

The complexity of the random landscapes of high-dimensional statistics, and of their optimization dynamics.

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The landscapes of the loss/risk/likelihood functions of high dimensional data can be exponentially complex (say, from a Morse theory point of view) at low signal. They usually show an interesting topological phase transition when the signal increases. This transition is important both for the information-theoretic as well as for the algorithmic properties of the model. I will report on recent progress in the case of one example, i.e the landscape for the spiked tensor PCA problem, and on its topological phase transition. I will then show how this impacts the properties of the dynamical exploration of this landscape.

This is based on recent joint work with S. Mei (Stanford), A. Montanari (Stanford), M. Nica (Toronto), with V. Ros (Paris), G. Biroli (Paris), C. Camarotta (London), and with A. Jagannath (Harvard) and R. Ghessairi (Courant).