

Interacting Particle Systems on Random Graphs

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*Mini-course at the Brazilian School of Probability,
5–9 August 2024, Salvador, Bahia, Brazil.*

STRUCTURE:

- Frank den Hollander:
4 lectures of 75 minutes each.
- Federico Capannoli:
2 exercise sessions of 60 minutes each.

OUTLINE:

- ▶ **Lecture 1.** Background and motivation for **IPS** on \mathbb{Z}^d , $d \geq 1$.
From micro to macro. Phase transitions, critical phenomena.
Key questions, core tools.
- ▶ **Exercise session A.** Exercises about **IPS**.
- ▶ **Lecture 2.** **SIM**: Stochastic Ising Model.
- ▶ **Lecture 3.** **VM**: Voter Model.
- ▶ **Exercise session B.** Exercises about **VM**.
- ▶ **Lecture 4.** **CP**: Contact Process.

In Lectures 2-4, IPS on three classes of random graphs will be considered:

- CM: Configuration Model.
- HER: Homogeneous Erdős-Rényi Random Graph.
- IER: Inhomogeneous Erdős-Rényi Random Graph.

GOALS:

- Sketch what is **known** and **not known** about **IPS** on **RG**.
- Highlight the role of **sparse** versus **dense** graphs.
- Exhibit the **relevant time scales** for critical phenomena and identify how these depend on the size of the graph.
- List some **open problems** and indicate some **lines of future research**.



The content of this mini-course is a **personal snapshot** of an interesting area of research that is **developing rapidly**.