

Breadth First Search(BFS) is an algorithm that has a variety of practical applications in graph theory, including the analysis of complex social networks. The datasets selected to implement BFS are the Enron email network from the company's infamous 2001 financial scandal and Social circles: Facebook, a survey report of online friends. Each graph node in both represents some sort of self-identifying information such as an email address or social profile, and the connected edges can be described as the exchange of electronic interactions between a sender and a recipient. By starting at an individual's profile and using BFS to search through their connections, the individual's level of influence and network can be derived as valuable information. The objective of this project's BFS implementation is to demonstrate the algorithm's simple ability to understand a graph's depth level by maintaining an ordered count of edges or degrees of connection between nodes.

Fundamental to BFS is the queue data structure as it marks connected edges as visited and adds them to the end of the queue to be explored in the next level. The algorithm continues to traverse the graph until it either reaches an intended destination or it visits all available vertices. The implemented graph structure keeps track of the adjacent vertices which BFS is able to mark as explored. In graph theory, ego networks like the Facebook dataset are a major topic and different types of algorithms are constantly being developed to extract insights into how people interact with each other and the information they might share. The analysis of ego networks using BFS is an important area of research, and historically the insights gained from graph theory have had important implications for understanding social behavior.

In the case of both datasets, they are represented as undirected graphs and BFS can be used to identify a degree of separation between individuals and their social connections. The six degrees of separation option is especially important because it calculates how connected the

graph is by finding the average number of connections it takes to reach any node from any original node. The project code provides several options to display the range of BFS's utility and proves it is an effective method for exploring social networks.