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Assignment 2 - Case Study

Connect Four

Connect Four is an excellent example of a two-player, perfect-information board game, making it suitable for game theory analysis. Connect Four is a classic two-player board game where players take turns dropping colored discs into a grid. The objective is to connect four of their own discs in a row, either horizontally, vertically, or diagonally, before their opponent does.

Game Theory concepts that can be applied in Connect Four are:

1. **Sequential Games:** Connect Four is a sequential game, which means that players take turns making decisions, and the outcome of one player's move can influence the choices of the other player. Game theory offers insights into optimal strategies in sequential games like Connect Four:
2. **Subgame Perfect Equilibrium:** In Connect Four, each move creates a new subgame, and players need to consider not only their current move but also the potential outcomes in subsequent moves. Game theory can help players identify subgame perfect equilibria, which are strategies that are optimal not only in the current subgame but in all future subgames as well. For example, if a player can force a win in two moves regardless of their opponent's response, they have found a subgame perfect strategy.
3. **Backward Induction:** Players can use backward induction, a game theory concept, to work backward from the end of the game to determine the optimal strategies at each step. In Connect Four, this can help identify moves that lead to a win, provided both players play optimally.
4. **Strategic Timing:** Game theory can be applied to assess the optimal timing of certain moves. For instance, players might intentionally delay their winning move to create situations where their opponents make suboptimal choices.
5. **Credibility of Threats:** Connect Four players can use threats and bluffs as strategic tools. Game theory helps assess the credibility of threats and how they can influence the opponent's decisions. For example, a player can threaten to create a winning position, forcing the opponent to respond.

In summary, applying game theory concepts such as subgame perfect equilibrium, backward induction, strategic timing, and threat credibility can enhance Connect Four strategies, leading to more sophisticated and informed gameplay for those seeking to improve their skills.