

Programming for Artificial Intelligence



SUPERIOR UNIVERSITY

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Class:

BSAI

Section:

4B

Subject:

Programming for Artificial Intelligence

Submitted to:

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Lab 4

N Queens problem

Code:

```
def position(board, row, col, n):
```

```
    for i in range(row):
```

```
        if board[i][col] == 'Q':
```

```
            return False
```

```
    # Check upper-left diagonal
```

```
    i, j = row, col
```

```
    while i >= 0 and j >= 0:
```

```
        if board[i][j] == 'Q':
```

```
            return False
```

```
        i -= 1
```

```
        j -= 1
```

```
    # Check upper-right diagonal
```

```
    i, j = row, col
```

```
    while i >= 0 and j < n:
```

```
        if board[i][j] == 'Q':
```

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```
    return False
```

```
    i -= 1
```

```
    j += 1
```

```
    return True
```

```
def display_board(board,n):
```

```
    print("Solution:")
```

```
    for row in board:
```

```
        print(" ".join(row))
```

```
    print()
```

```
def solve_n_queens(board, row, n):
```

```
    if row == n:
```

```
        display_board(board, n)
```

```
        return
```

```
    for col in range(n):
```

```
        if is_safe(board, row, col, n):
```

```
            board[row][col] = 'Q'
```

```
            solve_n_queens(board, row + 1, n)
```

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```
board[row][col] = '-'
```

```
n = int(input("Enter the number of queens: "))
```

```
board = [['-' for _ in range(n)] for _ in range(n)]
```

```
solve_n_queens(board, 0,n)
```

Description:

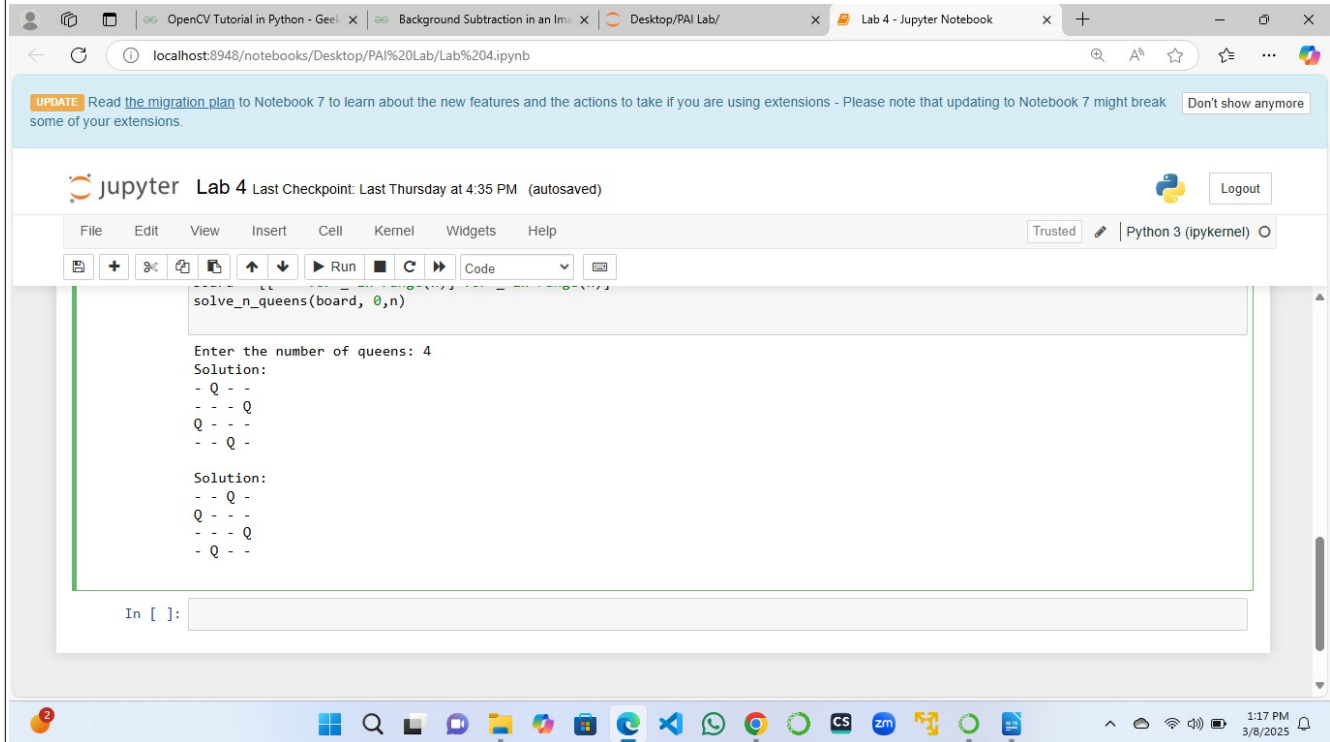
This program is implemented using the backtracking algorithm. The following functions are used:

1. **position(board, row, col, n):** Checks whether a queen can be placed in the given row and column by checking no other queen exist in the same column, row or diagonals.
2. **display_board(board, n):** Prints the chessboard structure for each valid solution.
3. **solve_n_queens(board, row, n):** Recursively places queens row by row, backtracking if a conflict is detected.
4. **Main function:** Initializes the chessboard and calls solve_n_queens to start solving the problem.

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Output:

For 4 Queens:



The screenshot shows a Jupyter Lab interface with a browser window at localhost:8948. The notebook is titled 'Lab 4' and shows a code cell with the function `solve_n_queens(board, 0, n)`. The output of the code is as follows:

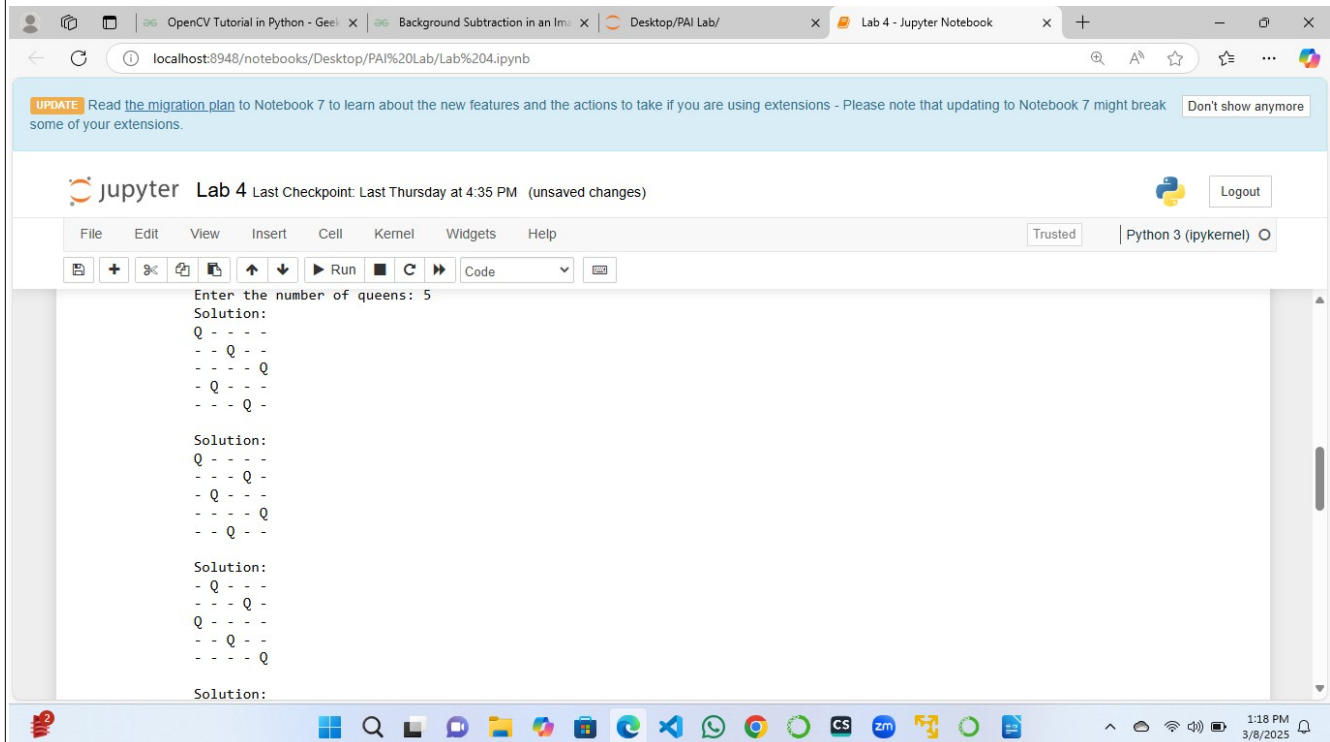
```
solve_n_queens(board, 0, n)

Enter the number of queens: 4
Solution:
- Q - -
- - - Q
Q - - -
- - Q -

Solution:
- - Q -
Q - - -
- - - Q
- Q - -
```

The interface includes a menu bar (File, Edit, View, Insert, Cell, Kernel, Widgets, Help) and a toolbar with icons for running, saving, and other actions. The status bar at the bottom shows the time as 1:17 PM on 3/8/2025.

For 5 Queens:



The screenshot shows the same Jupyter Lab interface, but with the code cell set to `solve_n_queens(board, 0, 5)`. The output displays three solutions for 5 queens:

```
Enter the number of queens: 5
Solution:
Q - - - -
- - Q - -
- - - Q -
- Q - - -
- - - Q -

Solution:
Q - - - -
- - - Q -
- Q - - -
- - Q - -
- - Q - -

Solution:
- Q - - -
- - - Q -
Q - - - -
- - Q - -
- - - Q -

Solution:
```

The interface is identical to the previous screenshot, showing the same menu bar, toolbar, and status bar.

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OpenCV Tutorial in Python - GeeksforGeeks x Background Subtraction in an Image x Desktop/PAI Lab/ x Lab 4 - Jupyter Notebook x

localhost:8948/notebooks/Desktop/PAI%20Lab/Lab%204.ipynb

UPDATE Read the [migration plan](#) to Notebook 7 to learn about the new features and the actions to take if you are using extensions - Please note that updating to Notebook 7 might break some of your extensions. Don't show anymore

jupyter Lab 4 Last Checkpoint: Last Thursday at 4:35 PM (autosaved) Logout

File Edit View Insert Cell Kernel Widgets Help Trusted Python 3 (ipykernel)

Run Code

```
Solution:
- Q - - -
- - - Q
- - - Q
- Q - - -
Q - - - -
- - - Q -

Solution:
- - - Q -
Q - - - -
- - - Q -
- Q - - -
- - - - Q

Solution:
- - - Q -
- - - - Q
- Q - - -
- - - Q -
Q - - - -

Solution:
- - - - Q
- Q - - -
- - - Q -
Q - - - -
- - - Q -
```

Windows taskbar: 1:20 PM 3/8/2025

OpenCV Tutorial in Python - GeeksforGeeks x Background Subtraction in an Image x Desktop/PAI Lab/ x Lab 4 - Jupyter Notebook x

localhost:8948/notebooks/Desktop/PAI%20Lab/Lab%204.ipynb

UPDATE Read the [migration plan](#) to Notebook 7 to learn about the new features and the actions to take if you are using extensions - Please note that updating to Notebook 7 might break some of your extensions. Don't show anymore

jupyter Lab 4 Last Checkpoint: Last Thursday at 4:35 PM (autosaved) Logout

File Edit View Insert Cell Kernel Widgets Help Trusted Python 3 (ipykernel)

Run Code

```
- - - - Q
- Q - - -

Solution:
- - - Q -
- Q - - -
- - - Q
- - - Q
Q - - - -

Solution:
- - - - Q
- Q - - -
- - - Q -
Q - - - -
- - - Q -

Solution:
- - - - Q
- Q - - -
- - - Q -
Q - - - -
- - - Q -
```

Windows taskbar: 1:20 PM 3/8/2025

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