Project Title:

Snake, Ladder Ludo Game

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Course: Artificial Intelligence Lab

1. Abstract

This project presents a hybrid board game titled "Snake, Ladder & Ludo Game", which integrates mechanics from the classic games of Snakes & Ladders and Ludo while introducing AI-driven decisions, dynamic elements, and strategic power-ups. Developed in Python using Tkinter and Pygame, the game supports two modes: Human vs Human and Human vs AI. The game enhances traditional board gameplay through evolving challenges and visual engagement.

2. Introduction

Traditional board games are often static and heavily luck-based. The aim of this project was to design and develop an innovative digital board game that not only maintains the nostalgia of Snakes & Ladders and Ludo but also infuses strategic depth and AI components to make the game engaging and intelligent.

3. Objectives

- Combine mechanics of Snakes & Ladders and Ludo.
- Add dynamic elements: moving snakes and ladders.
- Implement strategic power-ups and traps.
- Support Human vs Human and Human vs AI gameplay.
- Apply AI logic to simulate intelligent decision-making.

4. Technologies Used

- **Programming Language:** Python
- **GUI:** Tkinter
- **Audio and Game Logic:** Pygame
- **Randomization:** Python’s random module
- **AI Behavior:** Simple decision rules (with scope for Minimax or ML-based expansion)

5. Game Features

1. Dynamic Board Layout

Snakes and ladders reposition every 3 turns using a random logic function to simulate a shifting board.

2. Power-Ups

Special tiles apply random effects:
Extra Turn
Skip Opponent
Double Dice
Teleport to random location

3. Multiple Dice System

Though not currently splitting moves, the system simulates variability in movement and power-up application.

4. AI Opponent (in Human vs AI mode)

Uses randomized dice rolls.
Makes moves with consideration for snakes, ladders, and winning condition.
Designed with potential for future reinforcement learning integration.

6. AI Methodology

Current Implementation:

- **Heuristic Rules:** AI performs moves similar to humans but is handled programmatically without GUI delay.
- **Decision Factors:** Dice value, board state, and conditional use of power-ups.

Future Scope:

- Implement Minimax Algorithm for competitive AI.
- Integrate Reinforcement Learning to adapt based on performance and previous outcomes.

7. Game Rules and Logic

- Players take turns rolling a dice (1-6).
- Snake Head moves player backward.
- Ladder Base moves player forward.
- Power-Up Tile triggers a specific effect.
- Every 3 turns, the snakes and ladders are randomly reassigned.
- First to reach square 100 wins.

8. Challenges Faced

- Synchronizing GUI updates and logic during AI turns.
- Ensuring snakes/ladders don't overlap or contradict new positions.
- Implementing and debugging sound effects with Pygame.
- Handling restart logic without GUI errors.

9. Screenshots

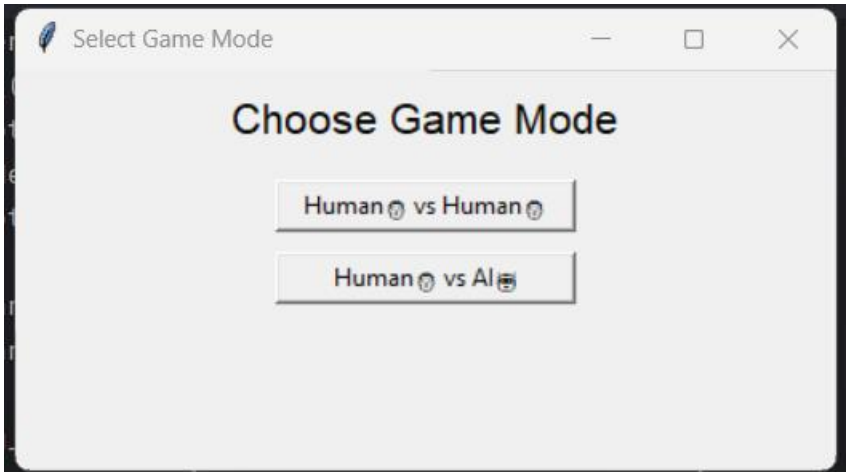

Figure 1: Ask For Mode

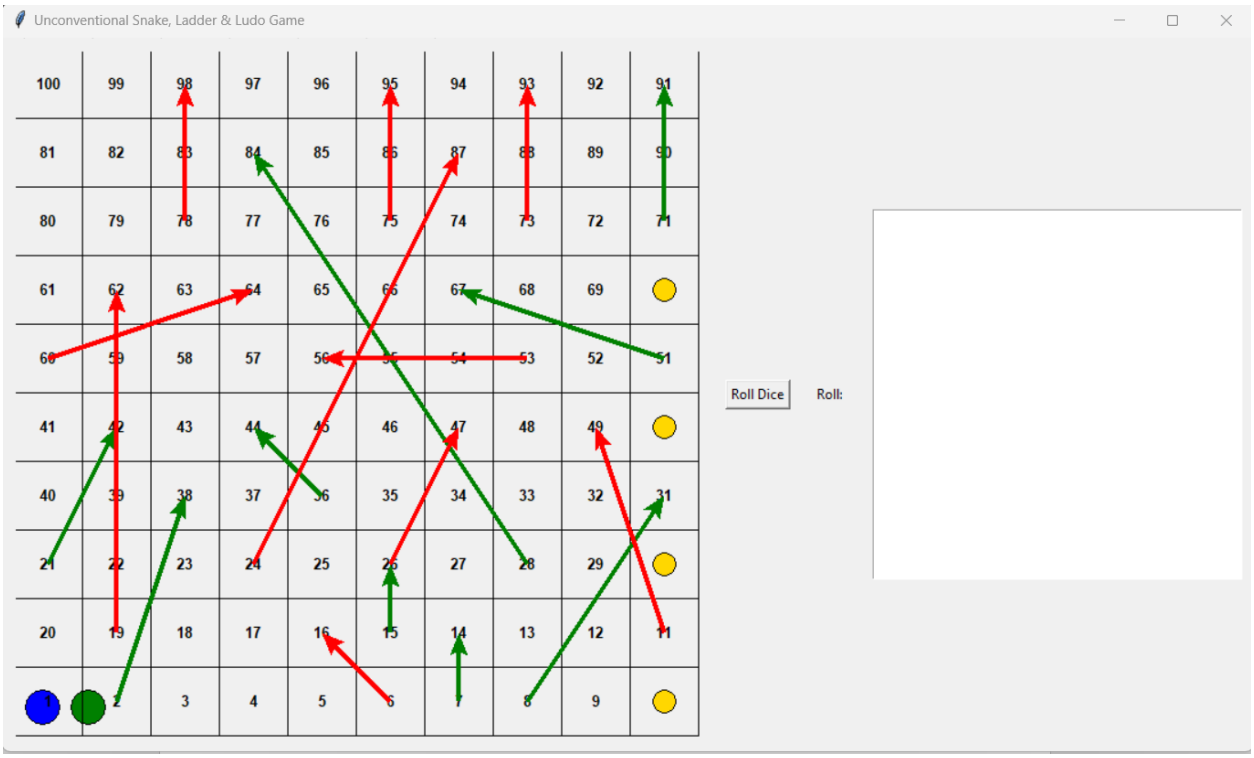

Figure 2: Interface Of Ludo Game

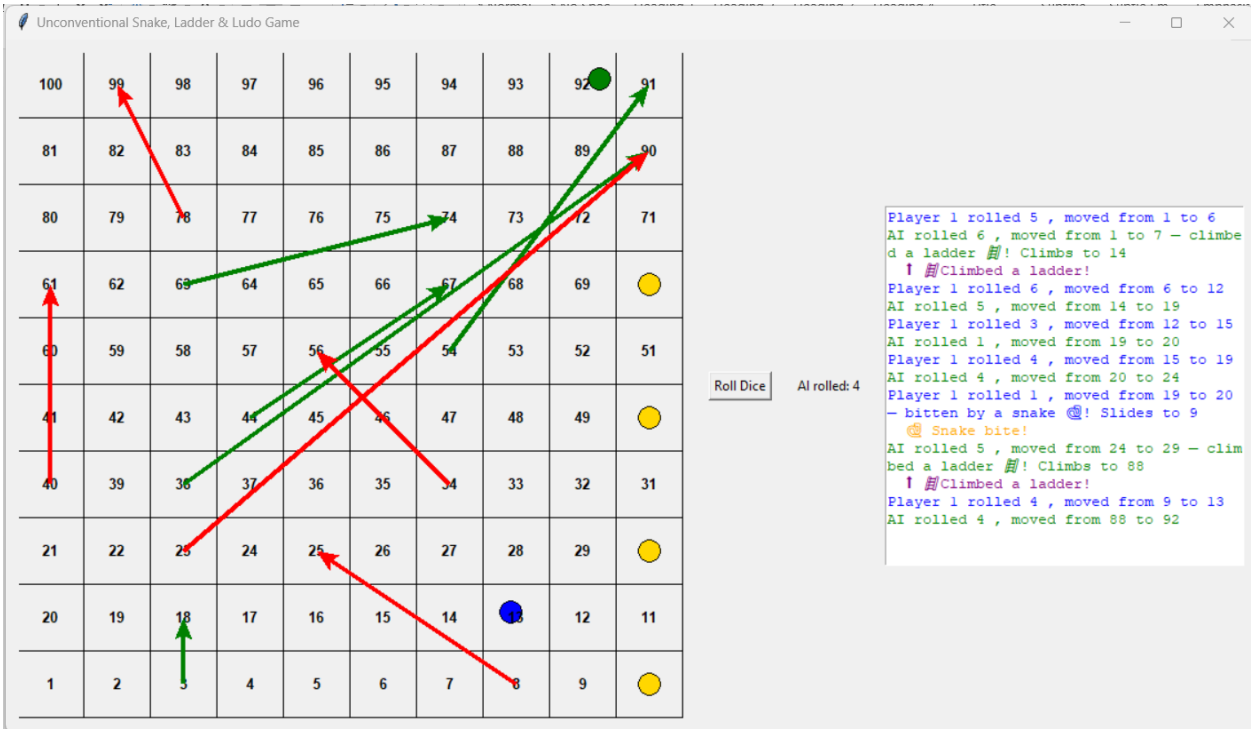

Figure 3: Human vs AI Mode

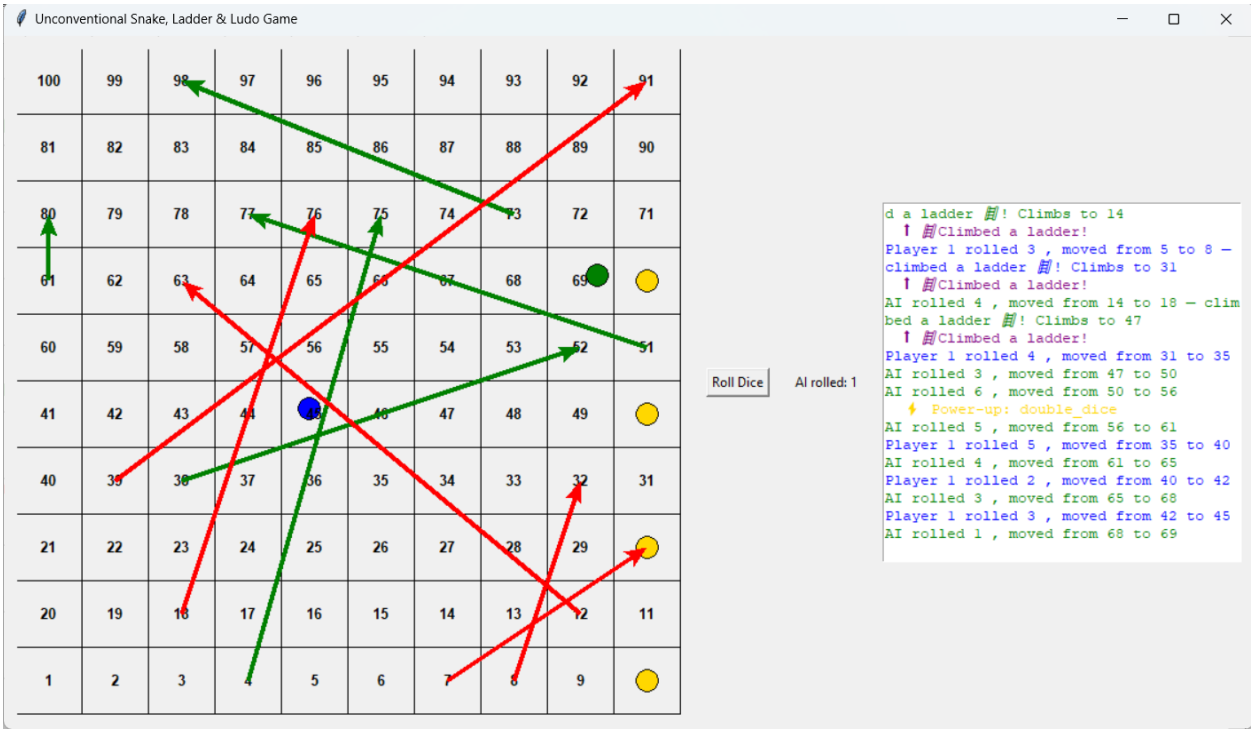

Figure 4: Logs Creates Side By Side

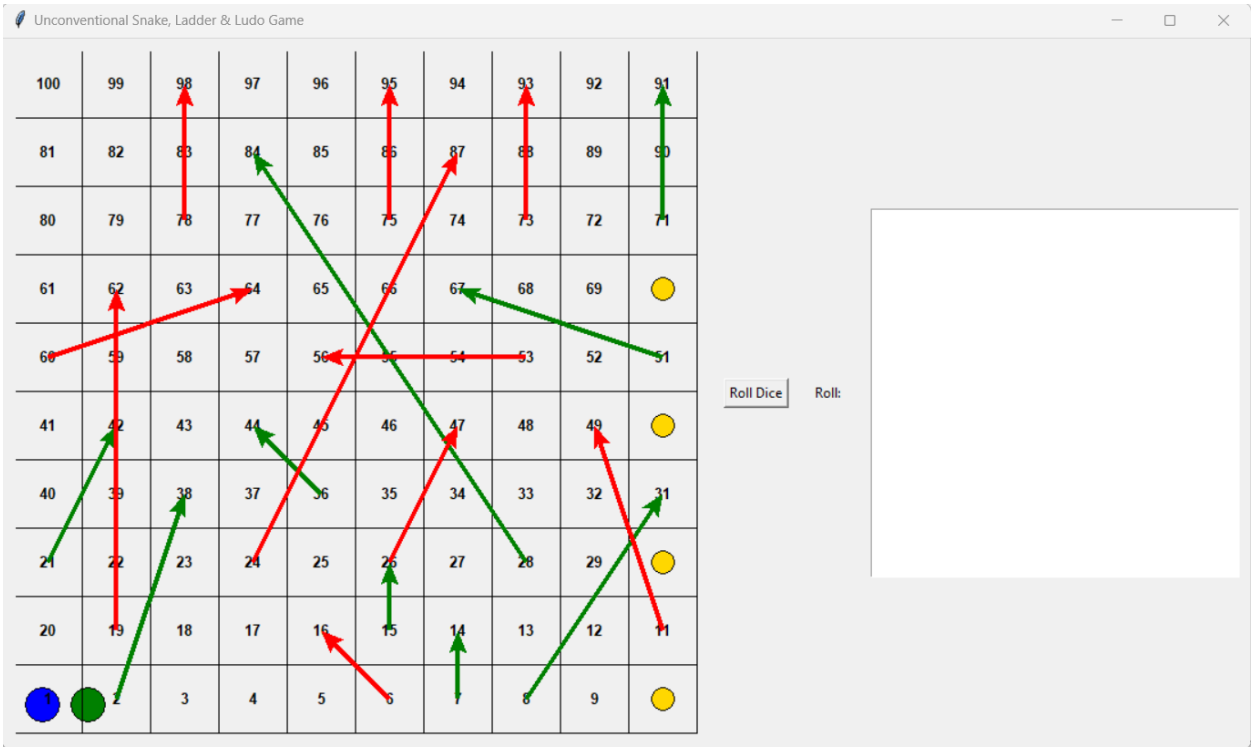

Figure 5: Yellow Dots Are Power Ups

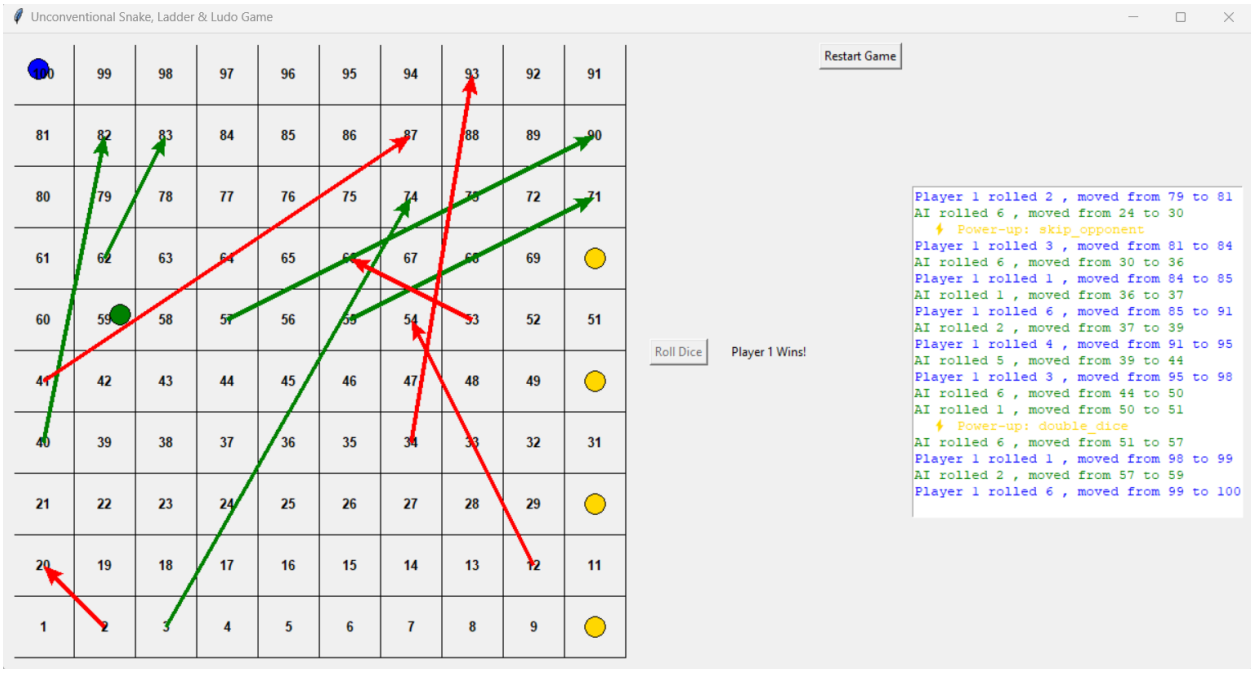

Figure 6: Restart Button Appears After Game Finish

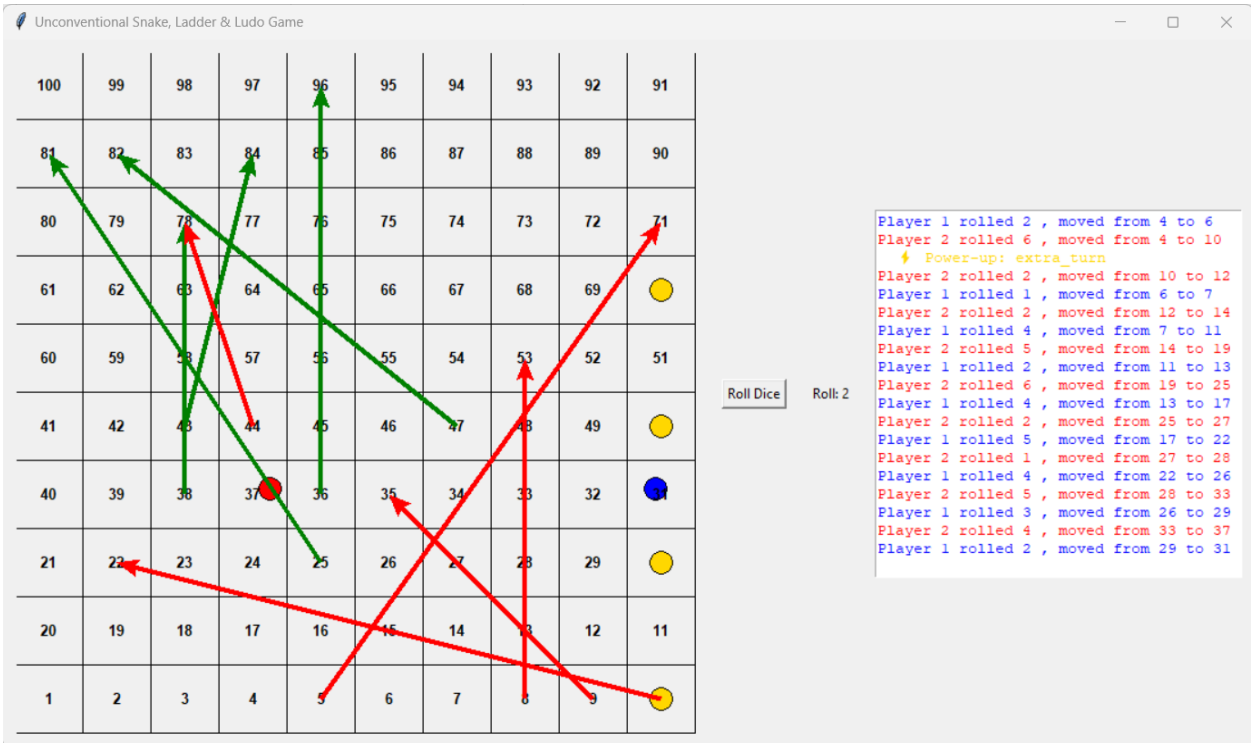

Figure 7: Human vs Human Mode

10. Conclusion

This project successfully demonstrates how traditional board games can be revitalized through AI and dynamic mechanics. By combining Snakes & Ladders with Ludo and enhancing gameplay with features such as power-ups, AI opponents, and dynamic board elements, the game provides a strategic and engaging experience. Future work includes deeper AI integration using reinforcement learning and an online multiplayer version.