



Applications of Information Entropies in Quantum Science

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Message from the Guest Editor

Information entropies, discrete or continuous, have been applied to examine the behavior and to quantify the uncertainty in underlying quantum distributions. The key here is the use of uncertainty as a conceptual tool for understanding quantum behavior. It did not escape attention that the Heisenberg uncertainty relation could be formulated in entropic terms, where the sum of the entropies in position and in momentum space is the information carrier. These applications, initiated in the study of atomic and molecular systems, have since migrated to encompass confined quantum systems, quantification of correlations, complexity studies, Bose–Einstein condensates, open quantum systems, design of functionals in density functional theory, and the theory of gravity as emergent phenomena. The discussion that was initiated with Shannon entropies has now been generalized to consider other uncertainty measures. Going forward, one would expect an increasing interaction between the quantum and other communities, to understand and to quantify quantum uncertainties.





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Message from the Editor-in-Chief

We get more and more evidence that quantum theory is the correct description of nature. It was born a century ago by explaining a few paradoxical results that could not be understood in the framework of classical physics. Today, quantum physics leads technological revolution in metrology, communication, computation, and the design of novel materials. Still it needs more solid foundations, and we need to develop a deeper understanding of how it can be used for new applications.

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