## National University of Computer and Emerging Sciences

## Karachi Campus

## TITLE OF PROJECT

*Sliding Tile Puzzle with AI Solver (A/BFS Algorithm)*\*

### Project Proposal

**Artificial Intelligence – Section: E**

### Group Members:

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### Introduction

We will develop an interactive Sliding Tile Puzzle game integrated with an AI solver using A\* and BFS algorithms. The puzzle will allow players to either solve it manually or activate the AI to watch a step-by-step solving process. The goal is to combine game mechanics with artificial intelligence to visualize problem-solving in action.

### Existing System

Traditional sliding puzzles exist in both physical and digital formats. Some digital versions include limited interaction or instant AI solutions without visual feedback. These systems lack in-depth visualization of the AI's decision-making process, which makes them less educational from an AI learning perspective.

### Problem Statement

Current systems do not offer a transparent way to observe how AI approaches problem-solving in a sliding puzzle. Most do not show intermediate steps, offer only one solving method, or are limited in puzzle size. This restricts user understanding and engagement.

### Proposed Solution

We will enhance the traditional game by integrating AI search algorithms that users can watch in real-time. Our system will allow switching between BFS and A\* algorithms, step-by-step animation of the solving process, multiple grid sizes, and user interaction through a graphical interface. This approach will make the solving mechanism both educational and engaging.

### Salient Features

* AI solver using **A\*** and **BFS** algorithms
* Step-by-step **visual animation** of AI solving the puzzle
* **Manual play** and interaction through mouse and arrow keys
* **Randomized puzzle generation** with solvability check
* **Multiple puzzle sizes** (3x3, 4x4)
* **Reset** and **solve-on-demand** functionality
* **Real-time move counter** and **timer**

### Tools & Technologies

* **Programming Language**: JavaScript
* **Framework/Environment**: Node.js, HTML5 Canvas
* **Operating System**: Cross-platform (Windows)
* **Version Control**: GitHub
* **Editor**: Visual Studio Code