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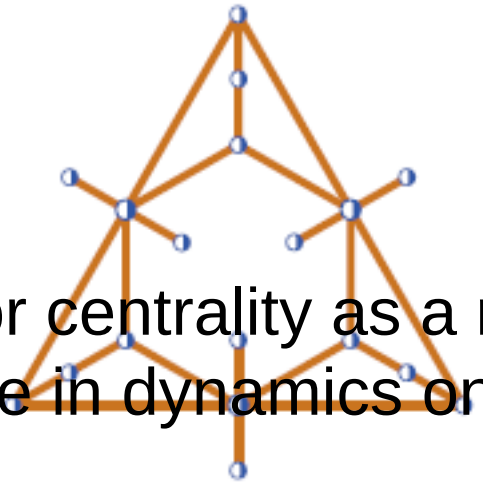

Eigenvector centrality as a measure of influence in dynamics on graphs

Content :

Definitions of centrality aim at quantifying the importance of a node in a given graph. Among many others, the degree, the betweenness and the closeness are examples of frequently used measures of centrality. Here we ask which notion of centrality is best suited for predicting the influence a node has on dynamics. The concept of dynamical influence is made rigorous for a class of dynamical rules that asymptotically lead the system to a stationary state $y(\infty)$ from any initial condition $y(0)$. Then the influence of node v is the dependence of the asymptotic state on the initial condition $y_v(0)$ at node v. Specifically, we study the SIR process of epidemic spreading on graphs. Here the task is to predict the expected size of an epidemic outbreak as a function of the initially infected node. We find that the leading eigenvector of the adjacency matrix outperforms other centrality measures as a predictor for influence [1]. We discuss attempts towards rigorous results for the predictive power of eigenvector centrality in epidemic spreading as well as other types of dynamics on graphs.

[1] Klemm, Serrano, Eguiluz, San Miguel, e-print arXiv:1002.4042

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