CSE 222 -DATA STRUCTURES & ALGORITHMS

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In this homework, we were responsible for creating a social network using graphs. We used adjacency list implementation of graphs in our homework. Adjacency list is great to use if we have sparse graphs because it's time complexity would be O(|E|).

At the implementation of the functions, add & remove person functions checks for the person's identity and creates or removes according to that. Add & remove friendships is also similar. It checks the friendship graph and creates or removes friendships according to that. In the FindShortestPath function, we were told that we need to use Breadth-First Search. BFS is a O(n) search technique for graphs. At first we select a node randomly. After that we traverse that nodes neighbours and add them to queue. We also have an visited array that holds the visited nodes for securing the search from infinite loop. According to queue we search the other nodes and it's complexity is equal to number of nodes. SuggestFriends function iterates over all the people that are not friends to out person. It calculates the overall scores of people according to mutual friends and mutual hobbies. CountClusters function counts the clusters. Clusters are friendship groups. In my implementation, I also added the people that does not have any friends as a cluster.

Some of the inputs & their outputs:

```
===== Social Network Analysis Menu =====
1. Add a person
2. Remove a person
3. Add a friendship
4. Remove a friendship
5. Find shortest path
6. Suggest friends
7. Count clusters
8. Exit
Please select an option:1
Enter name: A
Enter age: 21
Enter hobbies (comma separated): 1,2,3
Person added: A (Age: 21, Hobbies: [1, 2, 3] Wed May 29 13:05:37 TRT 2024)
```

```
===== Social Network Analysis Menu =====
1. Add a person
2. Remove a person
3. Add a friendship
4. Remove a friendship
5. Find shortest path
6. Suggest friends
7. Count clusters
8. Exit
Please select an option:3
Enter first name: A
Enter first person's timestamp: Wed May 29 13:05:37 TRT 2024
Enter second name: B
Enter second person's timestamp: Wed May 29 13:05:51 TRT 2024
Friendship added between A and B
```

```
===== Social Network Analysis Menu =====
1. Add a person
2. Remove a person
3. Add a friendship
4. Remove a friendship
5. Find shortest path
6. Suggest friends
7. Count clusters
8. Exit
Please select an option:5
Enter first name: A
Enter first person's timestamp: Wed May 29 13:05:37 TRT 2024
Enter second name: C
Enter second person's timestamp: Wed May 29 13:06:03 TRT 2024
Shortest path:
A -> B -> C
```

```
===== Social Network Analysis Menu =====
1. Add a person
2. Remove a person
3. Add a friendship
4. Remove a friendship
5. Find shortest path
6. Suggest friends
7. Count clusters
8. Exit
Please select an option:7
Countişng clusters in the social network...
Number of clusters found: 1
Cluster 1:
A
B
C
```

```
===== Social Network Analysis Menu =====
1. Add a person
2. Remove a person
3. Add a friendship
4. Remove a friendship
5. Find shortest path
6. Suggest friends
7. Count clusters
8. Exit
Please select an option:2
Enter name: B
Enter age: 21
Enter timestamp: Wed May 29 13:05:51 TRT 2024
Person removed: B
```

```
===== Social Network Analysis Menu =====
1. Add a person
2. Remove a person
3. Add a friendship
4. Remove a friendship
5. Find shortest path
6. Suggest friends
7. Count clusters
8. Exit
Please select an option:5
Enter first name: A
Enter first person's timestamp: Wed May 29 13:05:37 TRT 2024
Enter second name: C
Enter second person's timestamp: Wed May 29 13:06:03 TRT 2024
No path found between A and C
```

```
===== Social Network Analysis Menu =====
1. Add a person
2. Remove a person
3. Add a friendship
4. Remove a friendship
5. Find shortest path
6. Suggest friends
7. Count clusters
8. Exit
Please select an option:6
Enter person's name: A
Enter person's timestamp: Wed May 29 13:09:51 TRT 2024
Enter maximum number of friends to suggest: 2
Friend suggestions for A:
C (Age: 1, Hobbies: [1, 2, 4] Wed May 29 13:10:10 TRT 2024) (Score: 2.0, 1 mutual friends, 2 common hobbies)
D (Age: 1, Hobbies: [2] Wed May 29 13:10:16 TRT 2024) (Score: 1.5, 1 mutual friends, 1 common hobbies)
```