A.R. Plastino

Physics Department, University of Pretoria, South Africa

Lecture I:

Generalized maximum q-entropy distributions: some fundamental features and applications.

We first discuss some fundamental aspects of generalized entropic measures, in connection with the maximum entropy representations of parameterized families of probability distributions. We then consider the important particular case of Tsallis entropy, focusing on its application to: (1) classical evolution equations involving nonlinear diffusion processes, and (2) approximate shape invariant potentials in quantum mechanics.

Lecture II:

Generalized conditional and relative q-entropies and the physics of classical and quantum Information.

The physics of Information has been the focus of an increasing research activity in recent years. Generalized q-entropic measures provide useful mathematical tools in these lines of inquire. In the present contribution we apply the generalized q-entropies: (1) to establish certain limitations on the type of information-related processes that can be performed by classical dynamical systems, by considering the behavior of generalized Kullback measures evaluated on pairs of solutions of the associated Liouville equation, and (2) to investigate, through the numerical survey of the concomitant state space, the relationships existing between the relative q-entropies of quantum mixed states of composite systems, on the one hand, and the entanglement properties exhibited by those states, on the other one.