Probability Seminar

Absence of Replica Symmetry Breaking for the Random Field Ising Model in the Presence of Non-Gaussian Random Fields

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Date: 29/03/2019

Time: 14:00 Horas

MAT Mini-auditorium (AT–427/08)

Abstract. In 2015 [1] Sourav Chatterjee published a paper in CMP exhibiting the lack of replica symmetry breaking for the Random Field Ising Model (RFIM) in the presence of Gaussian random fields. The techniques employed in his paper uses heavily the Guassianity of the random field and he also adds that extending their results for non-Gaussian fields is a relevant question, but this issue could require new techniques.

This work [2] is concerned with the theory of the RFIM in the presence of random fields with non-Gaussian distribution on the hypercubic lattice. In this seminar we will briefly explain how to obtain the absence of replica symmetry breaking in any dimensions, at any temperature and field strength, almost surely, using three key elements: the FKG property of the RFIM, non-Gaussian integration by parts and the Ghirlanda-Guerra identities [3, 4].

References

[1] Sourav Chatterjee. Absence of replica symmetry breaking in the random field ising model. *Communications in Mathematical Physics*, 337:93–102, 2015.

[2] Jamer Roldan and Roberto Vila. On the absence of replica symmetry breaking for the random field ising model in the presence of a class of non-gaussian disorders. *Preprint*, 2019.

[3] Michael Aizenman and Pierluigi Contucci. On the stability of the quenched state in mean-field spin-glass models. *Journal of Statistical Physics*, 92:765–783, 1998.

[4] Stefano Ghirlanda and Francesco Guerra. General properties of overlap probability distributions in disordered spin systems. towards parisi ultrametricity. *Journal of Physics A: Mathematical and General*, 31:9149–9155, 1998.