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Introducing Weighted Triad Census through Peeling algorithm. An application to Football Passing Networks

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In Network Analysis, the topological properties of networks can be investigated through subgraph analysis. In particular, interactions between three vertices can be analyzed via the so-called triad census. However, the conventional procedure is suitable only for binary (unweighted) networks, neglecting the level of heterogeneity that can be observed, particularly in small and dense networks. This paper introduces and explores the usefulness of a new algorithm, named "network peeling", proposed to extend triad census in the case of weighted and directed networks. The proposed algorithm operates on a nested sequence of binary sub-networks in which arcs are "peeled out" each time by a unit value. Through a simulation study, we investigate whether the conventional and new weighted triad census exhibit non-negligible differences, considering three data-generating processes for the network formation, with varying density and variability of arc weights. As a well-studied case of small and dense weighted and directed networks, we examine a real-world application concerning the passing distribution in football. Specifically, we consider all matches of the clubs participating in the top four European football leagues during the 2015-2016 Season.

Keywords/Topics

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