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P-Rank Network Model: A New Method To Measure Influence and Impact Summary

A particularly interesting and challenging problem in network analysis is to measure influence and impact. In this article, we develop a P-Rank Network Model to figure out the influence of each node within research networks and other areas of society. Our model is based on PageRank algorithm and double-weighting factor p. To further improve the model, we also add Max-Degree algorithm to our model in order to discuss how to maximize the network-based influence when applying our model into practice within networks.

After carefully analyzing the problem, we divide our paper into five parts:

To complete the first task, after effective data extraction, we use a set of nodes and their links to build the co-author network of the Erdos1 authors with basic assumptions and then conduct the properties analysis.

As for the second and third tasks, we use the P-Rank Network Model (PRNM) to measure the influence and impact within research networks. With corresponding network influence data, we figure out the most influential Erdos1 author and determine the most influential paper in network science. In addition, we further discuss the model applicability to generic network influence-ranking problems.

To deal with the fourth question, we implement our model on network influence of movie actors. To achieve more reliable results, we restrict the network to only ten famous movie actors and then use the algorithm in PRNM to work out the most influential movie actor within this network. The effect of different value of p on our results is also discussed in this part.

Afterwards, we apply our model into practice within networks. In this case, we focus on how to maximize the network-based influence based on max-degree algorithm. To explain the application, we present two specific situations to maximize impact. We also discuss in detail on how to optimize our model by adding the new algorithm.

Finally, the sensitivity, strengths and weakness of the model are discussed, and the future work is pointed out.