Andres Herrera Poyatos (University of Oxford):
Friday, June 11th, 9:00-9:45 EDT.

Title: The complexity of approximating the complex-valued Ising model on bounded degree graphs

Abstract: The Ising model is one of the most well studied particle spin models. In this talk I will describe this model and explore the complexity of approximating its partition function $Z_{\text{Ising}}(G;\beta)$ in terms of the relation between the edge interaction β and an upper bound Δ on the maximum degree of the input graph G. Following recent trends in both statistical physics and algorithmic research, in this talk we allow the edge interaction β to be any complex number. After summarising known results on the complexity of this problem, I will present tractability and intractability results from joint work with Galanis and Golberg. Our tractability result is based on the determination of a zero-free region of the partition function, whereas our intractability result relies on tools of complex dynamics following previous work of Bezakova, Galanis, Goldberg and Stefankovic on the independent set polynomial.