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Departamentos de Física Teórica I y II
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TITULO: Spin glass theory and algorithm on the feedback vertex set problem

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ABSTRACT

A feedback vertex set (FVS) of an undirected graph is a set of vertices that contains at least one vertex of each cycle of the graph.
The feedback vertex set problem consists of constructing a FVS of size less than a certain given value. This combinatorial optimization problem has many practical applications, but it is a NP-complete problem in the worst-case computational complexity.
In this talk I define a spin glass model for the FVS problem and then study this model on the ensemble of finite-connectivity random graphs and finite-dimensional regular lattices. In this model the global cycle constraints are represented through the local constraints on all the edges of the graph, and they are then treated by distributed message-passing procedure, namely belief propagation.
The belief propagation-guided decimation algorithm can construct nearly optimal feedback vertex sets for single random graph instances and regular lattices. I will also briefly discuss a spin glass model for the FVS problem on a directed graph.
I hope this work will be very useful for identifying the set of vertices that contribute most significantly to the dynamical complexity of a large networked system.