

Abstract Submitted
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Finite-Connectivity Spin-Glass Phase Diagrams and Low Density Parity Check Codes GABRIELE MIGLIORINI, Aston University, DAVID SAAD, Aston University — We present phase diagrams of finite connectivity spin-glasses. We firstly compare the properties of the phase diagrams with the performance of low density parity check codes (LDPC) within the Replica Symmetric (RS) ansatz. We study the location of the dynamical and critical transition points within the one step Replica Symmetry Breaking theory (RSB), extending similar calculations that have been performed in the past for the Bethe spin-glass. The location of the dynamical transition line *does* change within the RSB theory, when comparing with the results obtained in the RS case. For LDPC decoding of messages transmitted over the binary erasure channel (BEC) we find, at zero temperature and rate $R = 1/4$ an RSB transition point located at $p_c \simeq 0.7450 \pm 0.0050$, to be compared with the corresponding Shannon bound $1 - R$. For the binary symmetric channel (BSC) we show that the low temperature reentrant dynamical transition boundary occurs at higher values of the channel noise when comparing with the RS case. Possible practical implications to improve the performance of the state-of-the-art error correcting codes are discussed.

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