been identified as a valuable reserve for Quantum Information and Computation protocols. In our study, we focus on a spin tetramer composed of spins with a magnitude of 1/2. These spins interact with each other through pairwise nearest-neighbour and diagonal interactions denoted as J_1 and J_2, respectively, as well as arm-wise and diagonal-wise 4-spin interactions of strengths K_1 and K_2 respectively . The geometric arrangement of the tetramer leads to frustration – a phenomenon observed in physical systems. By performing analytical calculations, we explore the quantum correlation properties of the tetramer in both its ground and thermal states. Our investigation includes the study of bipartite and multipartite entanglements, Quantum Discord and Fidelity. Notably, we identify signatures of quantum critical transition lines, which can be referred as the ‘entanglement transition lines’ signalled differently by different measures.

ARTICLE HISTORY
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KEYWORDS
multi-spin interactions; frustration; entanglement transition; multipartite entanglement; quantum fidelity

Introduction

Quantum Entanglement (QE), a fundamental property inherent in Quantum Mechanical systems, showcases entangled particles that display intricate quantum correlations. Specifically, the act of measuring one particle’s state instantaneously reveals pertinent information regarding the state of the other particle, irrespective of the spatial expanse that separates them. The singlet state of two spin-1/2 particles, depicted as $(1/\sqrt{2})(|\uparrow\downarrow\rangle - |\downarrow\uparrow\rangle)$, exemplifies this concept vividly as it resists being expressed as a mere product of individual spin states. In the realm of mixed states, QE or inseparability manifests when the density matrix (DM) of the full system can’t be depicted as a convex sum of the product states. These correlations stand in stark defiance of classical intuitions and reside at the core of Quantum mechanics [1]. Deemed to be a valuable asset for various quantum applications like Quantum Computation [2], Quantum Cryptography, Quantum information processing, and communication applications, QE has surfaced also as a potent instrument for scrutinising the behavioural nuances of a myriad of condensed matter systems ([3,4]). It has proven to be an indispensable linchpin for quantum computation and quantum protocols ([5–7]), assuming a pivotal role in the domain of quantum information and communication applications.

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