

## **Random walks on Graphs, Background Applications**

### **Applications in Social Computing:**

#### **PageRank Algorithm:**

Background: PageRank is a well-known algorithm developed by Google, based on random walks on the web graph.

Application: PageRank ranks web pages based on their importance, considering the link structure of the web. It's used in web search engines to determine the relevance of search results.

#### **Personalized Recommendations:**

Background: Random walks can be customized for individual users in recommendation systems.

Application: Personalized random walks help recommend products, articles, or content to users based on their past interactions and the behavior of similar users.

#### **Community Detection:**

Background: Random walks are valuable for identifying communities or clusters of nodes in social networks.

Application: Algorithms like Walktrap Community Detection use random walks to uncover groups of users with strong internal connections, aiding in community discovery.

#### **Information Diffusion:**

Background: Random walks simulate the spread of information or influence in networks.

Application: Understanding how information, trends, or rumors propagate through social media networks, influencing user behavior and decision-making.

#### **Link Prediction:**

Background: Random walks can estimate the likelihood of a future link forming between two nodes based on their shared neighbors.

Application: Predicting potential connections or collaborations between users or entities, aiding in network growth and recommendation systems.

#### **Centrality and Influence Analysis:**

Background: Random walks can be used to measure the centrality and influence of nodes in a network.

Application: Identifying influential users, content, or entities in social networks, which is crucial for targeted marketing and understanding information flow.

#### **Exploration and Serendipity:**

Background: Random walks promote exploration and serendipitous discovery of content or connections.

Application: Encouraging users to discover new, unexpected content or friends in social media platforms.

### **Relevance Ranking in Information Retrieval:**

Background: Random walks can be used to determine the relevance of web pages or documents to a query.

Application: Enhancing search engine algorithms by considering not only direct keyword matches but also the network structure of web pages.