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COLLOQUE 09

MODÉLISATION PROBABILISTE DU COMPORTEMENT DE GRANDS SYSTÈMES PHYSIQUES

VENDREDI 10 JUIN 2016

LA CITÉ, LE CENTRE DES CONGRÈS DE NANTES

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UNIVERSITÉ DE NANTES

COLLOQUE 09

MODÉLISATION PROBABILISTE DU COMPORTEMENT DE GRANDS SYSTÈMES PHYSIQUES

The goal of this conference is to display some recent results of Statistical Mechanics. The focus will be on Random Walks in Random Environment, Random Polymers and Random Graphs. These subjects have attracted the attention of many researchers in these last years. They gave rise to a large number of research projects in many different research fields, as in physics, mathematics, biology and big network. For instance the random graphs are widely used to optimize the behavior of some big network (Internet, social media, traffic networks, etc.). This conference will be an occasion to meet many specialists, French and from abroad, known by the international scientific community for the quality of their researches and their talks.

9h30 – 10h

Opening

10h – 10h50

Exponentiality of the metastable relaxation for the Stochastic Ising Model

Paolo Milanesi, University of Marseille

We consider the Stochastic Ising Model in dimension two in a finite box with periodic boundary conditions and under a small external magnetic field h. We study the relaxation to equilibrium at subcritical temperature when the system is started from the restricted ensemble or from a configuration in a metastable set. It is known that when $h\to 0$ the relaxation time goes essentially as $\exp(\lambda/h)$, where λ depends on the integral of the surface tension over the renormalized Wulff shape. By comparing the restricted ensemble with quasi-stationary measures we derive an asymptotic exponential law; then, by using theoretic-potential tools we give estimates on the mean exit time.

11h – 11h50

Breaking of Ensemble Equivalence in Complex Networks

Frank den Hollander, University of Leiden

It is generally believed that for physical systems in the thermodynamic limit, the microcanonical description as a function of energy coincides with the canonical description as a function of temperature. However, various examples of systems for which the microcanonical and canonical ensembles are not equivalent have been identified. A complete theory of this intriguing phenomenon is still missing. In this talk we show that ensemble nonequivalence can manifest itself also in random graphs with topological constraints. We find that, while graphs with a given number of links are ensemble-equivalent, graphs with a given degree sequence are not. This result holds irrespective of whether the «energy» associated with the constraint is nonadditive (as in unipartite graphs) or additive (as in bipartite graphs). In contrast with previous expectations, our results show that: (1) physically, nonequivalence can be induced by an extensive number of local constraints, and not necessarily by long-range interactions or nonadditivity; (2) mathematically, nonquivalence is determined by a different large-deviation behavior of microcanonical and canonical probabilities for a single microstate, and not necessarily for almost all microstates. The latter criterion, which is entirely local, is not restricted to networks and holds in general. Based on joint work with Diego Garlaschelli (Leiden), Joey de Mol (Leiden), Tiziano Squartini (Rome) and Andrea Roccaverde (Leiden).

12h – 13h30

Lunch

13h45 – 14h35

Universality of fluctuations in the dimer model

Benoît Laslier, University of Cambridge

On Z^2, Temperley's bijection gives a connection between a spanning tree, à dimer configuration and a height function which can be seen as a kind of discrete free field. This bijection has a continuum analogue given by the coupling between SLE and gaussian free field of the imaginary geometry type. I will first present a new point of view on this bijection emphasizing the link with the discrete bijection. Using this new approach, we will be able to go back to the discrete and study the dimer fluctuations. This will allow us to study new cases, in particular planar finite domains for lozenge tilings of arbitrary shape and slope.

14h45 – 15h35

Activated random walks with bias

Laurent Tournier, University of Paris 13

The Activated Random Walk model is a conservative particle system in which particles move independently as random walks except that, when alone at a vertex, particles may switch to a passive state and then stay still until the visit of another particle. The competition between local deactivation and global spread of activity by diffusion is believed to lead, in wide generality, to a nontrivial phase transition as the initial density increases: at low density, local configurations eventually stabilize, while at higher density activity persists locally forever. In this talk, we will first present the main features of the model and then focus especially on the case when the motion of particles is biased. This is joint work with Leonardo Rolla.

15h40 – 16h

Coffee break

16h – 16h50

Random long time dynamics in the stochastic Kuramoto model

Christophe Poquet, University of Lyon 1

The stochastic Kuramoto model is a toy model used to study synchronization phenomena. It consists in a population of N rotators with mean field interaction, each rotator being perturbed by a Brownian noise and possessing its own natural frequency of rotation. These frequencies are identically distributed and drawn independently, and correspond to a second source of randomness for the system (in addition to the thermal noise), called disorder. On finite time intervals [0,T] and in the limit of infinite population the model is described by a PDE of Fokker-Planck type. This limit model undergoes a synchronization type phase transition: when the interaction is strong enough this PDE admits a stable curve M (in fact a circle), corresponding to the synchronization of the rotators around a synchronization center that moves at constant speed. We will focus on the case in which the distribution of the disorder is symmetric. In that case the speed previously mentioned is equal to zero. We will see that, when the size N of the population is large but finite, the long time behavior of the system is not well described by this limit PDE, and that disorder-induced traveling-waves appear on the time scale N^{1/2}, with a speed given by the asymmetry of the finite-size draw of the disorder. This talk will be based on works made in collaboration with L. Bertini, G. Giacomin and E. Luçon.

Comités scientifique et d'organisation

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