Conference Program

Monday 8 April:

10.30-11.00 Opening - Coffee, then introduction of 10' by François Dunlop

11.00-11.50 Aernout van Enter: One-sided versus two-sided dependence.

11.50-12.40 Loren Coquille: Gibbs states for (long-range) Ising models.

12.40-14.10 Lunch

14.10-15.00 Hubert Lacoin: Wetting, disordered pinning and layering for discrete random interfaces.

15.00-15.50 Elisabetta Scoppola: Shaken dynamics for 2d Ising model.

15.50-16.40 Béatrice de Tilière: Elliptic dimers and genus 1 Harnack curves.

16.40-17.30 Poster session

Tuesday 9 April:

9.00- 9.50 Fabio Martinelli: Universality for Kinetically Constrained Spin Models

9.50-10.40 Oriane Blondel: Hydrodynamic limit for a facilitated exclusion process.

10.40-11.00 Coffee Break

11.00-11.50 Ivan Corwin: Some SPDE limits of interacting particle systems.

11.50-12.40 Anna de Masi: Fick's law with phase transitions.

12.40-14.10 Lunch

14.10-15.00 Nicoletta Cancrini: Chaos propagation for balls into bins dynamics.

15.00-15.50 Stefano Olla: Hydrodynamics and non-equilibrium stationary states for diffusive systems of conservation laws.

15.50-16.10 Coffee Break

16.10-17.00 Pierre Collet: Time scales in some large population birth and death processes, quasi stationary distribution and resilience.

17.00-17.50 Stefan Adams: Large deviations and concentration of scaling limits for $(1+1)$ dimensional fields with Laplacian interaction with pinning and wetting

18.30-20.00 Social Event

Wednesday 10 April:

9.00- 9.50 Emilio Cirillo: Microscopic stochastic particle models for Fick and Fokker-Planck diffusion equations.

9.50-10.40 Christian Maes: Statistical forces and stabilization out-of-equilibrium.

10.40-11.00 Coffee Break

11.00-11.50 Alessandra Faggionato: Stochastic homogenization in amorphous media and applications to Mott variablrange hopping.

11.50-12.40 Senya Shlosman: Glassy states of the Ising model on trees and Lobachevsky plane.

12.40-14.10 Lunch

14.10-15.00 Alessandra Bianchi: Random walk in a non-integrable random scenery time.

15.00-15.50 Roberto Livi: The discrete non linear Schroedinger equation:an example of inequivalence between statistical ensembles.

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Stefan Adams
https://warwick.ac.uk/fac/sci/maths/people/staff/stefan_adams/

Title: Large deviations and concentration of scaling limits for $ (1+1) $ dimensional fields with Laplacian interaction with pinning and wetting

Abstract: We study scaling limits and corresponding large deviation principles of random fields perturbed by an attractive force towards the origin and/or by hard-wall (wetting) constraints. In particular, we analyse the critical situation that the rate function admits more than one minimiser leading to a concentration of measure problems.
Our models are in fact interface models with Laplacian interaction, and such linear chain models with Laplacian interaction appear naturally in the physics literature in the context of semi-flexible polymers. We

discuss these connections as well as the ones with the related gradient models. These random fields are a class of model systems arising in the studies of random interfaces, critical phenomena, random geometry, field theory, and elasticity theory.

Alessandra Bianchi – https://www.math.unipd.it/~bianchi/

Title: Random walk in a non-integrable random scenery time.

Abstract: In this talk we consider a one-dimensional process in random environment, also known in the physical literature as Levy-Lorentz gas. The environment is provided by a renewal point process that can be seen as a set of randomly arranged targets, while the process roughly describes the displacement of a particle moving on the line at constant velocity, and changing direction at the targets position with assigned probability. We investigate the annealed behavior of this process in the case of inter-distances between targets having infinite mean, and establish, under suitable scaling, a functional limit theorem for the process. In particular we show that, contrary to the finite mean case, the behavior of the motion is super-diffusive with explicit scaling limit related to the Kesten-Spitzer process. The key element of the proof is indeed a representation of the consecutive "hitting times on the set of targets"

Oriane Blondel http://math.univ-lyon1.fr/homes-www/blondel/

Title: Hydrodynamic limit for a facilitated exclusion process.

Abstract: We show a hydrodynamic limit for the exclusion process on Z in which a particle can jump to the right only if it has a particle to its left and vice-versa. This process has an active/inactive phase transition at density 1/2. Joint work with Clément Erignoux, Makiko Sasada and Marielle Simon.

Nicoletta Cancrini – http://ing.univaq.it/cancrini/

Title: Chaos propagation for balls into bins dynamics.

Abstract: We consider N balls and L bins. Initially the balls are randomly placed into the bins. At each time a ball is taken from every non empty bin. Then all the drawn balls are placed into the bins according to a definite law. The evolution is a Markov chain. The model is an interacting particle system with parallel updating so it is not reversible. We give conditions under which propagation of chaos holds and present three applications.

Emilio Cirillo – http://www.sbai.uniroma1.it/~emilio.cirillo/index.php

Title: Microscopic stochastic particle models for Fick and Fokker-Planckdiffusion equations

Abstract: Diffusion in not homogeneous media can be described both by the Fick and the Fokker-Planck diffusion equation. The question whetherone of the two description has to be considered the correct one is often debated in the scientific literature. Using a microscopic approach, we show that both the descriptions are reasonable and that they correspond to different realizations of spatial inhomogeneities. This work is incollaboration with D. Andreucci (Roma), M. Colangeli (L'Aquila),and D. Gabrielli (L'Aquila).

Pierre Collet – pierre.collet@polytechnique.fr

Title: Time scales in some large population birth and death processes, quasi stationary distribution and resilience.

Abstract: With S.Meleard and J.-R.Chazottes we consider a birth and death process with one or several species depending on a (large) parameter giving the scale of the populations sizes. Assuming there is a unique globally attracting nontrivial fixed point for the rescaled infinite population dynamical system, we investigate (under some hypothesis) the time scale of global extinction and the existence and time scale of convergence to a quasi stationary distribution(q.s.d.). Together with S. Martinez we apply these results using micro-macro relations to recover the engineering resilience from the fluctuations of a sample of the process.

Loren Coquille – https://www-fourier.ujf-grenoble.fr/~coquilll/

Title : Gibbs states for (long-range) Ising models

Abstract : I will review old and present new results on standard and long-range Ising models in dimension 1, 2 and 3. I shall focus on fluctuations or rigidity of interfaces at low temperature, in the coexistence regime. Based on works in collaboration with Y. Velenik (Geneva) on one hand, and A. van Enter (Groningen), A. Le Ny (Paris) and W. Ruszel (Delft) on the other hand.

Ivan Corwin – https://www.math.columbia.edu/~corwin/

Title: Some SPDE limits of interacting particle systems.

Abstract: I will review some of the recent progress in deriving SPDE limits from various types of interacting particle systems. Time permitting I will discuss results for systems in contact with reservoirs, systems with inhomogeneities, and space-time discrete systems. Markov duality and the microscopic Cole-Hopf (or Gartner) transform provide the key tools in proving these results.

Anna De Masi – https://www.disim.univaq.it/main/home.php?users_username=anna.demasi

Title: Fick's law with phase transitions.

Abstract: The context is the Fick?s law where a stationary current flows in a system driven by the boundaries which are put in contact with suitable reservoirs. This is a much studied problem but only recently together with Olla and Presutti I have obtained results in models with phase transition I will present these models where the stationary non equilibrium distribution is known explicitly and exploit this to compare the stationary fluctuations of the interface in this case where a non zero current is present, with those at thermal equilibrium.

Béatrice de Tilière – https://www.ceremade.dauphine.fr/~detiliere/

Title: Elliptic dimers and genus 1 Harnack curves.

Abstract :

Alessandra Faggionato – http://www1.mat.uniroma1.it/people/faggionato/

Title: Stochastic homogenization in amorphous media and applications to Mott variable range hopping.

Abstract: By extending the method of 2-scale convergence we prove an homogenization theorem of difference operators given by Markov generators of random walks on random marked simple point processes with symmetric jump rates. Using this theorem, we derive two further results: (i) the hydrodynamic limit of the exclusion process given by multiple random walks with hard-core interaction; (ii) the a.s. convergence of the rescaled conductivity matrix of the Miller-Abrahams resistor network to the diffusion matrix of Mott random walk. The second result is related

to Mott variable range hopping, which is a fundamental mechanism of phonon-induced electron conduction in amorphous solids given by strongly disordered solids as doped semiconductors.

Hubert Lacoin – http://w3.impa.br/~lacoin/

Title :Wetting, disordered pinning and layering for discrete random interfaces

Abstract: Solid-on-Solid (SOS) is a simplified surface model which has been introduced to understand the behavior of Ising interfaces in $\mathbb Z^d$ at low temperature. The simplification is obtained by considering that the interface is a graph of a function ϕ, $\mathbb Z^{d-1} \to \mathbb Z$. In the present talk, we study the behavior of SOS surfaces in $\mathbb Z^2$ constrained to remain positive, and interacting with a potential when touching zero, corresponding to the energy functional: $$V(\phi)=\beta \sum_{x\sim y}|\phi(x)-\phi(y)|-\sum_{x}\left(h\ind_{\{\phi(x)=0\}}-\infty\ind_{\{\phi(x)=0\}} \right).$$ We show that if β is small enough, the system undergoes a transition from a localized phase where there is a positive fraction of contact with the wall to a delicalized one for $$h_w(\beta)= \log \left(\frac{e^{4\beta}}{e^{4\beta}-1}\right).$$ In addition by studing the free energy, we prove that the system undergoes countably many layering transitions, where the typical height of the interface jumps between consecutive integer values. We also discuss the case of the disordered model without positivity constraint.

Roberto Livi – https://www.unifi.it/p-doc2-2013-200010-L-3f2a3b2d392e2b-0.html

Title: The Discrete Non Linear Schroedinger Equation: an example of inequivalence between statistical ensembles

Abstract: The dynamics of the DNLSE is characterized by peculiar featuresin the region of parameter space above the line at infinite temperature:the deterministic version exhibits multi-breather states, lasting over astronomical times, while the stochastic (conservative) evolution yields a coarsening dynamics to an infinite temperature lattice, with a superimposed giant breather collecting a finite fractionof the total energy. The statistical mechanics of this model can be naturally described and explicitly computed in the microcanonical ensemble and allows us to conclude that the multi breather state, observed in the deterministic evolution, is a genuine equilibrium state at negative temperature. We also show that in this region there is no ensemble equivalence with the grand-canonical ensemble and, moreover, that the infinite temperature line is also the boundary of a first order phase transition between a thermalized (low-energy) phase and a condensed (high-energy) phase. Further details about the presence of a spinodal line, the

features of the order parameter and the non-extensivity of the condensed phase will be also discussed.

Christian Maes – https://fys.kuleuven.be/itf/staff/christ

Title: Statistical forces and stabilization out-of-equilibrium

Abstract: We discuss the nature of induced forces on a probe coupled to a nonequilibrium medium. We show how stabilization of fixed points may be achieved because on nonequilibrium effects.

Fabio Martinelli – http://www.mat.uniroma3.it/users/martin/

Title: Universality for Kinetically Constrained Spin Models.

Abstract: Kinetically constrained models (KCM) are reversible interacting particle systems with continuous time Markov dynamics of Glauber type, which have been extensively used in the physics literature to model the liquid-glass transition, a major and longstanding open problem in condensed matter physics. They also represent a natural stochastic (and non-monotone) counterpart of the family of cellular automata known as ?-bootstrap percolation thoroughly analyzed by P. Balister, B.Bollobas, H. Duminil-Copin, R. Morris, P. Smith and A. Uzzell. I shall present a series of universality results for the mean infection time of the origin for KCM, which have been obtained in various collaborations with C. Toninelli, L. Mareche', I. Hartarski and R. Morris.

Stefano Olla – https://www.ceremade.dauphine.fr/~olla/

Title: Hydrodynamics and non-equilibrium stationary states for diffusive systems of conservation laws.

Abstract: We consider one dimensional dynamics of interacting particles that have more conserved quantities that evolve macroscopically in the same diffusive time scale, and their macroscopic evolution is governed by a system of coupled diffusive equations.
Their non-equilibrium stationary states, driven by heat bath and external forces, present interesting phenomena like up-hill diffusion, negative linear response, internal eternalizations (non-monotous temperature

profiles). One example is given by the chain of coupled rotors. that conserves the energy and the angular momentum. Mathematical rigorous results can be obtained in harmonic chains of oscillators perturbed by noise that have more than one conservation laws. There are some common universal features due to the transformation of mechanical work into thermal energy done by the bulk dynamics.
Works in collaborations with Tomasz Komorowski, Marielle Simon, Alessandra Iacobucci, Gabriel Stoltz.

Senya Shlosman – http://www.cpt.univ-mrs.fr/~shlosman/shlosman.htm

Title: Glassy states of the Ising model on trees and Lobachevsky plane.

Abstract: I will explain that on trees and on Lobachevsky, the Ising model has a huge continuum of extremal states. As a result, the free state of the Ising model below the spin-glass temperature has a structure of a spin-glass state: it is a mixture of continuum many extremal states.
Joint work with D. Gandolfo, Ch. Maes, and J. Ruiz.

Elisabetta Scoppola – http://www.mat.uniroma3.it/users/betta/

Title: Shaken dynamics for 2d Ising model.

Abstract: We define a random dynamics which is a composition of two steps of parallel updating with interaction in opposite directions. The invariant measure of this dynamics turns out to be the marginal of the Gibbs measure of an Ising model on hexagonal graphs. The shaken dynamics can be applied to study the effect ofearth tides on earthquakes.

Aernout van Enter - http://www.math.rug.nl/dsmp/People/AernoutvanEnter

Title: One-sided versus two-sided dependence.

Abstract: Stochastic systems can be parametrised by time (like Markov chains),in which conditioning is one-sided (the past)or by one-dimensional space (like Markov fields), where conditioning is two-sided (right and left).I will discuss some examples, in particular generalising this to g-measures versus Gibbs measures, where, instead of a Markovian dependence, the weaker property of continuity (in the product topology) is required. In particular I will discuss when the two descriptions (one-sided or two-sided) produce the same objects and when they are

different.We show moreover the role one-dimensional entropic repulsion plays in this setting.
Joint work with R. Bissacot, E. Endo and A. Le Ny