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The second law of black hole mechanics in effective field theory

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The laws of black hole mechanics are an important part of the identification of black holes as thermodynamic objects. If this is correct then these laws should be robust against the inclusion of higher derivative corrections to the Einstein equation. For the first law, this was confirmed by the work of Wald et al in the early 1990s, which provides a definition of the entropy of a stationary black hole solution of any diffeomorphism invariant theory.
But it has remained an open problem to generalize this to obtain a definition of dynamical black hole entropy, that satisfies a second law of black hole mechanics. I shall describe a solution to this problem. The key ingredient is to treat higher derivative terms according to the rules of effective field theory.

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