

abstract

JOINT IAS/PU MATHEMATICAL PHYSICS SEMINAR

Topic:

Speaker:

Affiliation:

Date:

Time/Room:

We introduce the term 'superconcentration' to describe the phenomenon when a function of a Gaussian random field exhibits a far stronger concentration than predicted by classical concentration of measure. We show that when superconcentration happens, the field becomes chaotic under small perturbations and a 'multiple valley picture' emerges. Conversely, chaos implies superconcentration. While a few notable examples of superconcentrated functions already exist, e.g. the largest eigenvalue of a GUE matrix, we show that the phenomenon is widespread in physical models; for example, superconcentration is present in the Sherrington-Kirkpatrick model of spin glasses, directed polymers in random environment, the Gaussian free field and the Kauffman-Levin model of evolutionary biology. As a consequence we resolve the long-standing physics conjectures of disorder-chaos and multiple valleys in the Sherrington-Kirkpatrick model, which is one of the focal points of this talk.