Ranking of the Vertices in a Weighted Graph

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A graph represents a group of objects (network) and the relations between them. This research introduces ranking of vertices – a mathematical concept, applied to various areas (Google search, social networks and influence, bibliometrics, biology, ecology, chemistry, physics). The problem of ranking entities has a great impact on our society and therefore its understanding and exploration is crucial. Unfortunately, the concept itself can be vulnerable to manipulation. Therefore, the first goal of our project is to show and prove how the ranking of vertices in a graph (network) changes if a new node (object) or edge (relation) is added or removed. A second objective is to present the magnitude of ways to alter the ranking and to see how they affect it. In this research, we explore one main structure and its properties, cases with a group of non-interlacing structures, more dimensions, weights or a change in the number of elements in the network. Subsequently, we manage to start from a certain structure and convert it to a one we want to obtain. While doing this, we gain some theoretical results for the rank of graph nodes after the alteration and find their relation to the ranking algorithm. Our main result is the success in predicting changes of the ranking for every undirected structure, regardless its other properties.

Awards Won:
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