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Case Study - Dominant Strategy

Introduction:
The classic Prisoner's Dilemma scenario involves two individuals who have been arrested for a crime and are being interrogated separately by the police. The police lack sufficient evidence to convict them of the major crime, but they have enough evidence to convict both of a lesser charge. Each prisoner faces a crucial decision: whether to cooperate with their fellow prisoner by remaining silent or betray them by confessing.

Choices:
Cooperate (C): If both prisoners choose to cooperate and remain silent, the police can only convict them of a lesser charge, resulting in a relatively light sentence.

Betray (D): If one prisoner chooses to betray (confess) while the other remains silent (cooperates), the betrayer may go free (no sentence), while the cooperator receives the harshest sentence.

Mutual Betrayal (D): If both prisoners choose to betray, they both receive a moderate sentence because their confessions provide enough evidence for a conviction.

Payoff Matrix:

Player A / Player B	Cooperate (C)	Defect (D)
Cooperate (C)	-1, -1	-3, 0
Defect (D)	0, -3	-2, -2

In this matrix:
The first number represents the payoff to Player A.
The second number represents the payoff to Player B.

Analysis:
If both players cooperate (C), they each receive a small sentence of -1, representing a reduced charge.
If both players defect (D), they both receive a moderate sentence of -2 because their confessions provide enough evidence for a conviction.
If one player cooperates (C) while the other defects (D), the defector gets the best outcome (-3), as they avoid a sentence altogether, while the cooperator receives the worst outcome (0), facing the full charge.

Outcome:
In this scenario, each player's rational choice is to defect (D) because it provides a better individual outcome, irrespective of the other player's choice. As a result, both players end up confessing, and they both receive a moderate sentence of -2 years.

Conclusion:
The Prisoner's Dilemma illustrates a situation where individual rationality leads to a suboptimal collective outcome. Both prisoners would be better off if they could cooperate, but the fear of receiving a harsher sentence if the other defects drives them to defect as well. This classic example demonstrates the concept of Nash equilibrium, where each player's strategy is the best response to the other's strategy, even though a different outcome would be collectively more favorable.