

Game Theory Project

Prisoner's Dilemma

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1. Problem Statement

The program simulates the Repeated Prisoner's Dilemma game where a human player interacts with a computer opponent. Each round, both players simultaneously decide whether to "Cooperate" (C) or "Defect" (D), with payoffs assigned based on the combination of choices. The computer opponent can switch personalities with distinct strategies influencing their decisions.

2. Key Components

- **Player2 Class:** Handles the computer's decision-making process based on various personalities like Kind, Rude, Logical, Religious, and Opposite Person.
- **PrisonersDilemma Class:** Manages the GUI and game logic, updating scores, managing rounds, and displaying results.

3. How to Play the Game:

Step 1: Launch the Game

Running the script will open a GUI window titled "Repeated Prisoner's Dilemma."

Step 2: Understand the Payoff Matrix

The matrix is displayed at the top, showing the outcomes for each combination of decisions:

- Both players cooperate: Both get 20 points.
- One cooperates, the other defects: The cooperator gets 0 points, the defector gets 30 points.
- Both players defect: Both get 10 points.

Step 3: Choose Your Move

Use the "Cooperate" or "Defect" buttons to make your choice for each round. The computer's move and the resulting scores will immediately be displayed.

Step 4: Monitor the Outcomes

The results of each round are displayed in a table under the buttons. Your and the opponent's scores are updated after every move.

Step 5: End of the Game

After 25 rounds, the game will show a summary of the average payoffs. If there are remaining personalities for the opponent, you can continue playing against new personalities, or the game will end if all have been used.

4. Best Responses Analysis

The best responses for the players in the Prisoner's Dilemma were found to be:

- (2,1): (30,0)
- (2,2): (10,0)

5. Maximin Strategy Analysis

The maximin strategy analysis revealed the following strategies and associated payoffs for both players:

- Player 1's Maximin Strategy: 10
- Player 2's Maximin Strategy: 0

6. Strategy Type Determination

The strategy type analysis determined the nature of the game to be a Mixed Strategy. This implies that there is no pure strategy equilibrium where players can simply play a single strategy all the time to optimize their payoffs. Instead, they may need to randomize their strategies to optimize expected payoffs, particularly in extended iterations or varied scenarios of the game.

Step 1 + 2



Repeated Prisoner's Dilemma

	Cooperate	Defect
Coop	(20, 20)	(0, 30)
Defect	(30, 0)	(10, 10)

Personality:

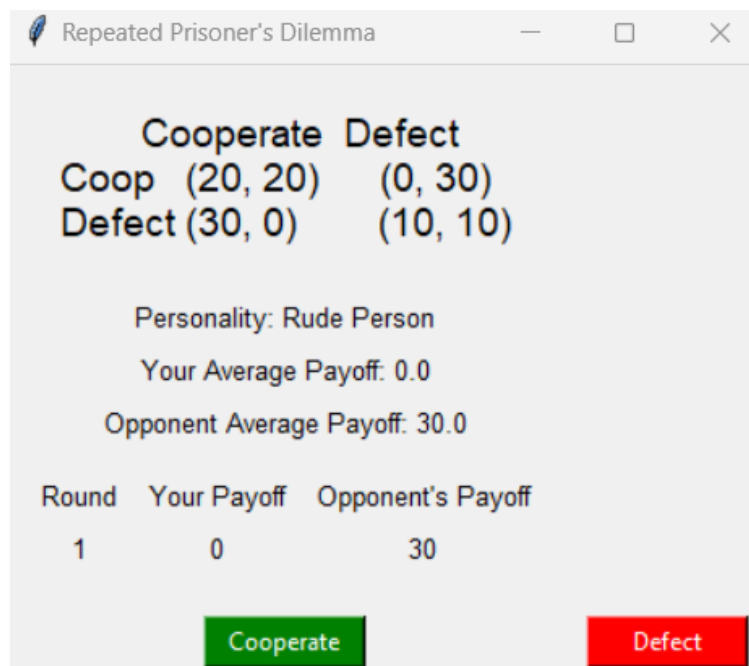
Your Average Payoff: 0.0

Opponent Average Payoff: 0.0

Round	Your Payoff	Opponent's Payoff
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Cooperate Defect

Step 3 + 4



Repeated Prisoner's Dilemma

	Cooperate	Defect
Coop	(20, 20)	(0, 30)
Defect	(30, 0)	(10, 10)

Personality: Rude Person

Your Average Payoff: 0.0

Opponent Average Payoff: 30.0

Round	Your Payoff	Opponent's Payoff
1	0	30

Cooperate Defect

Repeated Prisoner's Dilemma

Cooperate

Defect

Coop

Defect

(20, 20)

(0, 30)

(30, 0)

(10, 10)

Personality: Rude Person

Your Average Payoff: 4.8

Opponent Average Payoff: 20.4

Round	Your Payoff	Opponent's Payoff
1	0	30
2	10	10
3	0	30
4	10	10
5	10	10
6	0	30
7	10	10
8	0	30
9	10	10
10	10	10
11	10	10
12	0	30

Cooperate

Defect

Final Average Payoffs

Your Average Payoff: 4.8
Opponent Average Payoff: 20.4

OK