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Replica Symmetry Breaking, Shattering, and Metastability

Thursday 29 September 2022 15:15 (45 minutes)

The statics and dynamics of mean-field models of spin glasses have been studied in-depth by the physics community since the '70s. At the heart of this is the trade-off between the notions of replica symmetry breaking, shattering, and metastability. I will survey the current mathematical understanding of these ideas in the “simple” case of the spherical p -spin model. I will start by recalling how the landscape complexity can be used to understand of the “replica symmetry breaking” phase following the work of Auffinger–Ben Arous–Cerny and Subag. I’ll then turn to our recent joint work with Ben Arous on the “replica symmetric” phase. Here we prove the existence of a shattering phase and show that metastable states exist up to an even higher temperature as predicted by Barrat–Burioni–Mezard. This latter work is based on a Thouless–Anderson–Palmer decomposition which builds on the ideas of Subag. I will end by presenting a series of open questions and conjectures surrounding sharp phase boundaries for shattering and metastability.

This talk will touch on joint work with: A. Auffinger (Northwestern), G. Ben Arous (Courant), R. Gheissari (Northwestern), and I. Tobasco (UIC)

Presenter: JAGANNATH, Aukosh (University of Waterloo)