# International Islamic University Chittagong

## Project:Tic-tac -toe Game


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## Abstract:

Tic-Tac-Toe, a classic two-player, zero-sum game of perfect information, through the lens of game theory. Despite its simple rules and 3×3 grid, Tic-Tac-Toe serves as an excellent pedagogical tool for introducing fundamental game theory concepts such as pure strategies, optimal play, and the existence of a Nash equilibrium.

The game is characterized by players (traditionally "X" and "O") alternately placing their marks on an empty square of the grid, aiming to achieve three of their marks in a row, column, or diagonal. Due to its finite number of states and deterministic outcomes, Tic-Tac-Toe is a "solved" game. Through exhaustive analysis, it can be demonstrated that if both players employ optimal strategies, the game will always result in a draw. This outcome highlights the concept of perfect play leading to a predetermined result in such games.


## Introduction:

Tic-Tac-Toe, also known as Noughts and Crosses, is a classic two-player game played on a 3×3 grid. Its simplicity, requiring only a pencil and paper, has made it a universally recognized pastime enjoyed by people of all ages. Despite its seemingly elementary nature, Tic-Tac-Toe holds a significant place in the study of game theory, serving as a quintessential example of a "solved" game of perfect information.

The game's objective is straightforward: two players, traditionally "X" and "O," take turns marking empty squares on the grid. The first player to successfully place three of their marks in a horizontal, vertical, or diagonal row wins the game. If all nine squares are filled and neither player has achieved a winning line, the game concludes in a draw, often referred to as a "cat's game."

Historically, variations of Tic-Tac-Toe can be traced back to ancient civilizations. Evidence of similar 3×3 game boards has been found on roofing tiles from 1300 BCE in Egypt, and the Roman Empire had its version called "Terni Lapilli," played with three pebbles. The game evolved through the Middle Ages, with similar concepts appearing in "Three Men's Morris." The modern name "Tic-Tac-Toe" is believed to have originated in the 20th century, deriving from earlier names like "Noughts and Crosses" and "Tit-Tat-Toe." Its timeless appeal lies in its minimal equipment requirements and simple rules, making it accessible across cultures and generations.

## Software requirements:

1. Intel core i5 Processor.
2. Windows 10, 64 bit.
3. Google colab.
4. Python.

## Methodology:

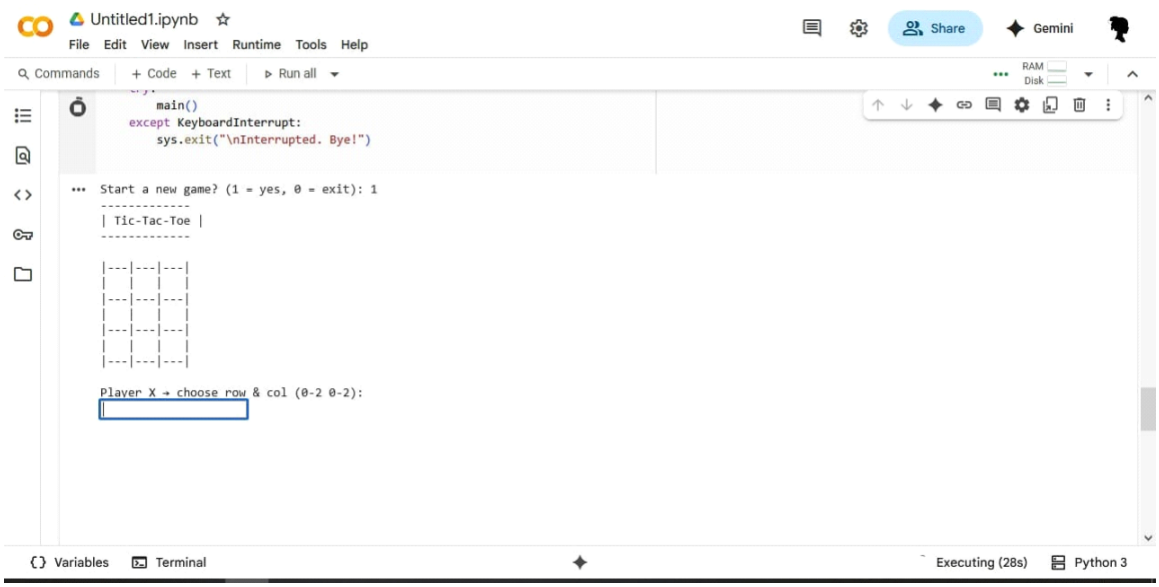
1. After running the program, we will be given two options. If we click on the first option, i.e., 1, the game will continue. And if we click on 0, the program will exit.

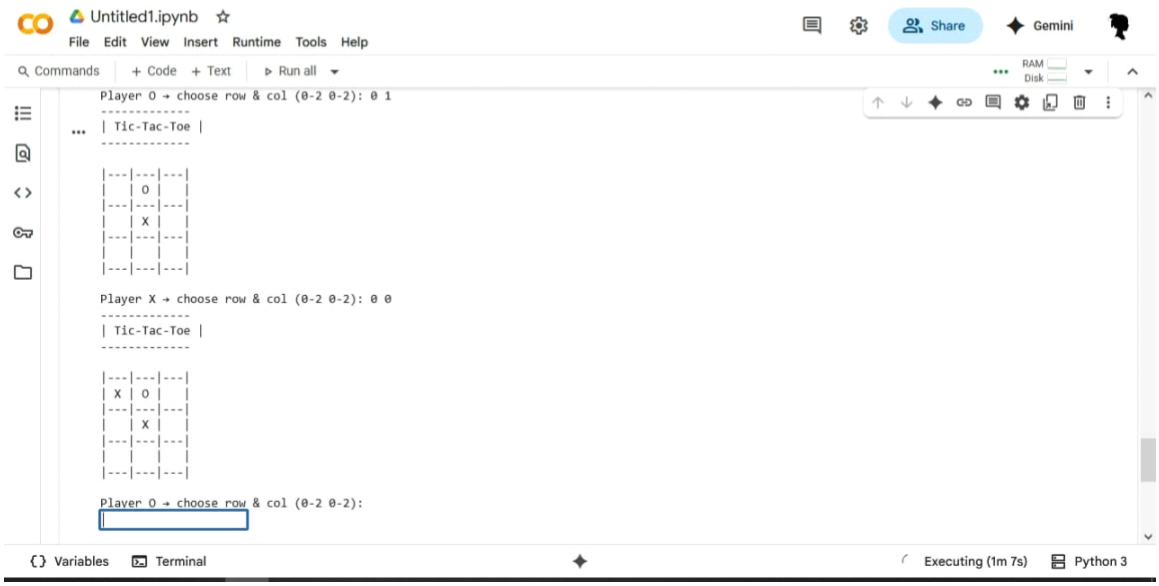
2. This game is arranged in rows and columns, where the range is from 0 to 2.

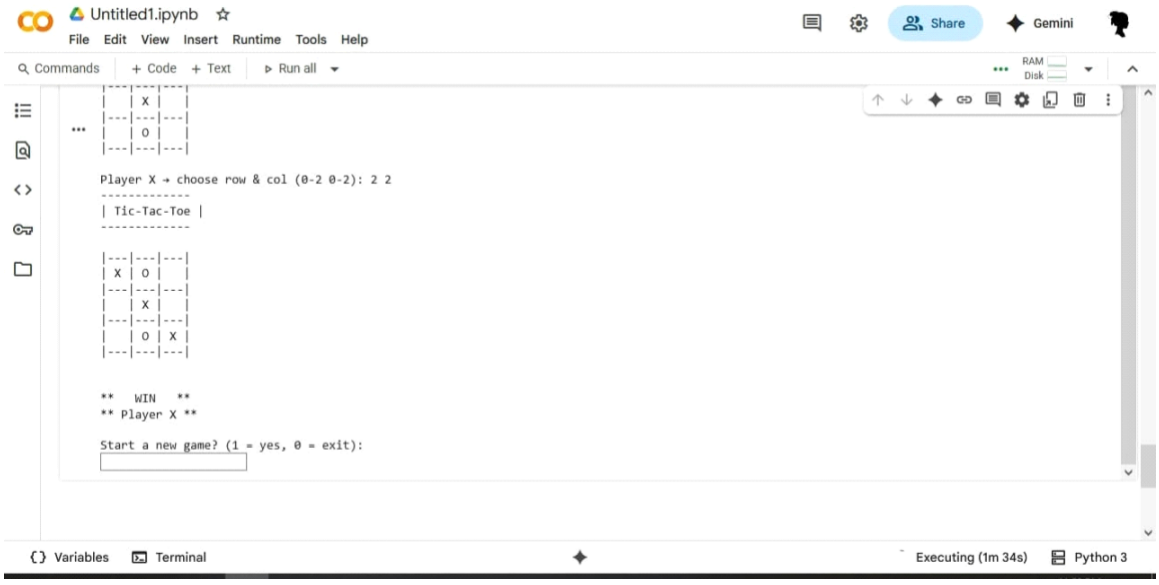
3. When we click on 0 0, it will display an 'X' in the first row. In this way, we can play the game using 0 0, 0 1, 0 2, 1 0, 1 1, 1 2, 2 0, 2 1, and 2 2.

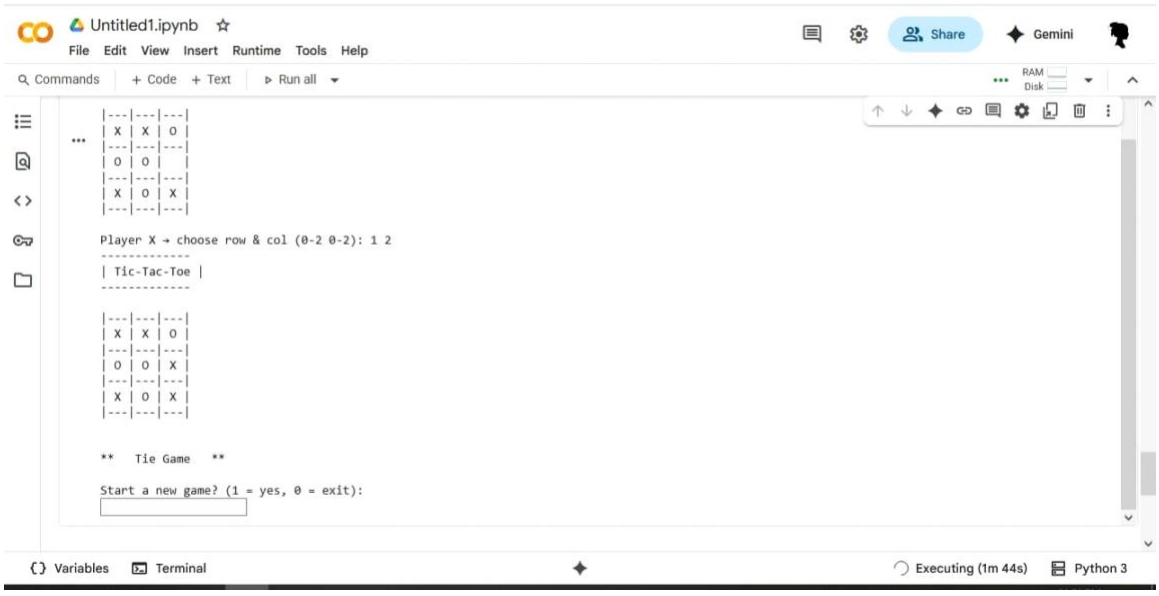
If the game ends in a draw, a "Tie" message will appear, and if someone wins, the message will say "Winner".

## Output:




Untitled1.ipynb
File Edit View Insert Runtime Tools Help
Share
Gemini
Commands
+ Code
+ Text
Run all
RAM
Disk
Player O → choose row & col (0-2 0-2): 0 1
| Tic-Tac-Toe |
Player X → choose row & col (0-2 0-2): 0 0
| Tic-Tac-Toe |
Player O → choose row & col (0-2 0-2):
Variables
Terminal
Executing (1m 7s)
Python 3


Untitled1.ipynb
File Edit View Insert Runtime Tools Help
Share
Gemini
Commands
+ Code
+ Text
Run all
RAM
Disk
Player X → choose row & col (0-2 0-2): 2 2
| Tic-Tac-Toe |
** WIN **
** Player X **
Start a new game? (1 = yes, 0 = exit):
Variables
Terminal
Executing (1m 34s)
Python 3




## Conclusion:

Tic-Tac-Toe, while a deceptively simple game, offers a rich landscape for exploring fundamental concepts in game theory and software development. From a game theory perspective, it stands as a prime example of a solved, perfect information game where optimal play from both sides inevitably leads to a draw. This characteristic underscores the importance of strategic foresight and the absence of a guaranteed winning strategy for the first player when faced with a perfectly rational opponent.