

Anomalous critical effects in complex networks

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Abstract

We discuss critical effects in cooperative models on compact, infinite-dimensional complex networks, which remarkably differ from those for lattices and for classical random graphs. Any cooperative model on small world substrates is surely in situation above the upper critical dimension, and so critical phenomena in these models should be precisely described in the framework of a mean field approach. Nonetheless, due to specific architectures of complex networks, the mean-field behaviour of cooperative models on them is quite unusual. We consider the non-traditional critical phenomena in complex networks by using representative examples: the Ising and Potts models, the percolation and its generalizations, etc. Remarkably, the critical behaviour is very different in equilibrium and growing networks. We explain that in specific growing networks, the percolation and Ising models may even demonstrate critical singularity of the Berezinskii-Kosterlitz-Thouless kind. Finally, we discuss relations between various cooperative models on networks and touch upon their applications.

References

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