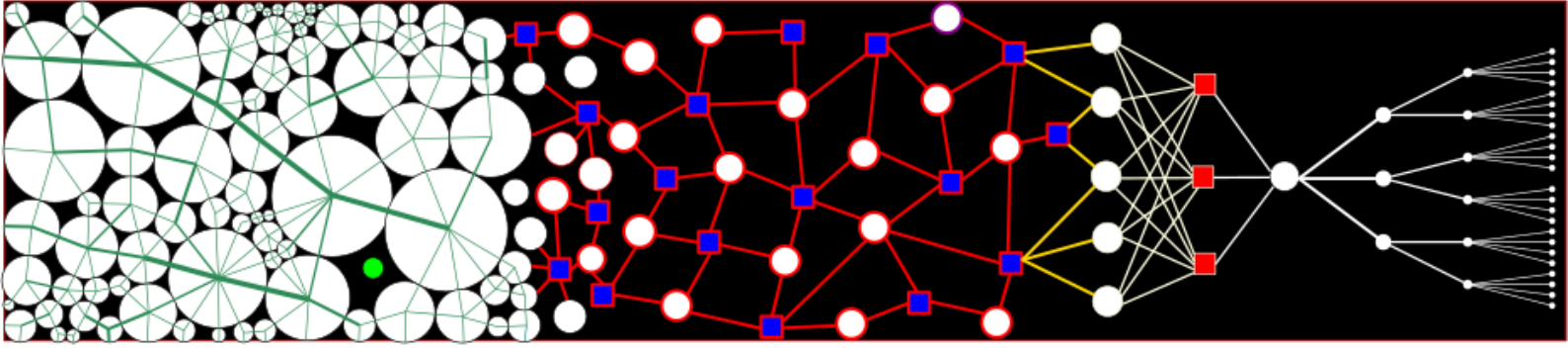

Math 690-40

Statistical Physics For Optimization and Learning

Florent Krzakala & Lenka Zdeborová

Interest in the methods and concepts of statistical physics is rapidly growing in fields as diverse as theoretical computer science, probability, machine learning, discrete mathematics, optimization and compressed sensing. This course will cover this rich and active interdisciplinary research landscape.

More specifically, we will review the statistical physics approach to problems ranging from graph theory (percolation, community detection) to discrete optimization and constraint satisfaction (satisfiability, coloring, bisection) and to inference and learning problems (learning in neural networks, clustering of data and of networks, compressed sensing or sparse linear regression, low-rank matrix and tensor factorization, etc.).

We will expose theoretical methods of analysis (replica, cavity, …) algorithms (message passing, spectral methods, …), discuss concrete applications, highlight rigorous justifications as well as present the connection to the physics of glassy and disordered systems.

The course is designed to be accessible to graduate students and researchers of all natural science and engineering disciplines with a basic knowledge of probability and analysis. Advanced training in any of the above fields is not requisite.

References:

Information, Physics and Computation (Oxford Graduate Texts), 2009, M. Mézard, A. Montanari

Statistical Physics of inference: Thresholds and algorithms, Advances in Physics 65, 5 2016, L. Zdeborová & F. Krzakala

Regular Academic Session, Duke University

Days & Times	Room	Units	Meeting Dates
WF 1:25PM - 2:40PM.	PHYSICS 235.	3 Units	01/10/2018 - 04/18/2018