Rust Final Project

The link to my dataset: <https://snap.stanford.edu/data/ego-Facebook.html>

I had to slightly alter my proposal because the other data set was not large enough to get a good idea of how the data was connected. I switch to a data set that only looks at Facebook data. I wanted to see how connected the data was and how connected the people were and what vertices are most connected. Using things like mean and median show connected the people are and how densely connected the data is. I will address the implications of the data on the graph's structure and connectivity.

The given results summarize the distances between different vertices in a graph, calculated using breadth-first search (BFS) from a specific starting vertex.

When running the code, you can just run it like you would with any other code using cargo run. There will be a large output. This out will be relatively ling because it prints out the entirety of the adjacency list. This can be avoided by commenting the section out. The rest of the output should be relatively short. There is also another section where it returns the entirety of the breadth first search. Right now that section is commented out but it can be added easily for a more in-depth look at all the different vertices. There are also so many vertices that not all of them will show up in the terminal.

First, the mean is reported as 3.84. This figure indicates that, on average, vertices are relatively close to one another in terms of path length. Such a low mean distance suggests that the graph is well-connected, a feature often observed in social networks and other real-world graphs. This connectivity may facilitate the flow of information or interactions across the network.

The maximum distance between different vertices is reported as 7. This figure represents the longest shortest path between any two vertices in the graph and serves as an indication of the graph's diameter. A relatively low maximum distance implies that the graph is not particularly expansive in terms of path length. This compactness is characteristic of small-world networks, which often exhibit short path lengths despite having many nodes.

The median distance between different vertices is 4.00, which matches closely with the mean distance. This suggests a symmetric distribution of distances, with half of the distances between vertices being less than or equal to 4.00 and the other half being greater. Such a distribution points to a balanced structure within the network, where most vertices are connected through paths of moderate length.

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Description automatically generated

The lowest 15 distances begin with a distance of 0 from the starting vertex, followed by many vertices at distances of 1 and 2. This pattern suggests the presence of a dense cluster of vertices around the starting point, indicating local connectivity or clustering. This phenomenon is common in real-world networks, where nodes tend to form tightly knit communities or clusters.

Conversely, the highest 15 distances are all equal to 7, representing the upper limit of distances in the graph. This uniformity in the highest distances suggests there is a group of vertices. They are not connected at all. These vertices might form a separate group or subgraph within the larger graph, pointing to potential segmentation or modularity in the network.

A screen shot of a computer

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This is the output of the adjacency list that basically describes what different vertices are directly connected. Below is a snippet of this. In the case of this data set this means that the people represented by the vertices are connected with the other vertices. There are clearly some that are more connected than others.

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Description automatically generated

In summary, the data reveals a graph with a relatively small mean and median distance, indicative of a dense and well-connected network. The graph's compact diameter, represented by the maximum distance, suggests a high degree of connectivity, typical of small-world networks. The clustering around the starting vertex and the consistent maximum distance of 7 among the highest distances hint at the presence of localized communities and potentially isolated groups of vertices. These insights provide a comprehensive understanding of the graph's overall connectivity, density, and potential community structure, which can be valuable for further analysis and interpretation within the context of real-world networks.

If this code is rerun the answers for the mean, median and max might slightly differ based on the chosen start vertex.