Assignment-1

Artificial Intelligence: Foundations and Applications

(AI61005)

Spring, 2024-25

IIT Kharagpur

Release Date: - [29/01/2025]
Submission Date: - [10/02/2025]
Total Marks: 20

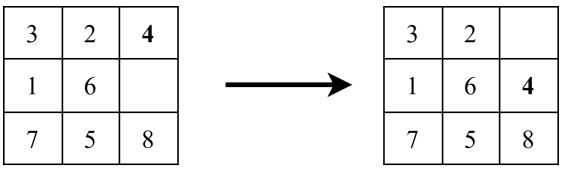
Instructions:

- All questions are compulsory to solve.
- Each step should be explained clearly in order to solve the questions.
- Each student has to submit ***only one pdf file*** named '***roll_number_A1.pdf***'.
- No late submissions will be entertained.

Problem Statement 1

$[3 + 7 = 10]$

The **8-puzzle** consists of eight numbered tiles on a 3×3 board. The object is to go from a starting state to a goal state by sliding tiles horizontally or vertically (**not diagonally**) using the empty space. For this problem, **assume** that if a state has been reached previously along the path back to the root in the search tree, you **cannot go back** to that state again (i.e., repeated state checking is done to avoid loopy paths).



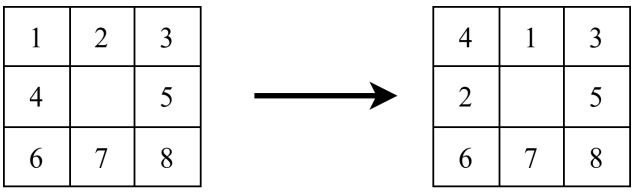
An example move in the 8-puzzle.

Question 1:

From some states in the 8-puzzle, what can be the maximum number of possible moves (i.e., the maximum number of legal successors)? Justify your answer by drawing a portion of the search tree that proves this.

Question 2:

What is the minimum number of moves needed to reach the goal state given below? Justify your answer by drawing a portion of the search tree that proves this.



Initial state Goal state

Problem Statement 2

$[3 + 5 + 2 = 10]$

Consider the following tree and answer the questions. Show computations and stepwise updates.

Question 1: How many leaf nodes must be explored to get the final result?

Question 2: What are the final alpha and beta values in the root node?

Question 3: Show the pruned branches by crossing (X) them out.