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Stochastic Local Distinguishability SOMSHUBHRO BANDYOPADHYAY, Universite de Montreal, Montreal, Canada, ANIRBAN ROY, International Centre for Theoretical Physics, Trieste, Italy, JONATHAN WALGATE, Perimeter Institute, Waterloo, Canada — We pose the question, "when is globally available information is also locally available?", formally as the problem of local state discrimination, and show that the deep qualitative link between local distinguishability and entanglement lies at the level of stochastic rather than deterministic local protocols. We restrict our attention to sets of mutually orthogonal pure quantum states. We define a set of states $\{|\psi_i\rangle\}$ as being*stochastically locally distinguishable* if and only if there is a LOCC protocol whereby the parties can conclusively identify a member of the set with some nonzero probability. If a set is stochastically locally distinguishable, then the complete global information is potentially locally available. If not, the physical information encoded by the system can never be completely locally exposed. Our results are proved true for all orthogonal quantum states regardless of their dimensionality or multipartiality. First, we prove that entanglement is a necessary property of any system whose total global information can never be locally accessed. Second, entangled states that form part of an orthogonal basis can never be locally singled out. Completely entangled bases are, always stochastically locally indistinguishable. Third, we prove that any set of three orthogonal states, is stochastically locally distinguishable.

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