REPORT

Introduction:

Tic Tac Toe is a basic game played by two people. To win, you need to get three of our traditional symbols (X or O) in a row, either vertically, horizontally, or diagonally

Minimax:
It's a powerful tool that can help you make decisions in two-player games by considering all possible moves and outcomes.

Here's how it works:

1. Consider all possible moves you can make. This might seem like a lot, but the Minimax algorithm is very efficient and can quickly narrow down the options.

2. For each of your moves, consider all possible moves your opponent can make. This is where the recursion comes in. The Minimax algorithm calls itself again for each of your opponent's moves, and so on, until the game ends.

3. Assign a value to each possible outcome. This is where things get a little more complicated. The value of an outcome depends on who wins and loses. For example, if you win, the outcome is worth +1. If you lose, the outcome is worth -1. And if the game ends in a draw, the outcome is worth 0.

4. Choose the move that leads to the best possible outcome. This is the heart of the Minimax algorithm. It will always choose the move that maximises your chances of winning or minimises your chances of losing, assuming that your opponent will also play optimally.

The Minimax algorithm is a powerful tool that can help you make better decisions in two-player games.

Reinforcement Learning:
It's a powerful tool that can help AI agents learn how to play games by letting them learn from their mistakes and improve over time.

Here's how it works:

1. Set a goal for the AI agent. This could be anything from winning a game of Tic Tac Toe to solving a complex puzzle.

2. Let the AI agent interact with the environment. This means giving the agent the opportunity to make decisions and observe the results.

3. Provide feedback to the AI agent. This could be in the form of rewards for good decisions and penalties for bad decisions.

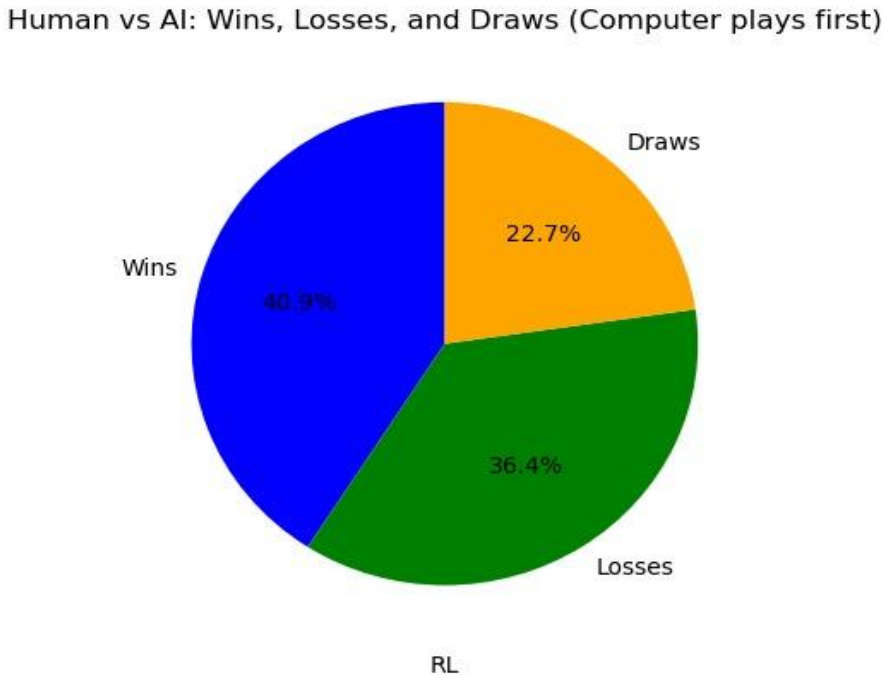
4. Over time, the AI agent will learn to make better decisions in order to get more rewards. This is because the agent will start to associate certain actions with positive outcomes and avoid actions that lead to negative outcomes.

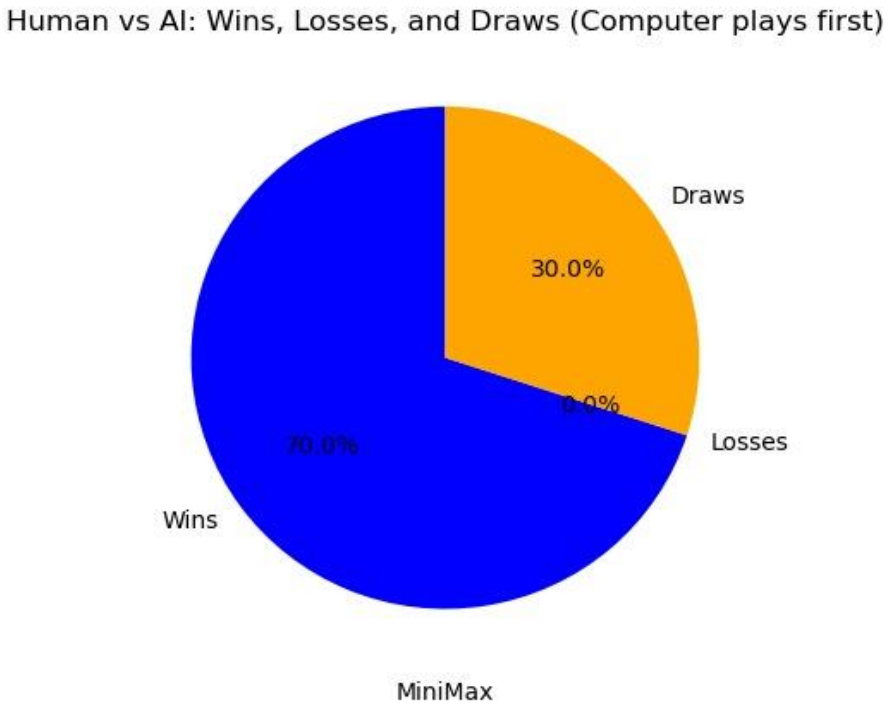
Reinforcement Learning can be a slow process, and it often requires a lot of data to train an AI agent.

Analysis of algorithms:

The bar graph shows the number of wins, losses, and draws in games of MiniMax and Reinforcement Learning (RL) against human players.

Case I: When the computer is playing first.

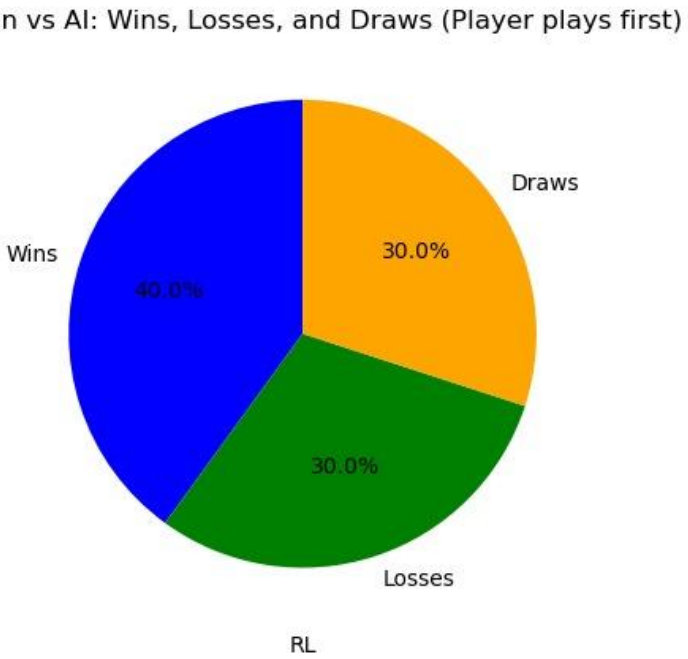


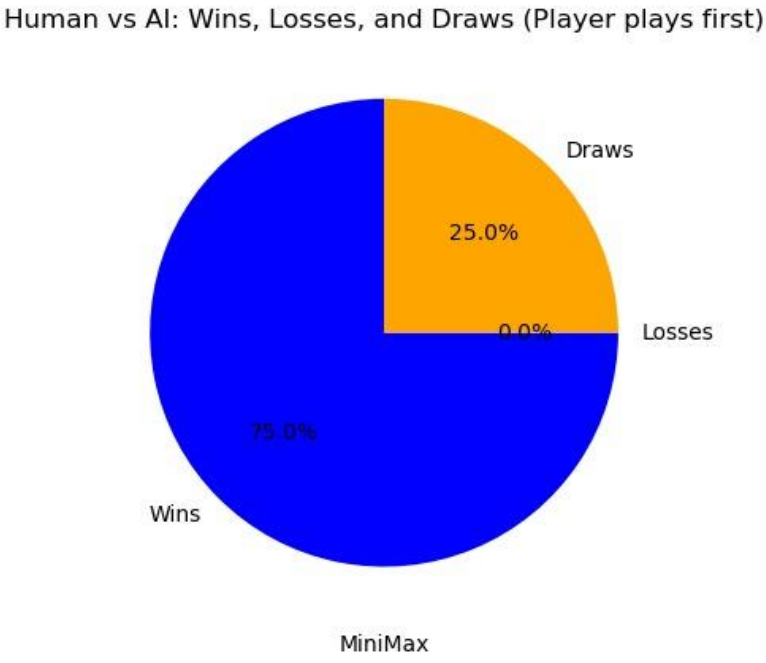


Here are the points summarising the outcomes of a game when the computer makes the first move from the above diagram:

1. **MiniMax Algorithm**:
    - The computer plays optimally, choosing the very good moves.
    - The outcomes are either a win for the computer or a draw. There are no losses for the computer.
    - When a human player makes the best move, the game either ends in a draw or a loss for the human.
2. **Reinforcement Learning**:
    - The computer can win, draw, or lose the game against human players.
    - This strategy allows the computer to take risks, which can sometimes lead to losses.

Case II: When Human is playing first.





Here are the points summarising the outcomes of a game when a human player makes the first move from the above diagram:

1. MiniMax Strategy:
    - The computer plays optimally, choosing the best possible moves.
    - The outcomes are either a win for the computer or a draw. There are no losses for the computer.
    - The probability of the game ending in a draw increases when the human player starts the game.
    - If the human player makes the best move, the game will either end in a draw or a loss for the human.
2. Reinforcement Learning:
    - The computer can win, draw, or lose the game against human players.
    - This strategy allows the computer to take risks, which can sometimes lead to losses.

Based on above analysis Human Favourable Game Designing:

MiniMax Strategy: This strategy is optimal and will always make the best possible move. This could be ideal if you want to create a challenging game where the human player has to think strategically to either win or draw. However, it might be frustrating for some players as the computer will never lose.

Reinforcement Learning: This strategy allows the computer to take risks, which means it can sometimes lose. This could make the game more enjoyable for casual players as it gives them a chance to win. However, the level of challenge might not be as high as with the MiniMax strategy.