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A new definition of local complexity in quantum field theories CURTIS ASPLUND, San Jos State University, ELISA PANCIU, Franklin Marshall College — We introduce a generalization of entanglement entropy that quantifies the predictive complexity of subsystems of extended quantum systems, including quantum field theories. Interest in finding good notions of quantum complexity is high, including from conformal field theory and holographic gauge-gravity duality. The quantity we introduce is calculated by applying an equivalence relation to states exterior to a subsystem that are dynamically equivalent with regard to that subsystem. The equivalence relation reduces the effective entanglement entropy and results in a measure of the local complexity. This definition is inspired by the "statistical complexity" defined for (non-quantum) stochastic processes. We present calculations of this measure in the Heisenberg model of a spin chain and show the effects of both scattering states and bound states. We then discuss this quantity for quantum field theories and the prospects for it to be a useful new way to analyze the complexities of states and processes in quantum field theories and other quantum systems.

Curtis Asplund
San Jos State University

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