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**Estimating topological properties of weighted networks from limited information**[1] ANDREA GABRIELLI, Istituto dei Sistemi Complessi (ISC) - Consiglio Nazionale delle Ricerche (CNR), GIULIO CIMINI, IMT - Institute of Advanced Studies (Lucca, Italy), DIEGO GARLASCHELLI, Lorentz Institute, Leiden University (NL), ANGELO SQUARTINI, IMT - Institute of Advanced Studies (Lucca, Italy) — A typical problem met when studying complex systems is the limited information available on their topology, which hinders our understanding of their structural and dynamical properties. A paramount example is provided by financial networks, whose data are privacy protected. Yet, the estimation of systemic risk strongly depends on the detailed structure of the interbank network. The resulting challenge is that of using aggregate information to statistically reconstruct a network and correctly predict its higher-order properties. Standard approaches either generate unrealistically dense networks, or fail to reproduce the observed topology by assigning homogeneous link weights. Here we develop a reconstruction method, based on statistical mechanics concepts, that exploits the empirical link density in a highly non-trivial way. Technically, our approach consists in the preliminary estimation of node degrees from empirical node strengths and link density, followed by a maximum-entropy inference based on a combination of empirical strengths and estimated degrees. Our method is successfully tested on the international trade network and the interbank money market, and represents a valuable tool for gaining insights on privacy-protected or partially accessible systems.

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