CSE222 HW8 Report

Program Functionality

Add Person: Adds a new user to the network.

Remove Person: Removes a user from the network based on their name and timestamp.

Add Friendship: Creates a bidirectional friendship between two users.

Remove Friendship: Removes the friendship between two users.

Find Shortest Path: Finds the shortest path between two users using BFS (Breadth-First Search).

Suggest Friends: Suggests potential friends based on mutual friends and common hobbies.

Count Clusters: Counts and lists the number of clusters in the network using BFS.

Algorithms Used

Breadth-First Search (BFS):

Shortest Path: The program uses BFS to find the shortest path between two users. BFS explores all nodes at the present depth level before moving on to nodes at the next depth level, ensuring the shortest path in an unweighted graph.

Cluster Counting: The program also uses BFS to count clusters in the network. Each unvisited node starts a new BFS traversal, which marks all reachable nodes, effectively identifying all nodes in the same cluster.

Friend Suggestion:

The friend suggestion algorithm calculates a score for each potential friend based on the number of mutual friends and common hobbies. The score is incremented by 1 for each mutual friend and incremented by 0.5 for each common hobby. The program then sorts these scores in descending order to suggest the best potential friends up to the specified maximum number.

TESTING WITH DEFAULT DEMO

```java
// Adding some people for demonstration
network.addPerson("John Doe", 25, Arrays.asList("reading", "hiking", "cooking"), defaultTimestamp);
network.addPerson("Jane Smith", 22, Arrays.asList("swimming", "cooking"), defaultTimestamp);
network.addPerson("Alice Johnson", 27, Arrays.asList("hiking", "painting"), defaultTimestamp);
network.addPerson("Bob Brown", 30, Arrays.asList("reading", "swimming"), defaultTimestamp);
network.addPerson("Emily Davis", 28, Arrays.asList("running", "swimming"), defaultTimestamp);
network.addPerson("Frank Wilson", 26, Arrays.asList("reading", "hiking"), defaultTimestamp);

// Counting clusters for demonstration
network.countClusters();
```

ADD PERSON & COUNT CLUSTERS

```
PS C:\Users\Serdar\Desktop\hw8\HW8_Demo\src> make run
javac SocialNetworkGraph.java Person.java Main.java
java Main
Person is added: John Doe (Age: 25, Hobbies: [reading, hiking, cooking], Timestamp: 2024-05-29 18:29:31)
Person is added: Jane Smith (Age: 22, Hobbies: [swimming, cooking], Timestamp: 2024-05-29 18:29:31)
Person is added: Alice Johnson (Age: 27, Hobbies: [hiking, painting], Timestamp: 2024-05-29 18:29:31)
Person is added: Bob Brown (Age: 30, Hobbies: [reading, swimming], Timestamp: 2024-05-29 18:29:31)
Person is added: Emily Davis (Age: 28, Hobbies: [running, swimming], Timestamp: 2024-05-29 18:29:31)
Person is added: Frank Wilson (Age: 26, Hobbies: [reading, hiking], Timestamp: 2024-05-29 18:29:31)
Cluster 1: [Frank Wilson (Age: 26, Hobbies: [reading, hiking], Timestamp: 2024-05-29 18:29:31)]
Cluster 2: [Bob Brown (Age: 30, Hobbies: [reading, swimming], Timestamp: 2024-05-29 18:29:31)]
Cluster 3: [Emily Davis (Age: 28, Hobbies: [running, swimming], Timestamp: 2024-05-29 18:29:31)]
Cluster 4: [Jane Smith (Age: 22, Hobbies: [swimming, cooking], Timestamp: 2024-05-29 18:29:31)]
Cluster 5: [John Doe (Age: 25, Hobbies: [reading, hiking, cooking], Timestamp: 2024-05-29 18:29:31)]
Cluster 6: [Alice Johnson (Age: 27, Hobbies: [hiking, painting], Timestamp: 2024-05-29 18:29:31)]
Number of clusters found: 6
===== Social Network Analysis Menu =====
1. Add person
2. Remove person
3. Add friendship
4. Remove friendship
5. Find shortest path
6. Suggest friends
7. Count clusters
8. Exit
Please select an option: 1
Enter name: patates
Enter age: 12
Enter hobbies (comma-separated): chillin, nothing else
Person is added: patates (Age: 12, Hobbies: [chillin,  nothing else], Timestamp: 2024-05-29 18:31:24)
```

REMOVE PERSON

```
Please select an option: 7
Cluster 1: [Frank Wilson (Age: 26, Hobbies: [reading, hiking], Timestamp: 2024-05-29 18:29:31)]
Cluster 2: [Bob Brown (Age: 30, Hobbies: [reading, swimming], Timestamp: 2024-05-29 18:29:31)]
Cluster 3: [Emily Davis (Age: 28, Hobbies: [running, swimming], Timestamp: 2024-05-29 18:29:31)]
Cluster 4: [Jane Smith (Age: 22, Hobbies: [swimming, cooking], Timestamp: 2024-05-29 18:29:31)]
Cluster 5: [patates (Age: 12, Hobbies: [chillin,  nothing else], Timestamp: 2024-05-29 18:31:24)]
Cluster 6: [John Doe (Age: 25, Hobbies: [reading, hiking, cooking], Timestamp: 2024-05-29 18:29:31)]
Cluster 7: [Alice Johnson (Age: 27, Hobbies: [hiking, painting], Timestamp: 2024-05-29 18:29:31)]
Number of clusters found: 7
===== Social Network Analysis Menu =====
1. Add person
2. Remove person
3. Add friendship
4. Remove friendship
5. Find shortest path
6. Suggest friends
7. Count clusters
8. Exit
Please select an option: 2
Enter name: Alice Johnson
Enter timestamp (yyyy-MM-dd HH:mm:ss): 2024-05-29 18:29:31
Person is removed: Alice Johnson (Age: 27, Hobbies: [hiking, painting], Timestamp: 2024-05-29 18:29:31)
```

ADD FRIENDSHIP

```
Please select an option: 7
Cluster 1: [Frank Wilson (Age: 26, Hobbies: [reading, hiking], Timestamp: 2024-05-29 18:29:31)]
Cluster 2: [Bob Brown (Age: 30, Hobbies: [reading, swimming], Timestamp: 2024-05-29 18:29:31)]
Cluster 3: [Emily Davis (Age: 28, Hobbies: [running, swimming], Timestamp: 2024-05-29 18:29:31)]
Cluster 4: [Jane Smith (Age: 22, Hobbies: [swimming, cooking], Timestamp: 2024-05-29 18:29:31)]
Cluster 5: [patates (Age: 12, Hobbies: [chillin,  nothing else], Timestamp: 2024-05-29 18:31:24)]
Cluster 6: [John Doe (Age: 25, Hobbies: [reading, hiking, cooking], Timestamp: 2024-05-29 18:29:31)]
Number of clusters found: 6
===== Social Network Analysis Menu =====
1. Add person
2. Remove person
3. Add friendship
4. Remove friendship
5. Find shortest path
6. Suggest friends
7. Count clusters
8. Exit
Please select an option: 3
Enter first person?s name: patates
Enter first person?s timestamp (yyyy-MM-dd HH:mm:ss): 2024-05-29 18:31:24
Enter second person?s name: John Doe
Enter second person?s timestamp (yyyy-MM-dd HH:mm:ss): 2024-05-29 18:29:31
Friendship added between patates and John Doe
```

REMOVE FRIENDSHIP

```
Please select an option: 7
Cluster 1: [Frank Wilson (Age: 26, Hobbies: [reading, hiking], Timestamp: 2024-05-29 18:29:31)]
Cluster 2: [Bob Brown (Age: 30, Hobbies: [reading, swimming], Timestamp: 2024-05-29 18:29:31)]
Cluster 3: [Emily Davis (Age: 28, Hobbies: [running, swimming], Timestamp: 2024-05-29 18:29:31)]
Cluster 4: [Jane Smith (Age: 22, Hobbies: [swimming, cooking], Timestamp: 2024-05-29 18:29:31)]
Cluster 5: [patates (Age: 12, Hobbies: [chillin,  nothing else], Timestamp: 2024-05-29 18:31:24), John Doe (Age: 25, Hobbies: [reading, hiking, cooking], Timestamp: 2024-05-29 18:29:31)]
Number of clusters found: 5
===== Social Network Analysis Menu =====
1. Add person
2. Remove person
3. Add friendship
4. Remove friendship
5. Find shortest path
6. Suggest friends
7. Count clusters
8. Exit
Please select an option: 4
Enter first person?s name: patates
Enter first person?s timestamp (yyyy-MM-dd HH:mm:ss): 2024-05-29 18:31:24
Enter second person?s name: John Doe
Enter second person?s timestamp (yyyy-MM-dd HH:mm:ss): 2024-05-29 18:29:31
Friendship removed between patates and John Doe
===== Social Network Analysis Menu =====
1. Add person
2. Remove person
3. Add friendship
4. Remove friendship
5. Find shortest path
6. Suggest friends
7. Count clusters
8. Exit
Please select an option: 7
Cluster 1: [Frank Wilson (Age: 26, Hobbies: [reading, hiking], Timestamp: 2024-05-29 18:29:31)]
Cluster 2: [Bob Brown (Age: 30, Hobbies: [reading, swimming], Timestamp: 2024-05-29 18:29:31)]
Cluster 3: [Emily Davis (Age: 28, Hobbies: [running, swimming], Timestamp: 2024-05-29 18:29:31)]
Cluster 4: [Jane Smith (Age: 22, Hobbies: [swimming, cooking], Timestamp: 2024-05-29 18:29:31)]
Cluster 5: [patates (Age: 12, Hobbies: [chillin,  nothing else], Timestamp: 2024-05-29 18:31:24)]
Cluster 6: [John Doe (Age: 25, Hobbies: [reading, hiking, cooking], Timestamp: 2024-05-29 18:29:31)]
Number of clusters found: 6
===== Social Network Analysis Menu =====
1. Add person
2. Remove person
3. Add friendship
4. Remove friendship
5. Find shortest path
6. Suggest friends
7. Count clusters
8. Exit
```

SUGGEST FRIENDS

```
Please select an option: 7
Cluster 1: [Frank Wilson (Age: 26, Hobbies: [reading, hiking], Timestamp: 2024-05-29 18:29:31), patates (Age: 12, Hobbies: [chillin,  nothing else], Timestamp: 2024-05-29 18:31:24), John Doe (Age: 25, Hobbies:
 [reading, hiking, cooking], Timestamp: 2024-05-29 18:29:31), Emily Davis (Age: 28, Hobbies: [running, swimming], Timestamp: 2024-05-29 18:29:31)]
Cluster 2: [Bob Brown (Age: 30, Hobbies: [reading, swimming], Timestamp: 2024-05-29 18:29:31)]
Cluster 3: [Jane Smith (Age: 22, Hobbies: [swimming, cooking], Timestamp: 2024-05-29 18:29:31)]
Number of clusters found: 3
===== Social Network Analysis Menu =====
1. Add person
2. Remove person
3. Add friendship
4. Remove friendship
5. Find shortest path
6. Suggest friends
7. Count clusters
8. Exit
Please select an option: 6
Enter person?s name: Emily Davis
Enter person?s timestamp (yyyy-MM-dd HH:mm:ss): 2024-05-29 18:29:31
Enter maximum number of friends to suggest: 5
Frank Wilson (Score: 1.0)
John Doe (Score: 1.0)
Bob Brown (Score: 0.5)
Jane Smith (Score: 0.5)
```

SHORTEST PATH

```
Please select an option: 7
Cluster 1: [John Doe (Age: 25, Hobbies: [reading, hiking, cooking], Timestamp: 2024-05-29 18:47:58), Bob Brown (Age: 30, Hobbies: [reading, swimming], Timestamp: 2024-05-29 18:47:58), Emily Davis (Age: 28, Hob
bies: [running, swimming], Timestamp: 2024-05-29 18:47:58)]
Cluster 2: [Alice Johnson (Age: 27, Hobbies: [hiking, painting], Timestamp: 2024-05-29 18:47:58)]
Cluster 3: [Frank Wilson (Age: 26, Hobbies: [reading, hiking], Timestamp: 2024-05-29 18:47:58)]
Cluster 4: [Jane Smith (Age: 22, Hobbies: [swimming, cooking], Timestamp: 2024-05-29 18:47:58)]
Number of clusters found: 4
===== Social Network Analysis Menu =====
1. Add person
2. Remove person
3. Add friendship
4. Remove friendship
5. Find shortest path
6. Suggest friends
7. Count clusters
8. Exit
Please select an option: 5
Enter start person?s name: John Doe
Enter start person?s timestamp (yyyy-MM-dd HH:mm:ss): 2024-05-29 18:47:58
Enter end person?s name: Emily Davis
Enter end person?s timestamp (yyyy-MM-dd HH:mm:ss): 2024-05-29 18:47:58
Shortest path: [John Doe (Age: 25, Hobbies: [reading, hiking, cooking], Timestamp: 2024-05-29 18:47:58), Bob Brown (Age: 30, Hobbies: [reading, swimming], Timestamp: 2024-05-29 18:47:58), Emily Davis (Age: 28,
 Hobbies: [running, swimming], Timestamp: 2024-05-29 18:47:58)]
===== Social Network Analysis Menu =====
1. Add person
2. Remove person
3. Add friendship
4. Remove friendship
5. Find shortest path
6. Suggest friends
7. Count clusters
8. Exit
Please select an option: |
```

Makefile commands:

make: compile codes

make run: compile and run program

make doc: create javadoc

make clean: clean class files and javadoc