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Università di Roma Tor Vergata
Dipartimento di Fisica

Seminar

Monday, 18 May 2015 - h. 14:00

Sala Struttura della Materia (Dipartimento di Fisica)

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"Markov Chain Monte Carlo algorithms and applications in the Ising and the nonlinear sigma model"

Abstract

Markov Chain Monte Carlo algorithms are a major part of modern computational physics as applied in statistical physics. Through these methods we have accomplished to approximate and further understand problems with large number of coupled degrees of freedom, which are impossible to solve or estimate with traditional mathematical methods.
In this seminar we will make a thorough introduction in the ideas and postulates behind Markov Chain Monte Carlo algorithms, which consist of: Markov Process, ergodicity, detailed balance, acceptance ratios and selective probabilities.
Next we will introduce one of the most renowned algorithms of this kind, the Metropolis algorithm, and we will present some of its basic applications in the Ising model. As an extension of the Metropolis algorithm we will present the Wolff algorithm, which is one of the most important single – cluster algorithms of its kind and a comparison of the two will follow.
Finally the classical Heisenberg model will be presented, which is an example of a nonlinear sigma model, together with its simulation using a modified Wolff algorithm.

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