"Entropic Dynamics: from Information Geometry to Quantum Geometry"

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Abstract:

Entropic Dynamics (ED) is a framework in which dynamical laws are derived as an application of entropic methods of inference. The dynamics of the probability distribution is driven by entropy subject to constraints that are eventually codified into the phase of a wave function. The central challenge is to identify the relevant physical constraints and, in particular, to specify how those constraints are themselves updated.

In this talk I describe how the information geometry of the space of probabilities is extended to the ensemble-phase space of probabilities and phases. The result is a highly symmetric Riemannian geometry that incorporates the symplectic and complex structures that characterize the geometry of quantum mechanics. The ED that preserves these structures is a Hamiltonian flow and the simplest Hamiltonian suggested by the extended metric leads to quantum mechanics. Thus, in the entropic dynamics framework, Hamiltonians and complex wave functions arise as the natural consequence of information geometry.

Bio:

Ariel Caticha is professor at the Department of Physics, University at Albany – SUNY. He was born in Uruguay, and educated in Brazil (BS and MS in physics from the Universidade Estadual de Campinas—Unicamp) and in the USA (PhD in physics from the California Institute of Technology).

In recent years his research has focused on the connection between physics and information. Caticha's papers on entropic inference and on its applications to the foundations of statistical mechanics and of quantum mechanics can be found at
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He also devotes a considerable effort to teaching physics. He has received the SUNY Chancellor's Award for Excellence in Teaching and the UAlbany Excellence in Teaching and Advising Award.