

Connectivity in networks

RICHARD Benoît

Master thesis in physics

In this thesis we present a theoretical framework for the study of networks, a pervasive concept encountered in many scientific fields. The framework presented is the configuration model, taking the degree distribution of a network as its defining characteristic. Using it we focus our analysis on the connectivity of networks and of multiplex networks, the latter being a generalization of the former. A particular care is given to the study of the phase transition that appears between low and high connectivity phases in both cases. Along the way, we introduce several network models (Erdos-Renyi, scale-free and exponential) as examples and some numerical algorithms, for simulation of networks and for guaranteed numerical computation, the latter leading to a short discussion of the theory of interval arithmetic. These numerical algorithms are used to confirm our analytic results.

Yi-Cheng Zhang