MULTILAYER NETWORK CHAIN INTERACTIONS VIA DEGREE SEQUENCE DISTRIBUTION

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ABSTRACT

Networks and Network Analysis play a very important role in modern mathematical research. Network Analysis has widespread applications in criminal intelligence, electrical engineering, and healthcare. In this study, we consider finite simple networks. Let $\langle N_i \rangle_{i=1}^{k}$ be a sequence of finite simple networks in a network space $\mathcal{N}$. The network chain interactions of these networks is a network obtained from the sequence by taking a copy of each network arranged in the order of sequence and such that for each natural number $p \in \{2,3, \dots, k\}$, a node $n_{p-1} \in N_{p-1}$ is linked to a node $n_p \in N_p$ whenever they have the same respective node degrees. This means that only those nodes in a given sequence of networks will interact which will strengthen the chain of networks. These network interactions create a chain reaction that will add links to the resulting network. The order of the resulting network is the sum of the orders of the given sequence networks. The size of the resulting network is established in this study. The degree sequence polynomial of a network is the generating function of the degree sequence of the network with unit coefficients. It is established in this paper the polynomial representation of the network resulting from a network chain interactions in terms of the polynomial representation of the existing networks. The derivative of a network, it exists, is a network with polynomial representation equal to the derivative of its degree sequence polynomial representation. It is shown that some networks can be reconstructed using the concept of derivatives of a degree sequence polynomial.

Keywords: Network Analysis**,** Polynomial representation of networks; network reconstruction**,** Reconstruction Algorithm, polynomial derivatives**,** Philippines