

## CS3642-W02 Programming Assignment #1 (Spring 2024)

Total Points: 100 + 15 (bonus)

Due: February 4, 2024 (11:59 PM, EST)

1. [80 points] To implement these 4 algorithms

- a) [20 points] Depth-First Search (DFS)
- b) [20 points] Uniform-Cost Search (UCS)
- c) [20 points] Best-First Search (BFS)
- d) [20 points] A\* Algorithm

to solve 8 Puzzle Problem.

Note: The 8 puzzle consists of eight numbered, movable tiles set in a 3x3 frame. One cell of the frame is always empty thus making it possible to move an adjacent numbered tile into the empty cell. Start with a random state (cannot be fixed, you have to write a program/function to randomly generate the initial state). The goal state is listed below.

1	2	3
8		4
7	6	5

2. [12 points] provide a table of statistics below.

The program is to change the initial configuration into the goal configuration. A solution to the problem is an appropriate sequence of moves. You must write your own codes for the algorithms. Make sure your submission meets all of the requirements and free of plagiarism. Your program should be able to address any initial configuration.

Algorithm	Average number of nodes visited (you need repeat each algorithm several times with different initial configuration)	Average Run time (milliseconds)	Your comment on these algorithms
DFS			
UCS			
BFS			
A*			

3. [8 points] Provide a video presentation of your programming assignment in MP4, YouTube or any media.

4. Bonus (Optional) [15 points bonus] Add GUI to show the searching process.

You may write your code in a contemporary language of your choice; typical languages would include C/C++, Python, Java, Ada, Pascal, Smalltalk, Lisp, and Prolog.

Submission requirement:

- 1. Submit a **PDF file** of your well-commented **source program**, **your design**, and **your printed outputs (screen shots)**. Please include your codes in your PDF file. It is plagiarism to take any codes from the website or others. Try to understand the algorithm and implement the algorithm by your own. You must have the following 2 sections in your PDF file.
- 2. Provide a **video presentation** of your programming assignment in MP4, YouTube, or any media.
- 3. Please submit **your project in a zipped file** with an organized structure.
- 4. Please upload items 1), 2) and 3) above separately to D2L.

Adding the following 2 sections (I and II) at the beginning of your PDF including your code and outputs.

### I. Your Information:

// Course: \_\_\_\_\_  
// Student name: \_\_\_\_\_  
// Student ID: \_\_\_\_\_  
// Assignment #: \_\_\_\_\_  
// Due Date: \_\_\_\_\_  
// Signature: \_\_\_\_\_ (Your signature assures that everything is your own work. Required.)  
// Score: \_\_\_\_\_ (Note: Score will be posted on D2L)

### II. A brief design of your algorithm, including the description, source code, and screenshots.

- a) [20 points] DFS
  - [5 points] Description:
  - [12 points] Source code:
  - [3 points] Screenshots:
- b) [20 points] UCS
  - [5 points] Description:
  - [12 points] Source code:
  - [3 points] Screenshots:
- c) [20 points] BFS
  - [5 points] Description:
  - [12 points] Source code:
  - [3 points] Screenshots:
- d) [20 points] A\*
  - [5 points] Description:
  - [12 points] Source code:
  - [3 points] Screenshots:

### III. [12 points] provide a table of statistics below

Algorithm	Average number of nodes visited (you need repeat each algorithm several times with different initial configuration)	Average Run time (milliseconds)	Your comment on these algorithms
DFS			
UCS			
BFS			
A*			