Special Issue

Entropic Forces in Complex Systems

Message from the Guest Editor

Entropic forces have attracted considerable attention as ways to reformulate, retrodict, and perhaps even "explain" classical Newtonian gravity from a rather specific thermodynamic perspective, as Verlinde suggested. Alex Wissner-Gross and Cameron Freer recently proposed "a causal generalization of entropic forces" that they showed can induce certain patterns of behavior with some very striking characteristics. One would not guess those outcomes by looking purely at the constraint that produces them. Underlying this set of intriguing behaviors is simply the computational capability to integrate over all possible futures to maximize the rate of entropy production over an entire trajectory. The observed behavior bears striking resemblance to examples we have seen in swarm intelligence, communities, and in urban studies. The process of sampling alternative paths and behaviors reveals the essential features of quantum mechanics, one of which is the inclination of electrons to "explore all paths" that can be viewed as part of a search process, bounded in space by maximal causal entropy and in time by minimum coordination latency.

Guest Editor

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The concept of entropy is traditionally a quantity in physics that has to do with temperature. However, it is now clear that entropy is deeply related to information theory and the process of inference. As such, entropic techniques have found broad application in the sciences.

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