

# CS250 - ARTIFICIAL INTELLIGENCE LAB

## ASSIGNMENT-4: Uniform Cost Search

**Date:** January 31, 2024

**Total Credit:** 10

- Markings will be based on the correctness and soundness of the outputs.
- Marks will be deducted in case of plagiarism.
- Proper indentation and appropriate comments are mandatory.
- *All code needs to be submitted in '.py' format.* Even if you code it in '.IPYNB' format, download it in '.py' format and then submit
- You should zip all the required files and name the zip file as:
  - <roll\_no>\_assignment\_<#>.zip, eg. 1501cs11\_assignment\_01.zip.

**Problem Statement:** The assignment targets to implement a Uniform Cost Search for an 8-puzzle problem

**Problem:** The task is to check if we can reach from any random start grid to the mentioned target grid by moving the Blank space ('B').

In one step, the Blank space can move either top or down or left or right. It can't move to the already occupied square.

**Input:** Generate a random grid of 3x3 shape containing numbers from 1 to 8 and a blank space.

A sample grid is as follows:

3 2 1

4 5 6

8 7 B

The Target grid is fixed

1 2 3

4 5 6

7 8 B

## Tasks:

### 1. Implementation:

- Write a program to find the goal state from the given starting state using Uniform Cost Search (UCS).
- Assume the cost of the edge between any two nodes at a given level is identical and equal to 1 (e.g., the cost of the edge between the node at level  $n$  and node at level  $n+1$  is 1 but the cost of the edge between the node at level  $n$  and  $n+2$  is 2 as the node at level  $n+2$  can be reached by traversing nodes at  $n+1$  level).

## Deliverables:

- Submit a Python code file containing your implementations of the search algorithms and analysis scripts.

## Marking Rubric:

- Implementation (70%): Correctness, efficiency, code clarity, documentation.
- Analysis (30%): Accuracy, insights, comparisons, understanding of complexities.

## For any queries regarding this assignment, contact:

Utsav Kumar Nareti ([utsavkumarnareti@gmail.com](mailto:utsavkumarnareti@gmail.com))

Kumari Priya([kumaripriya.manit@gmail.com](mailto:kumaripriya.manit@gmail.com))

Akash Zingade([akashzingade@gmail.com](mailto:akashzingade@gmail.com))