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Reconstructing topological properties of complex networks from partial information using the Fitness Model ANDREA GABRIELLI, Istituto dei Sistemi Complessi (ISC) - CNR, Italy, STEFANO BATTISTON, ETH Zurich, Switzerland, GUIDO CALDARELLI, IMT - Alti Studi Lucca, Italy, NICOLÓ MUSMECI, King's College London, UK, MICHELANGELO PULIGA, IMT - Alti Studi Lucca, Italy — We present a new method to reconstruct global topological properties of complex networks starting from limited information. We assume to know for all nodes a non-topological quantity that we interpret as fitness, while the degree is known only for a subset of the nodes. We then use a fitness model, calibrated on the subset of nodes for which degrees are known, to generate ensembles of networks. We focus on topological properties relevant for processes of contagion and distress propagation in networks, i.e. network density and k-core structure. We study how well these properties can be estimated as a function of the size of the subset of nodes utilized for the calibration. We perform a first test on ensembles of synthetic networks generated with the Exponential Random Graph model. We then perform a second test on empirical networks taken from economic and financial contexts (World Trade Web and e-mid interbank network). In both cases, we find that a subset as small as 10% of nodes can be enough to estimate the properties of the network with an error of 5% [1,2].

[1] N. Musmeci, S. Battiston, G. Caldarelli, M. Puliga, A. Gabrielli, J. Stat. Phys. **151**, 720 (2013).
[2] G. Caldarelli, A. Chessa, A. Gabrielli, F. Pammolli, M. Puliga, Nature Phys. **9**, 125 (2013).

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