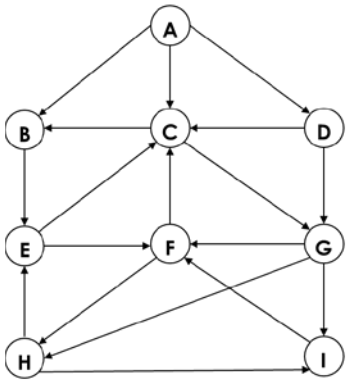
CS3353: Data Structures and Algorithm Analysis I
Fall 2022

Homework #5

- Full name only: _____
- Release date: Nov 28, 2022 (Monday), 5:15 PM
- Due date: **Dec 07, 2022 (Wednesday), 4:00 PM**
- It should be done INDIVIDUALLY; Show ALL your work; Submit your source code and results through Canvas.
- Total: 20 pts

1. Write a program to conduct a depth-first search using a stack and the minimum path search (e.g., breadth-first search) using a queue based on the following directed graph and its adjacency lists. In the depth-first search, any starting node can be selected (e.g., user input) in the graph. In the minimum path search, both starting and ending nodes should be selected (e.g., user input).



Adjacency Lists			
A:	B	C	D
B:	E		
C:	B	G	
D:	C	G	
E:	C	F	
F:	C	H	
G:	F	H	I
H:	E	I	
I:	F		

- Type the homework number and your full name at the top of your source code.

```
/* Homework #5, James Bond */
```

- Your program should be a menu-driven and execute the chosen command. If you type 3, then exit the program.

```
                    M E N U

Depth-First Search (0), Minimum Path Search (1)
Exit Program (3)

                    Choose?
```

- Display a message, in the case when searching a path that does not exist in the graph.
- Show ALL your work. For example,

```
                    M E N U

Depth-First Search (0), Minimum Path Search (1)
Exit Program (3)

                    Choose?  0  H
```

```
H  I  F  C  G  B  E


                        M E N U

Depth-First Search (0), Minimum Path Search (1)
Exit Program (3)

                        Choose?  1  A  I

A  C  G  I


                        M E N U

Depth-First Search (0), Minimum Path Search (1)
Exit Program (3)

                        Choose?  3

                    .
                    .
                    .
```

2. Please refer to Reference #1 and #2.

3. The adjacency list can be implemented by using either a linked list or an array. Both stack and queue data structures should be implemented in your way.

4. Submit your all source codes and results (e.g., screen copy) through the Canvas before the due date, **Dec 07, 2022 (Wednesday), 4:00 PM**. The TA will build and run your source codes and test with a random input.

- Source codes – The file name should be "your name + homework number", e.g., james_bond_5.cpp, james_bond_5.h, etc.
- Results in a word file (e.g., screen copy)
    - Self-testing is required before the submission.

5. **[Extra Credit]** If you can implement the following program, extra 10 points will be provided. Write a program to sort user input data using a set of sorting algorithms.

- Type the homework number and your full name at the top of your source code.

  ```
  /* Homework #5 – Bonus Work, James Bond */
  ```

- Your program should be a menu-driven and execute the chosen command. If you type 5, then exit the program.

  ```
                          M E N U

  Input Data (0), Insertion Sort (1), Selection Sort (2),
  Bubble Sort (3), Shell Sort (4), Exit Program (5)

                          Choose?
  ```

- A user can input a set of elements and select one of sorting algorithms to sort the recent input set. Show ALL your work. For example,

```
                          M E N U

Input Data (0), Insertion Sort (1), Selection Sort (2),
Bubble Sort (3), Shell Sort (4), Exit Program (5)

                        Choose?  0  9  7  6  15  16  5  10  11

9  7  6  15  16  5  10  11

                          M E N U

Input Data (0), Insertion Sort (1), Selection Sort (2),
Bubble Sort (3), Shell Sort (4), Exit Program (5)

                        Choose?  1

5  6  7  9  10  11  15  16

                          M E N U

Input Data (0), Insertion Sort (1), Selection Sort (2),
Bubble Sort (3), Shell Sort (4), Exit Program (5)

                       Choose?  0  2  8  6  1  10  15  3  12  11

2  8  6  1  10  15  3  12  11

                          M E N U

Input Data (0), Insertion Sort (1), Selection Sort (2),
Bubble Sort (3), Shell Sort (4), Exit Program (5)

                       Choose?  3

1  2  3  6  8  10  11  12  15
                          .
                          .
                          .
```

5.1. Please refer to the lecture slides for the related sorting algorithms and pseudocodes.

5.2. Submit your all source codes and results (e.g., screen copy) through the Canvas before the due date, **Dec 07, 2022 (Wednesday), 4:00 PM**. The TA will build and run your source codes and test with random input data.

- Source codes – The file name should be "your name + homework number", e.g., james_bond_5_bonus.cpp, james_bond_5_bonus.h, etc.
- Results in a word file (e.g., screen copy)
    - Self-testing is required before the submission.