Project Title: Analyzing Online Social Networks through Search Engine Data

Project Overview: The goal of this project is to analyze and visualize online social networks based on publicly available data from search engine results. By leveraging web scraping techniques and the **SERPAPI** (Search Engine Results Page API), the project will gather information about relationships between websites and topics of interest. The collected data will be used to construct a network graph using NetworkX and visualize network properties using heatmaps and 3D mesh models.

Project Components:

1. **Web Scraping with SERPAPI: (2%)**
   - Implement web scraping to extract data from search engine results pages (SERPs) using the SERPAPI.

2. **Network Construction with NetworkX: (2%)**
   - Utilize NetworkX, a Python library for network analysis, to build a graph representing the relationships between websites and topics.
   - Represent websites as nodes and relationships (e.g., co-occurrence in search results) as edges.

3. **Network Analysis: (1%)**
   - Perform basic network analysis to identify key nodes (websites/topics) based on centrality measures (e.g., degree centrality, betweenness centrality).
   - Explore community detection algorithms to uncover clusters of related websites/topics.

4. **Heatmap Visualization: (2%)**
   - Use heatmap visualization techniques to depict the strength of relationships (edges) between nodes (websites/topics).
   - Color code the heatmap based on edge weights or other network metrics to highlight important connections.

5. **3D Mesh Modeling: (2%)**
   - Implement 3D mesh modeling to visualize the network graph in a three-dimensional space.
   - Assign attributes (e.g., node size, color) based on network properties to create an interactive and visually engaging representation.

6. **Acceptable User Interface (UI): (1%)**

7. **Bonus Task (optional): 5%**

Extra options in the project capabilities will be appreciated with extra points. (The discussion of this part will be with me personally: Dr. Mohamed Maher).

Project submission requirements:

1. **Source Code:**

Upload the complete source code of your search engine implementation via classroom before the final discussion session, with a deadline of within 1 complete day (**24 hours**) prior to the discussion. This deadline ensures that all submissions can be reviewed prior to our final discussion and allows time for any necessary preparations.

2. **PDF Report:**

Prepare a PDF report that contains a brief description of each stage of your search engine implementation. Each student will upload his/her PDF at the same time of uploading the source code.

Important information

Maximum points	10%
Due date	Week 14 (a complete schedule of discussions will be announced within week 13)
For Bonus part	Your assigned TA's will review the bonus part and they will send me a recommendation of final review. Accordingly, I will send the student an email of final discussion with me

Important precaution:

As a reminder, the use of AI tools to complete this project is strictly prohibited. Any student found violating this policy will receive a **zero** for the affected assignment and the final course work. This policy is in place to ensure that each student gains a comprehensive understanding of the subject matter through their own efforts and learning. Please adhere to this policy to maintain academic integrity and fair assessment.