Ain Shams
Spring Semester 2023

Doctor: Tamer Mostafa

Game Theory
Documentation

Name: Haya Ahmed Hamed Shaker

ID: 20191703039

Name: Antony Nabil Naguib Youhanna

ID:20191703004

Name: Amira Barakat Ali

ID: 20191703002

Game Theory

Task 1:

We decided to use pygame for this project, starting with main menu, it presents two buttons, one for starting the game or exit, and since there are no buttons in pygame, therefore we created a function called “button”, and by clicking on it, it performs an action called in one of the parameters.

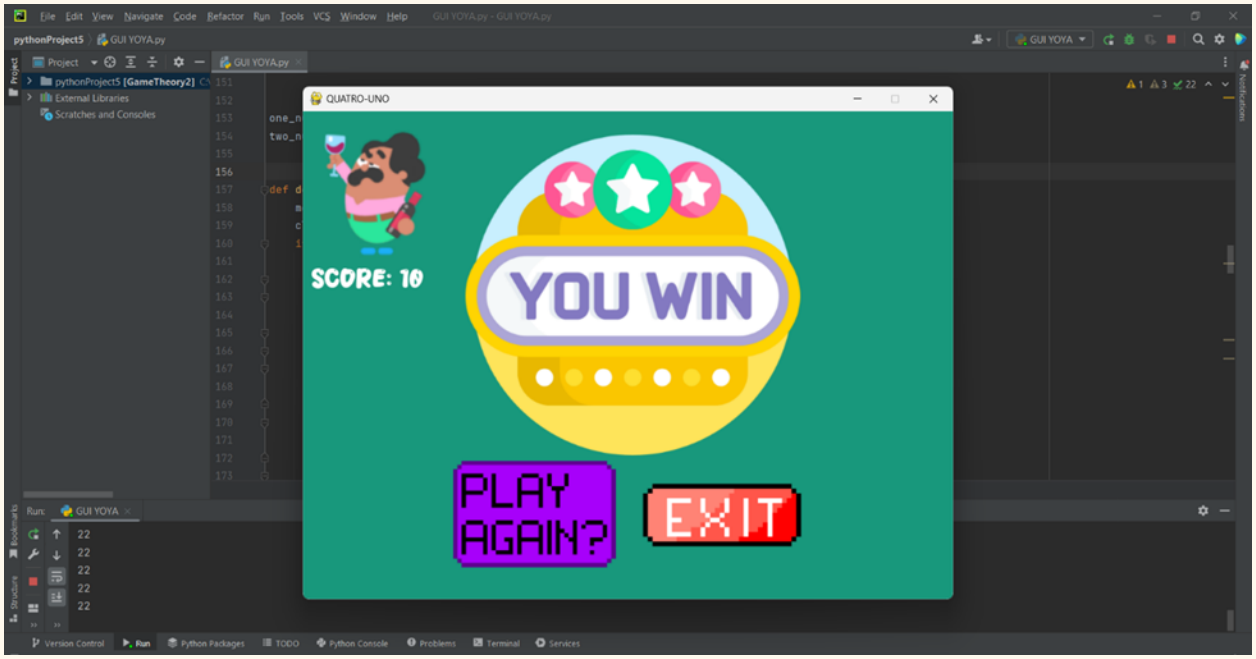
After clicking on “start” it performs the action “player 1’s turn”, and this page allows the first player to choose their card arrangement.

And displays it on the table, by using a list that saves the order of the cards and because we’ll need this list for other purposes later, and by pressing

the “next” button, the function for “player 2’s turn” will be called.

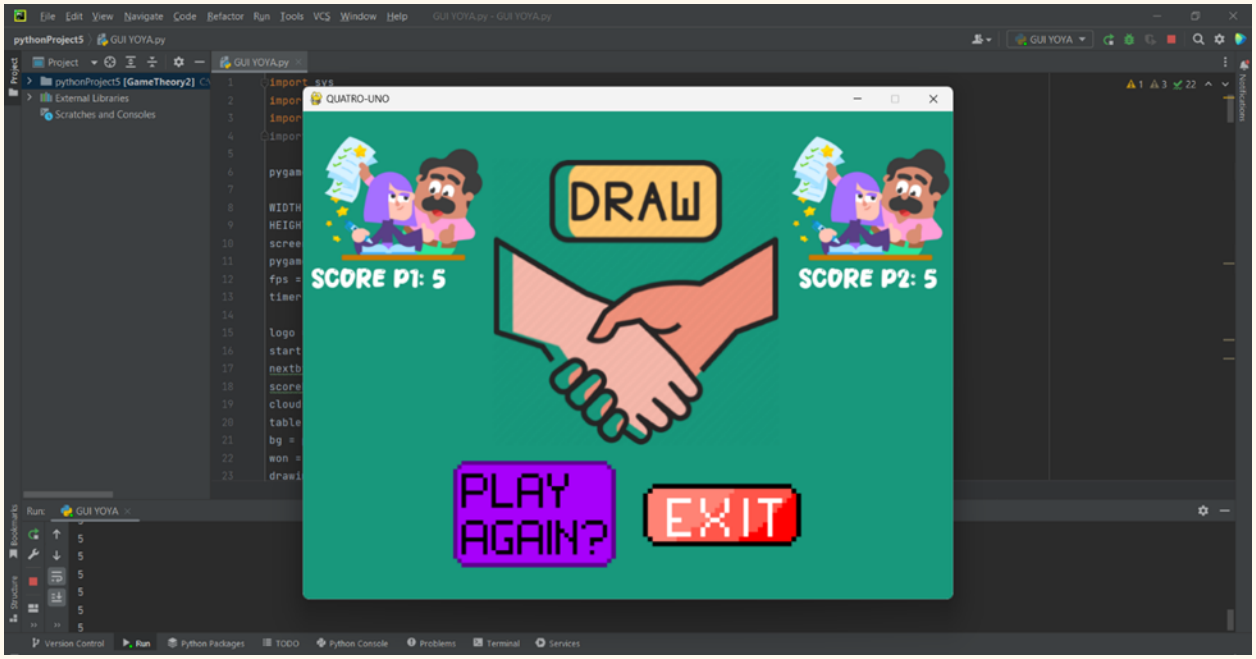
After player 2 chooses their arrangement, it’s also saved in another list, and when clicking on “score” button, it calls the function that calculates the winner, set of if conditions that compares between the 2 lists for each

player.



In this case player 1 wins the game, this gives player 1 plus 10 points and it leaves the two players with 2 options, whether to play again or exit the game.

Another case where player 1 and player 2 play the same cards.

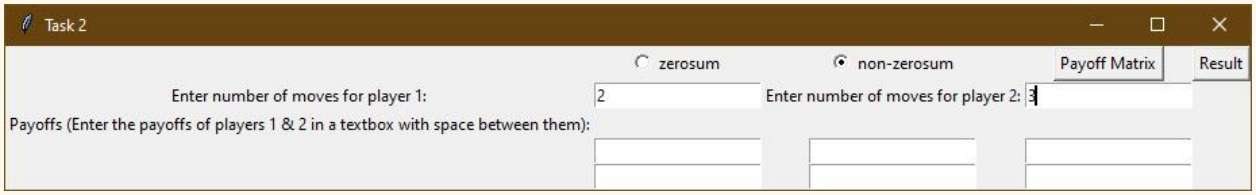


Players 1 and 2 both increase with the same 5 points.

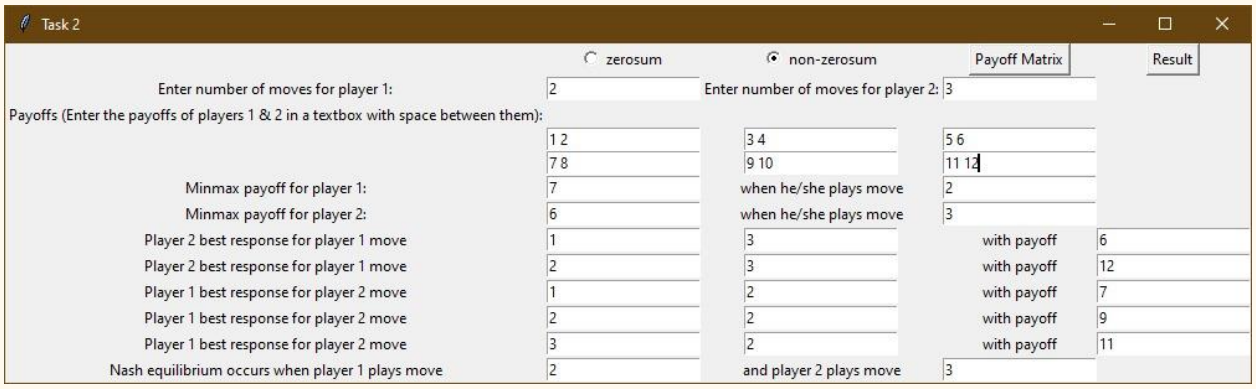
Task 2:

First, the user should choose the type of the game and number of moves for each player, then click on the payoff matrix button to enter the payoff matrix of the game.

After clicking on the payoff matrix button, the number of textboxes will be shown according to the number of moves entered for each player, if the game is non-zero sum, the user should enter the payoffs of every player in each textbox separating them with a space, otherwise, the user should only type the payoffs of the first player only, then the user should click on the results button.

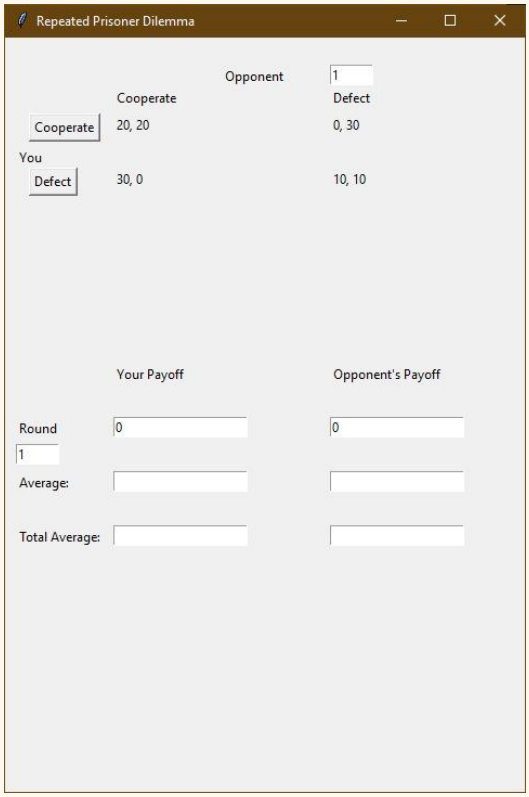


The results will then appear showing the minmax move for each player with the guaranteed payoffs, the best response for each player against the move of the other, and the moves causing Nash equilibrium if exists.

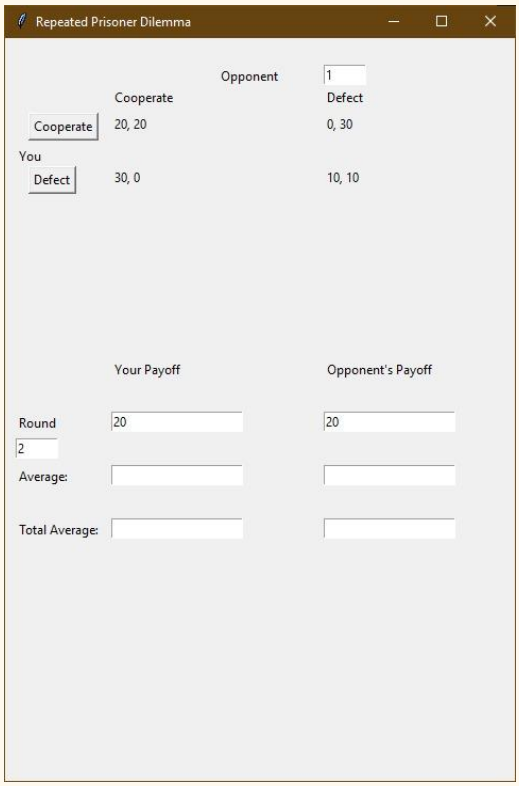

Task 2
zerosum
non-zerosum
Payoff Matrix
Result
Enter number of moves for player 1:
2
Enter number of moves for player 2:
3
Payoffs (Enter the payoffs of players 1 & 2 in a textbox with space between them):
1 2
3 4
5 6
7 8
9 10
11 12
Minmax payoff for player 1:
7
when he/she plays move
2
Minmax payoff for player 2:
6
when he/she plays move
3
Player 2 best response for player 1 move
1
3
with payoff
6
Player 2 best response for player 1 move
2
3
with payoff
12
Player 1 best response for player 2 move
1
2
with payoff
7
Player 1 best response for player 2 move
2
2
with payoff
9
Player 1 best response for player 2 move
3
2
with payoff
11
Nash equilibrium occurs when player 1 plays move
2
and player 2 plays move
3

Task 3:

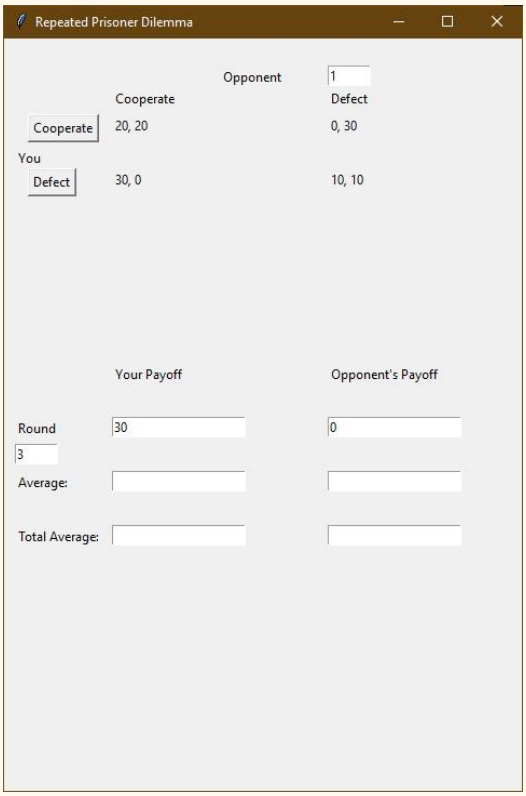
The user plays against 5 opponents 25 rounds each by choosing to cooperate or defect.



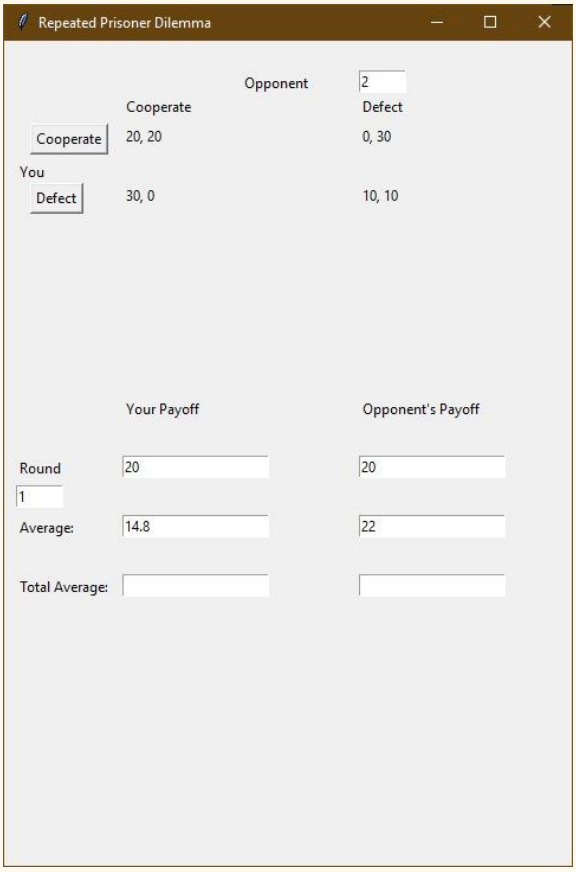
For example, the user chose to cooperate, and the opponent (computer) chose to cooperate too.



Here the user chose to defect while the opponent chose to cooperate.



After playing 25 rounds with an opponent, the average payoffs are calculated and shown each for the player and the opponent.



After playing with the 5 opponents 25 rounds each, average payoffs are calculated and shown for the player and all the opponents.