Rencontres de Probabilités 2018
27 et 28 septembre 2018

Programme

Jeudi 27 septembre

- 10h45 Ouverture officielle
- 11h00 - 12h : **Pierre CALKA** (Université de Rouen Normandie)
  Modèles classiques de géométrie stochastique (Partie I).
- 12h00 - 13h45 : Déjeuner
- 13h45 - 14h20 : **Amine ASSELAH** (Université Paris-Est Créteil)
  Deviations Estimates for the Capacity of a Random Walk in $d > 4$.
- 14h20 - 14h55 : **Federico SAU** (TU Delft, Netherlands)
  Self-duality for symmetric interacting particle systems.
- 14h55 - 15h30 : **Assaf SHAPIRA** (Université Paris Diderot)
  Criticality of the Bootstrap Percolation on Trees
- 15h30 - 15h45 : Pause
- 15h45 - 16h45 : **Pierre CALKA** (Université de Rouen Normandie)
  Modèles classiques de géométrie stochastique (Partie II).
- 16h45 - 17h20 : **Sébastien MARTINEAU** (Université Paris-Sud)
  Monotonie stricte du paramètre critique de percolation vis-à-vis de l'opération de quotient
- 17h20 - 17h55 : **Irène MARCOVICI** (Institut Elie Cartan, Université de Lorraine)
  Automates cellulaires et perturbations aléatoires

Vendredi 28 septembre

- 10h00 - 10h35 : **Clément ERIGNOUX** (IMPA, Rio de Janeiro)
  Understanding the phenomenology of active matter with hydrodynamic limits.
- 10h35 - 10h50 : Pause
- 10h50 - 11h25 : **Oriane BLONDEL** (Institut Camille Jordan, Université Claude Bernard Lyon 1)
  One-dimensional random walks in dynamic environment with polynomial decay of correlations.
- 11h25 - 12h00 : **Thibaut DEMARET** (KU Leuven, Belgium)
  Death and resurrection of a current by disorder, interaction or activity.
- 12h00 - 13h45 : Déjeuner
- 13h45 - 14h20 : **Christine FRICKER** (INRIA, Paris-Rocquencourt)
  Time to reach opinion levels in a fully connected voter model.
- 14h20 - 14h55 : **Eric LUÇON** (Université Paris Descartes)
  Long-time behavior of excitable systems in mean-field interaction

• **Amine ASSELAH**

Titre : Deviations Estimates for the Capacity of a Random Walk in $d > 4$.

Résumé : We focus on the ways a simple random walk reduces the capacity of its range, when dimension is larger than 4. We look at large and moderate deviations. We discuss a robust method, its strenghs and weaknesses.
This is a joint work with Bruno Schapira.

• **Oriane BLONDEL**

Titre : One-dimensional random walks in dynamic environment with polynomial decay of correlations

Résumé : We study random walks in one-dimensional stationary dynamic random environment. If the covariance between boxes that are well-separated in time decays at least polynomially (with sufficiently high exponent), we can show a law of large numbers for a rather general class of nearesst-neighbour random walks. Joint work with Marcelo Hilario and Augusto Teixeira.

• **Pierre CALKA**

Titre : Modèles classiques de géométrie stochastique.

Résumé :

• **Thibaut DEMARET**

Titre : Death and resurrection of a current by disorder, interaction or activity

Résumé : Because of disorder the current-field characteristic may show a first order phase transition as function of the field, at which the current jumps to zero when the driving exceeds a threshold. The discontinuity is caused by adding a finite correlation length in the disorder. At the same time the current may resurrect when the field is modulated in time, also discontinuously: a little shaking enables the current to jump up. Finally, in trapping models exclusion between particles postpones or even avoids the current from dying, while attraction may enhance it. We present simple models that illustrate those dynamical phase transitions in detail, and that allow full mathematical control.

• **Clément ERIGNOUX**

Titre : Understanding the phenomenology of active matter with hydrodynamic limits.

Résumé : (J.W. With Mourtaza Kourbane-Houssene, Julien Tailleur and Thierry Bodineau)
Motility Induced Phase Separation (MIPS) and alignment phase transitions are two of the phenomena characteristic of active matter which have been the most widely studied by the physics community. However, although some progress has been achieved for mean-field models on the mathematical front, there is still a lack of mathematical understanding of many active matter models, which are by essence driven out of equilibrium by energy consumption at a microscopic model. In this talk, I will give an brief description of active matter and of the two phenomena cited above, and will show how the theory of hydrodynamic limits for particle lattice gases can, under the right scaling, allow to compute exact phase diagrams for stochastic models with purely microscopic interactions and prove the emergence of MIPS and alignment phase transition.

• **Christine FRICKER**

Titre : Time to reach opinion levels in a fully connected voter model.

Résumé : Interaction between all the agents arise naturally in applications. The model consists in a set of agents with opinion 0 or 1, where each agent updates his opinion i with probability p_i. In the voter rule, he chooses another agent at random and takes his opinion. In the majority rule, he chooses $2K$ agents (with replacement) at random and takes the opinion of the majority of these $2K$ agents and himself. As the set of agents gets large, the limiting proportion of agents with opinion one and its fluctuations are derived. The behavior is quite different for the two rules. For the voter rule, the limiting quantity is 1 if $p_0 > p_1$, while in the majority rule, it is 0 or 1 depending on the initial proportion. The Functional Central Limit Theorem gives also the first and second order terms for the time that the proportion of agents with opinion 1 reaches a certain level.

• **Eric LUÇON**

Titre : Long-time behavior of excitable systems in mean-field interaction

Résumé : We consider the long-time dynamics of a general class of nonlinear Fokker- Planck equations, describing the large population behavior of mean-field interacting diffusions. Our main motivation concerns (but not exclusively) the case where the individual dynamics is excitable (e.g. neuronal models). We address the question of the emergence of oscillatory behaviors induced by noise and interaction in such systems. We tackle this problem by considering this model as a slow-fast system (the mean value of the process giving the slow dynamics) in the regime of small individual dynamics and by proving the existence of a positively stable invariant manifold, whose slow dynamics is at first order the dynamics of a single individual averaged with a Gaussian kernel. We consider applications of this result to Stuart-Landau, FitzHugh-Nagumo and Cucker-Smale oscillators. This is a joint work with Christophe Poquet.

• **Irène MARCOVICI**

Titre : Automates cellulaires et perturbations aléatoires

Résumé : Les automates cellulaires sont des systèmes dynamiques pour lesquels le temps et l'espace sont discrets. Ils permettent de modéliser l'évolution d'un ensemble de composantes interagissant entre elles de manière locale : au cours du temps, chacune actualise son état en fonction de ce qu'elle perçoit de son voisinage. La règle locale qui définit le système peut mener à une grande complexité de comportements macroscopiques, qui dépendent souvent fortement de l'état initial. Cependant, quand on perturbe un automate cellulaire par un bruit aléatoire, on s'attend généralement à ce que le système soit ergodique, c'est-à-dire à ce qu'il oublie la configuration initiale au cours de son évolution. Lorsque le bruit est suffisamment élevé, des méthodes classiques de couplage permettent de le montrer. Mais lorsque le bruit est faible, l'ergodicité est souvent difficile à prouver. Je présenterai différentes extensions de la méthode de couplage lorsque l'automate cellulaire a des propriétés spécifiques. Nous nous intéresserons aussi à la capacité de certains automates cellulaires de "réparer" des erreurs présentes seulement dans la configuration initiale.

• **Sébastien MARTINEAU**

Titre : Monotonie stricte du paramètre critique de percolation vis-à-vis de l'opération de quotient

Résumé : La percolation est un modèle de propagation en milieu poreux qui a été introduit en 1957 par Broadbent et Hammersley. Un graphe G modélise la géométrie de la situation et un paramètre p rend compte de la porosité du milieu : la percolation consiste à indépendamment conserver chaque arête avec probabilité p, effacer les autres, et s'intéresser aux composantes connexes du graphe ainsi formé. Il y a alors une porosité critique : pour des porosités moindres, toutes les composantes sont finies presque sûrement, tandis que pour les porosités supérieures il y a au moins une composante infinie presque sûrement. Comment cette porosité dépend-elle du graphe considéré ? C'est une vaste question, qui s'avère liée à celle de déterminer le comportement précisément au point critique. On l'abordera ici sous l'angle suivant : on montrera que, sous des conditions raisonnables, quotienter un graphe augmente strictement la valeur de la porosité critique. Il s'agit d'un travail en collaboration avec Franco Severo, qui s'appuie notamment sur des techniques d'Aizenman-Grimmett.

• **Federico SAU**

Titre : Self-duality for symmetric interacting particle systems.

Résumé : In this talk, we will sketch some recent developments about the notion of duality for interacting particle systems. In particular, we will show the simplification that arises in presence of self-duality when considering hydrodynamic limits in a dynamic disorder (work in progress with F. Collet, F. Redig and E. Saada). We will find all particle systems which admit a special form of self-duality (joint work with F. Redig) and, in conclusion, we will use the spectral point of view of this notion to address some open questions.

• **Assaf SHAPIRA**

Titre : Criticality of the Bootstrap Percolation on Trees.

Résumé : Bootstrap percolation is a deterministic dynamics in discrete time defined on a graph. The vertices of the graph could be in one of two states, usually called "infected" and "healthy", and the infection propagates according to certain rules. We will discuss the bootstrap percolation on regular trees and on Galton-Watson trees, focusing on the proportion of infected vertices as the parameters of the model change, in particular near its discontinuity.