physics:Characterizing post-selected quantum dynamics and its classical counterparts

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1 Cosmic Censorship: the Role of Quantum Physics

Shahar Hod

Metadata

ID: http://arxiv.org/abs/gr-qc/9908004v1
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gr-qc :: 5 pages

Summary

The cosmic censorship hypothesis introduced by Penrose thirty years ago is still one of the most important open questions in *classical* general relativity. The main goal of this paper is to put forward the idea that cosmic censorship is intrinsically a *quantum* phenomena. We construct a gedanken experiment which seems to violate the cosmic censorship principle within the purely *classical* framework of general relativity. We prove, however, that *quantum* physics restores the validity of the conjecture. It is therefore suggested that cosmic censorship might be enforced by a quantum theory of gravity.

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2 iQuantum: A Case for Modeling and Simulation of Quantum Computing Environments

Hoa T. Nguyen, Muhammad Usman, Rajkumar Buyya

Metadata

ID: http://arxiv.org/abs/2303.15729v1
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quant-ph :: 10 pages, 8 figures

Summary

Today's quantum computers are primarily accessible through the cloud and potentially shifting to the edge network in the future. With the rapid advancement and proliferation of quantum computing research worldwide, there has been a considerable increase in demand for using cloud-based quantum computation resources. This demand has highlighted the need for designing efficient and adaptable resource management strategies and service models for quantum computing. However, the limited quantity, quality, and accessibility of quantum resources pose significant challenges to practical research in quantum software and systems. To address these challenges, we propose iQuantum, a first-of-its-kind simulation toolkit that can model hybrid quantum-classical computing environments for prototyping and evaluating system design and scheduling algorithms. This paper presents the quantum computing system model, architectural design, proof-of-concept implementation, potential use cases, and future development of iQuantum. Our proposed iQuantum simulator is anticipated to boost research in quantum software and systems, particularly in the creation and evaluation of policies and algorithms for resource management, job scheduling, and hybrid quantum-classical task orchestration in quantum computing environments integrating edge and cloud resources.

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3 Bose-Einstein condensate of kicked rotators

B. Mieck, R. Graham

Metadata

ID: http://arxiv.org/abs/cond-mat/0405057v1
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cond-mat.stat-mech ::

Summary

A concrete proposal for the realization of a Bose-Einstein condensate of kicked rotators is presented. Studying their dynamics via the one-dimensional Gross-Pitaevskii equation on a ring we point out the existence of a Lax-pair and an infinite countable set of conserved quantities. Under equal conditions we make numerical comparisons of the dynamics and their effective irreversibility in time, of ensembles of chaotic classical-, and BECs of interaction-free quantum-, and interacting quantum kicked rotators.

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4 Information measures and classicality in quantum mechanics

C. Anastopoulos

Metadata

ID: http://arxiv.org/abs/quant-ph/9805055v1
UPDATED: 1998-05-19T12:15:49Z
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quant-ph :: 35 pages, LATEX

Summary

We study information measures in quantu mechanics, with particular emphasis on providing a quantification of the notions of classicality and predictability. Our primary tool is the Shannon - Wehrl entropy I. We give a precise criterion for phase space classicality and argue that in view of this a) I provides a measure of the degree of deviation from classicality for closed system b) I - S (S the von Neumann entropy) plays the same role in open systems We examine particular examples in non-relativistic quantum mechanics. Finally, (this being one of our main motivations) we comment on field classicalisation on early universe cosmology.

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5 Classical and Quantum Problems for Quanputers

Nugzar Makhaldiani

Metadata

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quant-ph :: 8 pages, latex, no figures

Summary

Quantum computers are considered as a part of the family of the reversible, lineary-extended, dynamical systems (Quanputers). For classical problems an operational reformulation is given. A universal algorithm for the solving of classical and quantum problems on quanputers is formulated.

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6 A mathematical foundation of quantum information and quantum computer -on quantum mutual entropy and entanglement-

Masanori Ohya

Metadata

ID: http://arxiv.org/abs/quant-ph/9808051v1
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quant-ph :: 10 pages, Latex2e

Summary

The study of mutual entropy (information) and capacity in classica l system was extensively done after Shannon by several authors like Kolmogor ov and Gelfand. In quantum systems, there have been several definitions of t he mutual entropy for classical input and quantum output. In 1983, the autho r defined the fully quantum mechanical mutual entropy by means of the relati ve entropy of Umegaki, and it has been used to compute the capacity of quant um channel for quantum communication process; quantum input-quantum output. Recently, a correlated state in quantum syatems, so-called quantum entangled state or quantum entanglement, are used to study quntum information, in part icular, quantum computation, quantum teleportation, quantum cryptography. In this paper, we mainly discuss three things below: (1) We point out the di fference between the capacity of quantum channel and that of classical-quant um-classical channel. (2) So far the entangled state is merely defined as a non-separable state, we give a wider definition of the entangled state and c lassify the entangled states into three categories. (3) The quantum mutual e ntropy for an entangled state is discussed. The above (2) and (3) are a join t work with Belavkin.

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7 DynamiQS: Quantum Secure Authentication for Dynamic Charging of Electric Vehicles

Tommaso Bianchi, Alessandro Brighente, Mauro Conti

Metadata

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cs.CR ::

Summary

Dynamic Wireless Power Transfer (DWPT) is a novel technology that allows charging an electric vehicle while driving thanks to a dedicated road infrastructure. DWPT's capabilities in automatically establishing charging sessions and billing without users' intervention make it prone to cybersecurity attacks. Hence, security is essential in preventing fraud, impersonation, and user tracking. To this aim, researchers proposed different solutions for authenticating users. However, recent advancements in quantum computing jeopardize classical public key cryptography, making currently existing solutions in DWPT authentication nonviable. To avoid the resource burden imposed by technology upgrades, it is essential to develop post-quantum-resistant solutions. In this paper, we propose DynamiQS, the first post-quantum secure authentication protocol for dynamic wireless charging. DynamiQS is privacy-preserving and secure against attacks on the DWPT. We leverage an Identity-Based Encryption with Lattices in the Ring Learning With Error framework. Furthermore, we show the possibility of using DynamiQS in a real environment, leveraging the results of cryptographic computation on real constrained devices and simulations. DynamiQS reaches a total time cost of around 281 ms, which is practicable in dynamic charging settings (car and charging infrastructure).

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8 Single- and two-mode quantumness at a beam splitter

Matteo Brunelli, Claudia Benedetti, Stefano Olivares, Alessandro Ferraro, Matteo G. A. Paris

Metadata

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quant-ph :: 13 pages, 10 figures

Summary

In the context of bipartite bosonic systems, two notions of classicality of correlations can be defined: P-classicality, based on the properties of the Glauber-Sudarshan P-function; and C-classicality, based on the entropic quantum discord. It has been shown that these two notions are maximally inequivalent in a static (metric) sense – as they coincide only on a set of states of zero measure. We extend and reinforce quantitatively this inequivalence by addressing the dynamical relation between these types of non-classicality in a paradigmatic quantum-optical setting: the linear mixing at a beam splitter of a single-mode Gaussian state with a thermal reference state. Specifically, we show that almost all P-classical input states generate outputs that are not C-classical. Indeed, for the case of zero thermal reference photons, the more P-classical resources at the input the less C-classicality at the output. In addition, we show that the P-classicality at the input – as quantified by the non-classical depth – does instead determine quantitatively the potential of generating output entanglement. This endows the non-classical depth with a new operational interpretation: it gives the maximum number of thermal reference photons that can be mixed at a beam splitter without destroying the output entanglement.

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9 Fundamentals of quantum mutual entropy and capacity

Masanori Ohya

Metadata

ID: http://arxiv.org/abs/quant-ph/9806042v2
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PUBLISHED: 1998-06-12T07:39:29Z
quant-ph :: 13 pages, Latex

Summary

The study of mutual entropy (information) and capacity in classica l system was extensively done after Shannon by several authors like Kolmogor ov and Gelfand. In quantum systems, there have been several definitions of t he mutual entropy for classical input and quantum output. In 1983, the autho r defined the fully quantum mechanical mutual entropy by means of the relati ve entropy of Umegaki, and he extended it to general quantum systems by the relative entropy of Araki and Uhlmann. When the author introduced the quantu m mutual entropy, he did not indicate that it contains other definitions of the mutual entropy including classical one, so that there exist several misu nderstandings for the use of the mutual entropy (information) to compute the capacity of quantum channels. Therefore in this note we point out that our quantum mutual entropy generalizes others and where the m isuse occurs.

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10 Wigner function non-classicality as indicator of quantum chaos

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Metadata

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quant-ph :: 19 pages including 5 figures

Summary

We propose a Wigner function based parameter that can be used as an indicator of quantum chaos. This parameter is defined as "entropy" from the time-dependence of "non-classicallity" proposed in [**?**]. We perform our considerations for the system of damped nonlinear (Kerr-like) oscillator excited by a series of ultra-short external pulses.