



# Cours de physique théorique

agrée par l'École doctorale de physique en Île-de-France – ED PIF

## *Statistical physics of inference*

*Florent Krzakala  
(École normale supérieure)*

Les vendredis 16 mai, 23 mai et 6 juin, et le mercredi 28 mai 2014 à 10h

### Lecture 1.

- Motivational examples: module detection in networks and compressed sensing.
- Optimal Bayes inference and solving statistical mechanical models.
- Factor graphs.
- Derivation of belief propagation algorithm on trees.

### Lecture 2.

- Random graphs and their tree-like property.
- Potts antiferromagnet, graph coloring and planted graph coloring.
- How to find planted coloring using belief propagation and associated phase transition.
- Phase diagram of inference models and physics on the Nishimori line.

### Lecture 3.

- The phase diagram of mean field glassy system and inference with mismatching prior distribution.
- On the presence or absence of replica symmetry breaking.
- Message passing for module detection in networks, associated phase diagram.
- Comparison with other inference techniques - Monte Carlo, naive mean field inference and spectral methods.

### Lecture 4.

- Solving compressed sensing.
- The approximate message passing technique.
- The phase diagram of compressed sensing.
- Optimal inference by introducing spatial coupling and connection to nucleation.

Lieu: IPhT, CEA Saclay, Orme des Merisiers, Bât. 774, porte 1A Salle C. Itzykson

Accès: Navettes CEA du RER B Le Guichet vers CEA Ormes, toutes les 15 minutes de 8h à 9h45  
ou bus publics Mobicaps 9 et 10, Albatrans 91.06 et 91.10

Renseignements: <http://ipht.cea.fr> ou [ipht-lectures@cea.fr](mailto:ipht-lectures@cea.fr)