CoE-MaSS weekly seminar series

THE DST-NRF CENTRE OF EXCELLENCE IN MATHEMATICAL AND STATISTICAL SCIENCES (CoE-MaSS) PRESENTS A SEMINAR BY

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"Characteristics of chaos evolution in one-dimensional disordered nonlinear lattices"

Friday, 01 February 2019
10h30-11h30
CoE-MaSS Seminar Room, 1st floor,
Math Sci Bldg, West Campus, Wits University.

We present results on the chaotic behavior of disordered, nonlinear Hamiltonian systems, emphasizing the quantification of chaos strength through the computation of the maximum Lyapunov exponent (mLE, [1] and references therein). In particular, we discuss the dynamics of the disordered variants of two typical lattice models: the Klein-Gordon oscillator chain and the discrete nonlinear Schrödinger equation. Initially we explain how one can use symplectic integration schemes for the efficient integration of the equations of motion, as well as the variational equations needed for the computation of the mLE, of these models [2, 3, 4, 5, 6]. Performing extensive numerical simulations for several initial wave packet profiles, disorder strengths and nonlinearities, we determine the characteristics of chaos for the different chaotic dynamical regimes encountered in such models. We also compute the time evolution of the mLE and the distribution of the associated deviation vector. We emphasize the fact that the observed power law decays of the mLE have exponents different from -1, which is seen in the case of regular motion. This is a clear indication that the dynamics becomes less chaotic, since the constant total energy of the system is shared among more sites, but it does not show any sign of crossing over to regular motion, which could imply a potential halt of spreading [7, 8, 9, 10].
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