Review of: "Fidelity of quantum blobs"

Boris Atenas Núñez[1]

1 Universidad de Tarapacá

Potential competing interests: No potential competing interests to declare.

This paper is well organized, the english is correct, the equations are correctly written and the references are suitable. This paper delves into the concept of quantum fidelity on complex phase space within the framework of symplectic topology. The research is grounded on a set of foundational postulates, which include the representation of a quantum blob (a maximum-precision snapshot of a quantum state) by its set of symplectic capacities on a complex-valued phase space. It also posits that the symplectic capacity of a quantum blob is constrained from below by the Gromov width.

The paper introduces the probability that a pair of quantum blobs are mistaken for each other upon measurement, given by the Born rule, which involves the overlap between the symplectic capacities of the pair of quantum blobs. This concept is extended to a closed Hamiltonian system where the probability is conserved over time.

One of the key takeaways from the research is the generalization of the classical notion of distinguishability between pairs of states. While classical mechanics permits only two conditions - complete distinction or identity - quantum mechanics, as explored in this paper, allows for a continuous transition of states, from being completely distinct to identical. The larger the calculated probability, the more similar the pairs of states are. This nuanced understanding of states is not possible in classical mechanics.

Overall, the paper presents an insightful study on the limitations of classical distinguishability, and expands our understanding of quantum states, highlighting the role of symplectic topology in interpreting quantum fidelity.
However, I consider that all theoretical works can be enriched if you consider:
Connection to real-world scenarios or experiments: Whenever possible, tying your theoretical analysis to real-world scenarios, experimental results, or potential applications could make your paper more impactful. If any existing experimental data could support your findings, it would be great to mention that.
Comparison with other studies: Compare and contrast your approach and results with previous studies in the field. This can help position your work in the context of existing research.
Implementing these suggestions could offer a more comprehensive and practical understanding of the topic at hand, and I believe it would significantly enhance the overall quality of the work.