

Indian Institute of Engineering Science & Technology, Shibpur
Department of Computer Science & Technology
8th Semester Artificial Intelligence Laboratory 2025
CS 4271
ASSIGNMENT – 1

1. In the realm of Artificial Intelligence, contemplate a problem involving two containers of indeterminate capacity, referred to as jugs. One jug has a capacity of 3 units, while the other holds up to 4 units. There is no markings or additional measuring instruments, the objective is to develop a strategic approach to precisely fill the 4-unit jug with 2 units of water. The restriction stipulates the use of solely the aforementioned jugs, excluding any supplementary tools. Both jugs initiate the scenario in an empty state. The aim is to attain the desired water quantity in the 4-unit jug by executing a sequence of permissible operations, including filling, emptying, and pouring water between the jugs. The challenge in this scenario involves crafting an algorithm:
 - a. Define the permissible operations carefully that includes filling, emptying, and pouring water between the jugs.
 - b. Use both Depth First Search and Breadth First Search to systematically explore and determine the optimal sequence of moves for accomplishing the task while adhering to the defined constraints. Also determine the total path count to reach to the goal state.
 - c. The initial and the goal state of the jugs may be varied.
2. Develop a comprehensive program that effectively addresses a puzzle problem. The puzzle involves a 3x3 grid with eight numbered tiles and an empty space (Given in the diagram). The task is to create a program that can systematically rearrange the tiles, around the empty cells, to reach to the predefined goal state from the initial configuration adhering to the constraints of permissible moves.
 - a. Use two different heuristic functions: one, the total count of the number of misplaced cells to reach to the goal state, second, consider the Manhattan distance as a heuristic function to determine the distance to reach to the goal state.

1	2	3
8		4
7	6	5

Initial State

2	8	1
	4	3
7	6	5

Goal State