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D16AD

60

```
import random


def prisoner_dilemma(player1_choice, player2_choice):
    if player1_choice == "cooperate" and player2_choice == "cooperate":
        return 5, 5
    elif player1_choice == "defect" and player2_choice == "defect":
        return 0.5, 0.5
    elif player1_choice == "cooperate" and player2_choice == "defect":
        return 0, 10
    elif player1_choice == "defect" and player2_choice == "cooperate":
        return 10, 0
    else:
        raise ValueError("Invalid choices")

choices = ["cooperate", "defect"]
player1_choice = input("Player 1, enter your choice (cooperate/defect): ")
G = random.choice(choices)
player2_choice = G
payoff1, payoff2 = prisoner_dilemma(player1_choice, player2_choice)

print(f"Player 1 payoff(in years): {payoff1}")
print(f"Player 2 payoff(in years): {payoff2}")


payoff_matrix = {}

for choice1 in choices:
    for choice2 in choices:
        payoff_matrix[(choice1, choice2)] = prisoner_dilemma(choice1, choice2)

print("Payoff Matrix:")
print("\t   Cooperate   Defect")
for choice1 in choices:
    print(f"{choice1}\t   {payoff_matrix[(choice1, 'cooperate')]}   {payoff_matrix[(choice1, 'defect')]}")
```

```
Player 1, enter your choice (cooperate/defect): defect
Player 1 payoff(in years): 0.5
Player 2 payoff(in years): 0.5
Payoff Matrix:
           Cooperate   Defect
cooperate          (5, 5)   (0, 10)
defect     (10, 0)   (0.5, 0.5)
```

```
!pip install nashpy
```

```
Collecting nashpy
  Downloading nashpy-0.0.40-py3-none-any.whl (27 kB)
Requirement already satisfied: numpy>=1.21.0 in /usr/local/lib/python3.10/dist-packages (from nashpy) (1.23.5)
Requirement already satisfied: scipy>=0.19.0 in /usr/local/lib/python3.10/dist-packages (from nashpy) (1.10.1)
Requirement already satisfied: networkx>=3.0.0 in /usr/local/lib/python3.10/dist-packages (from nashpy) (3.1)
Collecting deprecated>=1.2.14 (from nashpy)
  Downloading Deprecated-1.2.14-py2.py3-none-any.whl (9.6 kB)
Requirement already satisfied: wrapt<2,>=1.10 in /usr/local/lib/python3.10/dist-packages (from deprecated>=1.2.14->nashpy) (1.14.1)
Installing collected packages: deprecated, nashpy
Successfully installed deprecated-1.2.14 nashpy-0.0.40
```

```
import numpy as np
import nashpy as nash

payoff_matrix_p1 = np.array([[5, 5], [0, 10]])
payoff_matrix_p2 = np.array([[10, 0], [0.5, 0.5]])


prisoners_dilemma = nash.Game(payoff_matrix_p1, payoff_matrix_p2)
equilibria = prisoners_dilemma.support_enumeration()

print("Nash Equilibria:")
for eq in equilibria:
    print(f"Player 1: {eq[0]}, Player 2: {eq[1]}")
```

```
Nash Equilibria:
Player 1: [1. 0.], Player 2: [1. 0.]
Player 1: [0. 1.], Player 2: [0. 1.]
```

```
/usr/local/lib/python3.10/dist-packages/nashpy/algorithms/support_enumeration.py:259: RuntimeWarning:
An even number of (2) equilibria was returned. This
indicates that the game is degenerate. Consider using another algorithm
to investigate.

  warnings.warn(warning, RuntimeWarning)
```