

# A Survey on various Ranking Methodologies used by Social Networks

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**Abstract**— Social networks are built from a group of people who share the same interests, backgrounds, and activities. In social networks, people can communicate with each other in many ways. They can share and upload files such as images, videos, and audios to their profiles. It is sites are web based services that allow individuals to create a public profile, create a list of users with whom to share connections, and view and cross the connections within the system. Different social networking services such as Facebook, Twitter, YouTube, etc., allow users to view content posted by others as well as to post their own content or opinions. This paper surveys different methodologies used for ranking.

**Keywords**— Social network, social media, ranking methodology, metrics.

## I. INTRODUCTION

Social media usage has become an essential and important part of day-to-day activities of people. Social Graphs can be used to represent social networks. A social network can be defined as a representation of the relationships existing within a community of people or it is built from a group of people who share the same interests, backgrounds, and activities. [1]

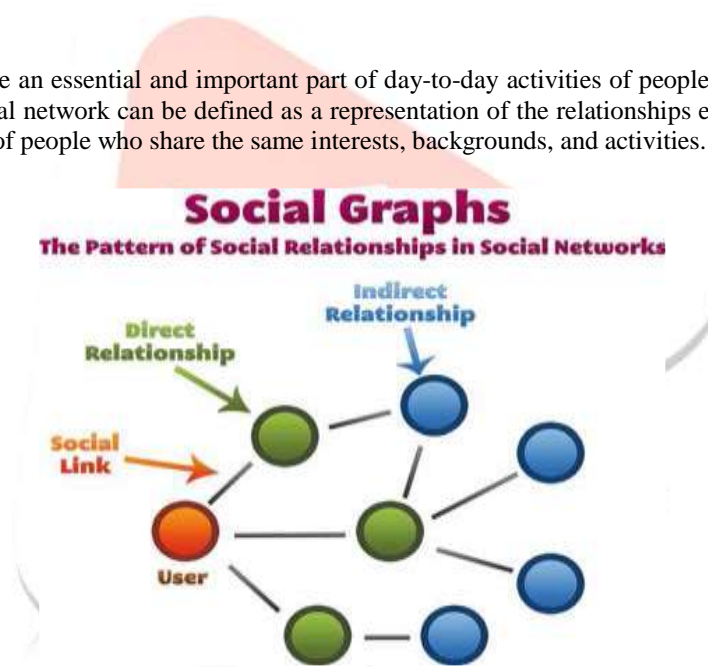


Fig. 1 Social graph: the pattern of social relationships in social networks [6]

Nodes represent social network users and edges are used to represent relationships among them. Different social networking services such as Facebook, Twitter, YouTube, etc., allow users to view content posted by others as well as to post their own content or opinions. Also, Social media provide a lot of web features, such as user information, interaction records and action tracking. These features can be used to mine user interest. Especially, the trust between different users and reputation among them. In computer language, when you "like" something through Face book, it becomes an edge. The edge can be the connection point between you and other people, places, or things.

Reputation for a person is defined as “what is generally said or believed about a person’s character or standing.” and they also define Reputation as the collective measurement of trustworthiness based on referral or ratings of the members in the community. The basic idea of reputation system is to derive a score for users. Based on these scores, user will know its reputation among different user. Every user will have a reputation value, which is calculated as the harmonic mean between the average trust score and the experience of the user. To calculate the reputation value for user p, we need to average the trust values that every member in the community holds for user p. [7] From this reputation user will get to know what is its reputation among their friends.

Various research method is used, they are useful for different disciplines from which we can categorize user’s behavior.

Several methods are Network analysis, Web content analysis, Sentiment analysis etc. There are various methods from which we can find reputation of person.

In this paper, evaluation of various social metrics such as Pagerank, NodeRanking, Reputation system, Engagement rate, Rankscore, Polarityrank are made.

## II. RELATED WORK

### • EVALUATION OF SOCIAL METRICS

In paper [1] author have proposed **Pagerank method**. The main idea of Pagerank is that good nodes point or are pointed by another good node. So, the authority of a node depends on the nodes that point to it.

$$x^{(t+1)} = L^T x^t \quad (1)$$

Pagerank uses the matrix P, that is the adjacency matrix L, where all the rows sum to 1, thus a stochastic matrix is obtained. This method can be used in social network sites like Facebook, Google+, Twitter etc. The full stochastic matrix of transition probability is:

$$M = e \frac{1}{n} \mathbf{1}\mathbf{1}^T + (1-e)P \quad (2)$$

In paper [1] author have proposed **NodeRanking method**. NodeRanking is based on the idea that each node on the graph has an associated degree of authority. Initially, all nodes are assumed to have the same authority. Cycles in the graph can produce critical Deadlocks. The NodeRanking algorithm overcomes these problems. It follows a random walker strategy to explore the graph. It starts in a randomly selected node, and proceeds by selecting one of the nodes that can be reached through out-edges. After running NodeRanking the resulting authority measure is used to infer the reputation of a node within the graph, that is, the reputation of a member within his community. Authority of a node, a, is calculated as a function of the total measure of authority present in the network and the authority of the nodes pointing to a. If a node is not referred by any other node in the network, it is assigned a default authority value. Authority values are positive values.

In paper [2] author have proposed **Reputation system**. Reputation systems play an important role in the process of trust establishment and management. Reputation systems can be analyzed from three dimensions namely formulation, calculation and dissemination. The formulation dimension describes the mathematical model and input for the assessment of reputation values. It includes two main aspects: the reputation measure and the mathematical model (metric) used to aggregate ratings. Reputation can be measured using discrete or continuous values. Metrics can be based on simple summation or average of ratings, fuzzy logic, flow-based models etc. The calculation dimension addresses the practical design and implementation of the algorithm for assessing reputation, whereas the dissemination dimension focuses on the mechanisms for the distribution and storage of ratings and reputation values among entities within the system.

In paper [3] author have proposed **Engagement rate method**. Engagement means establishing and sustaining relationships, while developing a level of trust that makes people comfortable enough to do business with you. Engagement Rate can be calculated using their friend can interact with user's posts or make them show up in their Newsfeeds using data like total numbers of likes, comments and share are available in per post of user, and using this data we can find how many people are engage with user's profile. This method is used in Facebook to know who much user is interacted with that particular page.

$$\text{Average Post Engagement Rate} = \frac{\text{Likes + Comments + Shares on a given day}}{\frac{\text{\# of wall posts made by page on a given day}}{\text{Total Fans on a given day}}} \times 100$$

$$\text{Daily Page Engagement Rate} = \frac{\text{Likes + Comments + Shares on a given day}}{\text{Total Fans on a given day}} \times 100$$

In paper [5] author have proposed **Rankscore method**. 'm' is a starting point of summation. And 'n' is all of seed's friends. 'α', 'β' and 'γ' are weighted parameters. This formula means that RankScore shows user how close to user and friend A where, Relationship score is the small social network service information of Ego-network that made by friends list. Interaction score is a strong probability that the two people are in friendly relationship if they have much communication about their interests

and share the same information. Personal score means that overlapping size was similar to each person's personal information. This method is used in Twitter etc.

$$RankScore_{seed,A} = \alpha \times \frac{Relationship\ score_A}{\sum_{m=1}^n Relationship\ score_m} + \beta \times \frac{Interaction\ score_A}{\sum_{m=1}^n Interaction\ score} + \gamma \times \frac{Personal\ score_A}{\sum_{m=1}^n Personal\ score}$$

In this paper [6] author have proposed **PolarityRank method**. PolarityRank is based on the similar ideas as PageRank, but it extends its functionalities in order to handle graphs with positive and negative edges. PolarityRank defines two different ranking values for each node in the graph, **Positive PolarityRank (PR+)** and **Negative PolarityRank (PR-)**. This method is used in Slashdot.org, Twitter etc.

$$PR^+(v_i) = (1 - d)e_i^+ + d \left( \sum_{j \in In^+(v_i)} \frac{P_{ji}}{\sum_{k \in Out(v_j)} |P_{jk}|} PR^+(v_j) + \sum_{j \in In^-(v_i)} \frac{-P_{ji}}{\sum_{k \in Out(v_j)} |P_{jk}|} PR^-(v_j) \right)$$

$$PR^-(v_i) = (1 - d)e_i^- + d \left( \sum_{j \in In^+(v_i)} \frac{P_{ji}}{\sum_{k \in Out(v_j)} |P_{jk}|} PR^-(v_j) + \sum_{j \in In^-(v_i)} \frac{-P_{ji}}{\sum_{k \in Out(v_j)} |P_{jk}|} PR^+(v_j) \right)$$

### III. COMPARATIVE STUDY

Table: I Comparison between different ranking methodologies.

Sr. No.	Title	Year	Method used	Limitation
1.	Distributed and Adaptable Ranking Algorithm for Reputation and Relevance Extraction. [1]	Research Gate 2015	Pagerank method.	It does not check all the nodes in graph.
2.	Distributed and Adaptable Ranking Algorithm for Reputation and Relevance Extraction. [1]	Research Gate 2015	NodeRanking method.	Time consuming as Converge function has to check all the nodes
3.	A reference model for reputation systems. [2]	Elsevier 2014	Reputation system.	Reputation System that produce reputation values is either 0 or 1. (i.e. a value between 0.5 and 1 rounds to a 1, while anything under 0.5 rounds down to 0).
4.	Social and online media research – data, metrics and methods. [3]	Reaser 2012	Engagement rate method.	Accurate ranking of page is not possible.
5.	Propagation of trust and distrust for the detection of trolls in a social network. [6]	Elsevier 2012	Polarityrank method	Time consuming, as it checks both positive and negative edges.

6.	<b>Digital Brand Management — A Study on the Factors Affecting Customers Engagement in Facebook Pages.</b> <sup>[4]</sup>	IEEE 2015	Online Engagement rate method.	If page is not kept up to date, then user will have no interest in that page that result in low engagement rate.
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#### IV. CONCLUSION

Various social networking platforms apply specific methodologies to find rank/reputation of users to publish feeds, use in suggestions, marketing & advertisements, recommend social items. Most effective use of ranking **PolarityRank** is done by Twitter to suggest users to follow and have gained large number of users from other platforms. Further survey of corporate social networks can be done to identify better features and integrate algorithms with public social network algorithms.

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