

Information Dynamics at the Edge of Chaos

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Many evolutionary and self-organization pressures can be characterized information theoretically not only because it's an approximation useful in designing biologically-inspired Artificial Life systems, but also because numerous optimal structures evolve/self-organize in nature when information transfer within certain channels is maximized. Specifically, distributed computation can be described in terms of three fundamental operations: information storage, transfer, and modification. The talk will focus on information dynamics of computation within spatio-temporal systems, quantifying these operations on a local scale in space and time. The approach will be exemplified in different contexts, including cellular automata, modular robotics, computational neuroscience, and random Boolean networks. In addition, we shall discuss a relation between Fisher information and phase transitions / order parameters, drawing from both thermodynamics and statistical estimation theory.