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Zero temperature mean field spin glass transitions in a field

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I will consider a recently introduced soft spin glass model, named the KHGPS model, in which soft spins are subjected to a local random anharmonic quartic potential and an external magnetic field, and interact through the usual SK-like random pairwise term. Depending on the control parameters, at zero temperature the model undergoes to a spin glass transition that can be in two different universality classes. In the first universality class, at the transition, the spin glass susceptibility is divergent. Approaching the critical point from the simple (replica symmetric) phase, the ground state gets a fat tail of soft modes in the spectrum of the Hessian and therefore the transition is driven by an abundance of soft linear excitations.
On the other hand one can have a transition where, coming from the simple phase, the spin glass susceptibility is not divergent. In this case the transition is driven by the appearance of a finite density of non-linear excitations which are captured by full replica symmetry breaking and not by the Hessian analysis.
I will discuss how these mechanisms change in finite dimensions and develop a zero temperature field theory to address this problem and discuss its universal properties.
Based on the following works:
Bouchbinder, Lerner, Rainone, Urbani, Zamponi, Phys. Rev. B 103, 174202 (2021)
Folena, Urbani, J. Stat. Mech. (2022) 053301
Urbani 2022 J. Phys. A: Math. Theor. 55 335002

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