

AI Lab Project Proposal

AI-Powered Memory Match Game: 3-Card Match Variant

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Submission Date: 15-4-2025

Introduction:

In this project, we will develop an AI-powered Memory Match Game where players will have to match three cards instead of the traditional two cards to score points. This variant adds complexity and requires players to have an enhanced memory and strategy to succeed. The AI will act as an opponent and will utilize machine learning or algorithmic strategies to make decisions on which cards to flip, making the game challenging and interactive. The AI will be designed to track the flipped cards and intelligently decide the best possible moves, making it an engaging and competitive game for players.

Existing System:

Currently, Memory Match Games traditionally require players to match two cards with the same image or value. Many digital versions of memory games exist, ranging from simple grid-based designs to more advanced versions that include AI opponents. Common examples include classic memory matching games where users play against the system, often based on predefined or simple algorithms. Some versions also include time limits, competitive scoring, and other variations to enhance the gameplay.

For example:

Memory Match (Digital): Basic implementation where players flip cards in search of matching pairs.

AI in Memory Games: Some games use a simple AI that tracks card positions and performs rudimentary card matching based on available information.

However, existing systems have a limitation in terms of complexity, as they usually focus on pairing two cards. This project aims to elevate the difficulty by requiring the matching of three cards at once, introducing a new challenge for both players and AI opponents.

Problem Statement:

Traditional memory match games, where players match two cards, are relatively simple, especially when playing against AI opponents. This simplicity can reduce the challenge and make the gameplay less engaging. Additionally, existing AI opponents in such games mostly use basic algorithms, lacking advanced decision-making abilities and adaptability.

The main discrepancies in existing systems are:

- Lack of AI complexity in making intelligent moves.
- Traditional two-card match limit.
- The absence of strategies that mimic human-like memory and tactics.

Our proposed system will address these issues by introducing:

- A requirement for matching three cards, increasing the game's difficulty and making it more strategic.
- An AI opponent with memory-enhancement algorithms that will attempt to "remember" and predict cards based on past moves, simulating human-like strategies.

Proposed Solution:

We propose to develop a 3-card Memory Match Game where the player and AI compete to match three cards with the same image or value. The solution will incorporate:

AI as an Opponent: The AI will keep track of the cards that have been flipped and try to make educated guesses to match sets of three cards. It will implement memory-based strategies to recall previously flipped cards and make intelligent moves accordingly.

Three-card Matching: Players will need to match three cards rather than two. This introduces a new layer of complexity and strategy to the traditional memory match game.

Dynamic Difficulty: The AI's decision-making process will adapt depending on the player's performance, offering a competitive challenge by adjusting its guessing and matching strategies.

We will use an algorithm to simulate the AI's decision-making process, where it will prioritize matching cards based on its knowledge of the grid and the history of card flips. Over time, the AI will learn and adapt, using a more optimized strategy to challenge the player.

Salient Features

- **AI Opponent:** An intelligent AI that tracks flipped cards, adapts its strategy, and competes with the player.
- **Three-Card Matching:** Instead of matching two cards, the player must match sets of three cards to score points.
- **Memory-Based AI:** AI mimics human-like memory and decision-making by remembering flipped cards and making educated guesses.
- **Game Difficulty Adjustment:** The AI adjusts its level of play based on the player's progress, making the game more challenging as the player improves.
- **Grid-based Gameplay:** A grid of cards that the player flips to find matches. Cards are revealed in random positions to increase difficulty.
- **Player Feedback:** Clear visual and audio feedback when a player matches three cards.
- **High Score Tracking:** A score system that tracks the player's best performance based on matches made.
- **Time-based Challenge (optional):** Players could be timed on how quickly they can make the three-card matches, adding another layer of challenge.

Tools & Technologies

Programming Language: Python (Primary language for development due to its simplicity and power in implementing AI algorithms)

AI Algorithm: For AI memory and decision-making, we will implement a basic machine learning model or use a rule-based approach where the AI keeps track of flipped cards and employs decision trees or search algorithms like minimax for intelligent moves.

Libraries/Frameworks:

Pygame: A library for creating simple games in Python, which will be used to build the graphical interface and manage the game loop.

NumPy: For handling the game's data structures (e.g., card grids, tracking flipped cards).

Random: To shuffle cards and randomize the card grid.

Operating System: Windows/Linux (Compatible with both for development and testing)