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# Probabilistic paths dynamics over weighted complex networks

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*Abstract*: Probabilistic interactions among temporal events provide a framework for a theoretical model to describe phenomena in multiple applied instances of different natural and social sciences. For example, sequences of seismic events, symbols sequences, events in armed conflicts, internet, and the brain dynamics may be modeled considering ensembles of networks of a set of nodes connected by specific probabilities represented by weighted links. Interestingly, literature reports that networks that represent these systems present characteristics of complex networks like small-world networks and scale-free networks, which shades light of the correlation presented among them. However, to the best of our knowledge, there is no evidence in the literature that relates the topology of these networks with the transition rates that fully describe these interactions. The sequences of weights of these links seem to form probability paths, which constitutes an interesting tool to describe the dynamical flux of information. In this work, we present a mathematical model to describe the probability paths in an ensemble of networks. We contrast the results of our approach with results obtained from simulations of dynamical events on complex networks. We study networks whose topology is described by Erdos-Renyi, Watts-Strogatz, and Barabasi-Albert models and its weights are distributed as power-laws. We applied our results to characterize different symbol sequences like western languages and sequences of seismic events.

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