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Coexistence of critical regimes in interconnected networks FILIPPO RADICCHI, Indiana Univ - Bloomington — Networks in the real world do not exist as isolated entities, but they are often part of more complicated structures composed of many interconnected network layers. Recent studies have shown that such mutual dependence makes real networked systems exposed to potentially catastrophic failures. The theoretical approach to this problem is based on the study of the nature of the phase transitions associated to critical phenomena running on interconnected networks. In particular, it has been shown that many critical phenomena of continuous nature in isolated networks become instead discontinuous, and thus catastrophic, in interconnected networks when the strength of the connections between the various network layers is sufficiently large. We show that four main ingredients determine the critical features of a random interconnected network: the strength of the interconnections, the first two moments of the degree distribution of the entire network, and the correlation between intra- and inter-layer degrees. Different mixtures of these ingredients change the location of the critical points, and lead to the emergence a very rich scenario where phase transitions can be either discontinuous or continuous and different regimes can disappear or even coexist.

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