You have developed a novel new product. You believe “word of mouth” is the key for the success of your new product. You want to start a viral marketing campaign. And your company’s data analyst has obtained a list of the people you want to target and their interactions from social media.

Work with the network data mentioned in the slide deck provided (‘network\_nodelist.csv’ and ‘network\_edgelist.csv’). Answer the following questions by conducting the right analysis.

Part 1: Get started with Networkx

* Install and initialize Networkx
* Draw network graphs
* Generate the network density
* Generate the shortest path between "Joseph Wyeth" and "Gervase Benson"
* Generate the centrality measures

Part 2: The message can be forwarded to multiple users at the same time, but the travel distance of the message is limited to one step, which means if it travels more than one step in this network, it is no longer effective. Apply your knowledge in network centrality to select the best candidate.

* Based on the right measure, suggest the right candidate and explain why

*Write down the answer in the notebook and the word file*

*Based on the analysis of the network, if the message needs to be forwarded to multiple users simultaneously and its travel distance is limited to one step, the most effective approach would be to choose the node with the highest degree centrality. In this case, "William Penn" has the highest degree centrality, indicating that he is the most connected node in the network. By selecting William Penn as the forwarding node, the message has the highest probability of reaching the maximum number of individuals in the network within one step.*

Part 3: Now the limit of travel distance has been removed. Regardless of who you pick, every node in the network will eventually receive the message. But we want to ensure the lowest average number of hops.

* Based on the right measure, suggest the right candidate and explain why.

*Write down the answer in the notebook and the word file*

*To achieve the lowest average number of hops, we need to select the node that has the highest betweenness centrality. Based on our network analysis, William Penn has the highest betweenness centrality, which implies that he plays a crucial role in bridging the communication gap between various nodes in the network. This is due to the fact that William Penn is located in a central position and serves as a hub that connects different clusters of nodes. Therefore, selecting William Penn to deliver the message would ensure the lowest average number of hops required for the message to reach all nodes in the network.*

Part 4: Now, besides the viral marketing, you also want to run targeted advertising g campaign: show different groups of people different ads. For example, through social media, you find that *'Rebecca Travers'* interacted with the ad featuring Ang Lee. Who else do you want to show the ad to?

* Based on the right measure, suggest the people you want to show the ad to and explain why.
* *Write down your answer on the notebook and the word file*

Based on the network analysis, it is likely that individuals who are in the same community as Rebecca Travers, such as Daniel Quare and Alice Curwen, would be interested in an advertisement featuring Ang Lee. This is because individuals in the same community are more likely to share similar interests and preferences. Therefore, targeting individuals in the same community as Rebecca Travers could be an effective strategy to reach a relevant audience for the advertisement.