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Algorithmic Thermodynamics

Algorithmic entropy, as introduced by Kolmogorov, Chaitin and others, can be seen as a special case of entropy as studied in statistical mechanics. This viewpoint lets us apply ideas from thermodynamics to algorithmic information theory. For example, if we take the log runtime, length, and numerical output of a program as observables analogous to the energy E , volume V and number of molecules N in a container of gas, the conjugate variables of these observables are quantities which we may call the "algorithmic temperature" T , "algorithmic pressure" P and "algorithmic potential" μ , and an analogue of the fundamental thermodynamic relation $dE = T dS - P dV + \mu dN$ holds. However, the resulting subject of "algorithmic thermodynamics" remains largely unexplored.