

Logarithm Versus Square Root: Comparing Quantum Fisher Information

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Abstract: In classical statistics, the Fisher information is unique in the sense that it is essentially the only monotone Riemannian metric on the space of probability densities. In quantum theory, this uniqueness breaks down, and there are many natural quantum analogues of the Fisher information, among which two particular versions distinguish themselves by their intuitive and informational significance: The first has its origin in the skew information introduced by Wigner and Yanase in 1963 in the context of quantum measurement, and is defined via the square root of the density operator. The second arises from Helstrom's study of quantum detection in 1967, and is defined via the symmetric logarithmic derivative. The aim of this paper is to compare these two versions of quantum Fisher information, and to establish two informational inequalities relating them.

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Key words: Fisher information, logarithm, square root, measurement, quantum Fisher information

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