

## Assignment 2

### AI Search techniques

#### Rules of submission:

- 1- The maximum number of students in a team is 2.
- 2- The folder name should follow this structure: ID1\_ID2\_GX.
- 3- No late submission.
- 4- Use Prolog to implement this assignment.
- 5- Add comments to explain your code.
- 6- Cheating students will take -2 and no excuses will be accepted. If you have any problems during the submission, contact your TA.

#### **Problem-1 (2 grades) :**

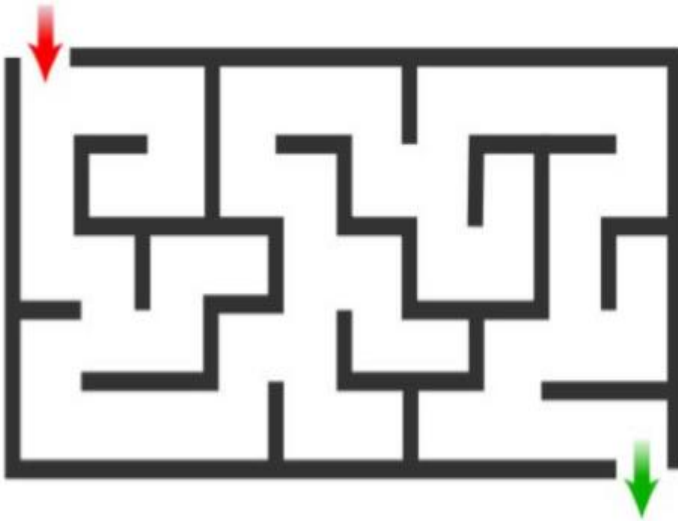
- Sudoku is a puzzle played on a partially filled 9 x 9 grid. The task is to complete the assignment using numbers from 1 to 9 such that the entries in each row, each column and each major 3 x 3 block are pairwise different. Below are given two tables; the first is showing a Sudoku Problem and the second a solution to this problem.
- **You must implement one of the uninformed search techniques to solve this Problem.**
- **Don't use built in predicates except (Append, findall, bagof, setof, nth0, nth1, member, substitute, length).**

A Sudoku Puzzle								
	2	6				8	1	
3			7		8			6
4				5				7
	5		1		7		9	
		3	9		5	1		
	4		3		2		5	
1				3				2
5			2		4			9
	3	8				4	6	

A Sudoku Puzzle Solution								
7	2	6	4	9	3	8	1	5
3	1	5	7	2	8	9	4	6
4	8	9	6	5	1	2	3	7
8	5	2	1	4	7	6	9	3
6	7	3	9	8	5	1	2	4
9	4	1	3	6	2	7	5	8
1	9	4	8	3	6	5	7	2
5	6	7	2	1	4	3	8	9
2	3	8	5	7	9	4	6	1

## Problem 2 - Diamonds Maze (2 grades):

Overview: A maze is a tour puzzle in the form of a complex branching passage through which the solver must find a route. The pathways and walls in a maze are fixed.



The goal is to choose a path to the exit of the maze. Assume that the maze contains diamonds. We want to implement the A\* algorithm in order to find a path till the exit of the maze while at the same time maximizing the number of collected diamonds that is within the path

For example If this is the input list that represents the maze where 0 means empty 1 means blocked and 2 is a diamond.

```
[ 0 , 0 , 1 , 1 , 1 , 1 , 1 , 1 , 1 , 1 ,  
 1 , 2 , 1 , 1 , 1 , 1 , 1 , 1 , 1 , 1 ,  
 1 , 0 , 1 , 1 , 1 , 1 , 1 , 1 , 1 , 1 ,  
 1 , 2 , 2 , 2 , 1 , 1 , 0 , 2 , 0 , 1 ,  
 1 , 0 , 1 , 0 , 1 , 1 , 0 , 1 , 0 , 1 ,  
 1 , 0 , 1 , 0 , 2 , 2 , 2 , 1 , 2 , 1 ,  
 1 , 0 , 1 , 0 , 1 , 1 , 1 , 1 , 0 , 0 ,  
 1 , 0 , 0 , 2 , 1 , 1 , 1 , 1 , 1 , 1 ,  
 1 , 1 , 1 , 1 , 1 , 1 , 1 , 1 , 1 , 1 ]
```

**The optimal path that will be found by the A\***

**[X , X , 1 , 1 , 1 , 1 , 1 , 1 , 1 , 1 ,  
1 , X , 1 , 1 , 1 , 1 , 1 , 1 , 1 , 1 ,  
1 , X , 1 , 1 , 1 , 1 , 1 , 1 , 1 , 1 ,  
1 , X , X , X , 1 , 1 , X , X , X , 1 ,  
1 , 0 , 1 , X , 1 , 1 , X , 1 , X , 1 ,  
1 , 0 , 1 , X , X , X , X , 1 , X , 1 ,  
1 , 0 , 1 , 0 , 1 , 1 , 1 , 1 , X , X ,  
1 , 0 , 0 , 2 , 1 , 1 , 1 , 1 , 1 , 1 ,  
1 , 1 , 1 , 1 , 1 , 1 , 1 , 1 , 1 , 1 ]**

**Maximum number of collected diamonds = 9**

- 1- You will implement the search algorithm A\*.**
- 2- Define the heuristic in order to choose the path with the maximum number of collected diamonds.**
- 3- Print the number of collected diamonds.**