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Self Healing Percolation[1]

ANTONIO SCALA, CNR

We introduce the concept of self-healing in the field of complex networks modelling; in particular, self-healing capabilities are implemented through distributed communication protocols that exploit redundant links to recover the connectivity of the system. Self-healing is a crucial in implementing the next generation of smart grids allowing to ensure a high quality of service to the users. We then map our self-healing procedure in a percolation problem and analyse the interplay between redundancies and topology in improving the resilience of networked infrastructures to multiple failures. We find exact results both for planar lattices and for random lattices, hinting the role of duality in the design of resilient networks. Finally, we introduce a cavity method approach to study the recovery of connectivity after damage in self-healing networks.

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