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Department of Mathematics
The Chinese University of Hong Kong

數學系
香港中文大學

Phone: (852) 3943 7988 • Fax: (852) 2603 5154 • Email: dept@math.cuhk.edu.hk
Room 220, Lady Shaw Building, The Chinese University of Hong Kong, Shatin, N.T., Hong Kong

Seminar

Replica Symmetry Breaking for mean field spin glass models

Prof. Qiang ZENG
City University of New York

Abstract

In statistical physics, the study of spin glasses was initialized to describe a peculiar low temperature state of certain magnetic alloys in the 1960s. Mean field spin glass models were introduced as an approximation of the physical short range models in the 1970s. The typical mean field models include the Sherrington-Kirkpatrick (SK) model, the (Ising) mix p-spin model and the spherical mixed p-spin model. Nowadays spin glasses have become a paradigm for highly complex disordered systems.

Starting in 1979, the physicist Giorgio Parisi wrote a series of ground breaking papers introducing the idea of replica symmetry breaking (RSB), which allowed him to predict a solution for the SK model by breaking the symmetry of replicas infinitely many times at low temperature. This is known as full-step replica symmetry breaking (FRSB). In this talk, we will explain the Parisi program and show that Parisi's FRSB prediction holds at zero temperature. This implies that at positive temperature the level of RSB will diverge as the temperature goes to zero. On the other hand, we will show that there exist two-step RSB spherical mixed p-spin glass models at zero temperature, which are the first examples beyond the replica symmetric, one-step RSB and FRSB phases. Consequences on the energy landscape will also be presented.

This talk is based on joint works with Antonio Auffinger (Northwestern University) and Wei-Kuo Chen (University of Minnesota).

Date: 18 February 2019 (Monday)
Time: 10:00am – 11:00am
Venue: Room 219, Lady Shaw Building,
The Chinese University of Hong Kong, Shatin

All are Welcome