

abstract

COMPUTER SCIENCE/DISCRETE MATH I

Topic:

Speaker:

Affiliation:

Date:

Time/Room:

We present a novel tree representation for the hard-core lattice gas model (weighted independent sets) on a general graph. We use this representation to show that for any graph of maximum degree D , the Gibbs measure is unique (the influence of any boundary condition decays with distance) provided that the activity parameter $\lambda < \lambda_c$, where λ_c is the critical activity for the regular tree of degree D . This resolves an open conjecture in statistical physics. Also, since λ_c is known, this extends the known uniqueness regime for many interesting graphs, including the square integer lattice \mathbb{Z}^2 . Our proof is algorithmic in nature, consisting of an elegant recursive procedure for calculating the probabilities that a given vertex is occupied. This procedure yields an efficient deterministic approximation scheme for counting independent sets of any graph of maximum degree D in the above regime of λ . This extends the regime of λ for which an efficient approximation scheme is known to exist, and includes the interesting case of $\lambda=1$ (all independent sets are equally weighted) and maximum degree $D=5$.