RA1911033010075
VAIBHAV MISHRA

EXPERIMENT - 1

AIM

To implement the N-Queens (Toy Problem) using python programming.

ALGORITHM

1) N-queens problem aims to place N-queens on a N*N chess-board such that no two queens can attack each other in the same row column or diagonally

2) Place the first queen in the leftmost column in cell (1,1)

3) Place the second queen by checking for these rules:

   i) The queen shouldn't be in the same row, column or diagonal as the first queen

   ii) If the queen can be placed safely in this row then make this [row, column] as a part of the solution

   iii) Repeat step (ii) for all N queens, if this returns a solution return true.

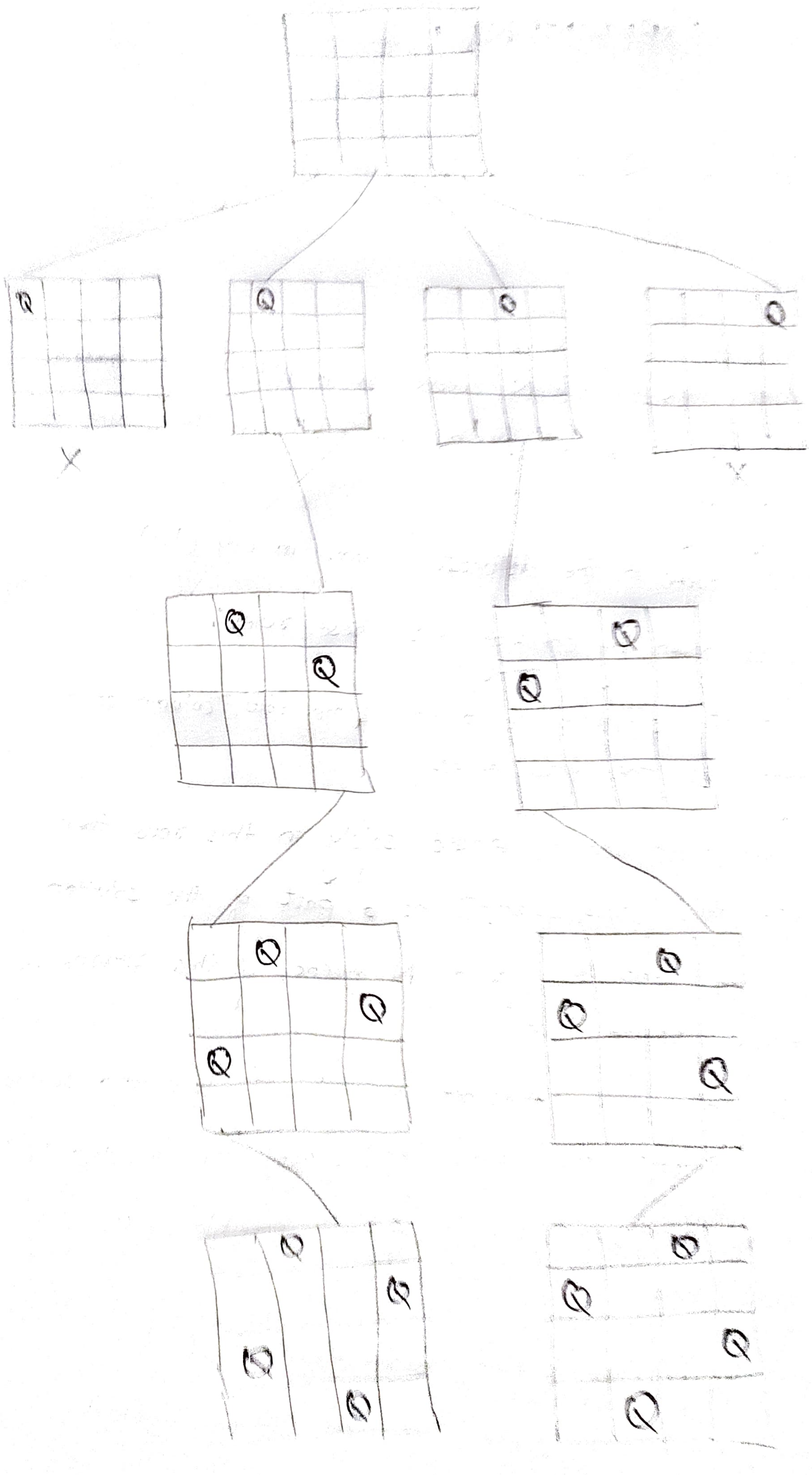
   iv) If placing this ~~question~~ queen doesn't lead to a solution then unmark this [row, column]. Back track to step (2)

   v) Repeat the step from (3) for all possible cells in the first row.

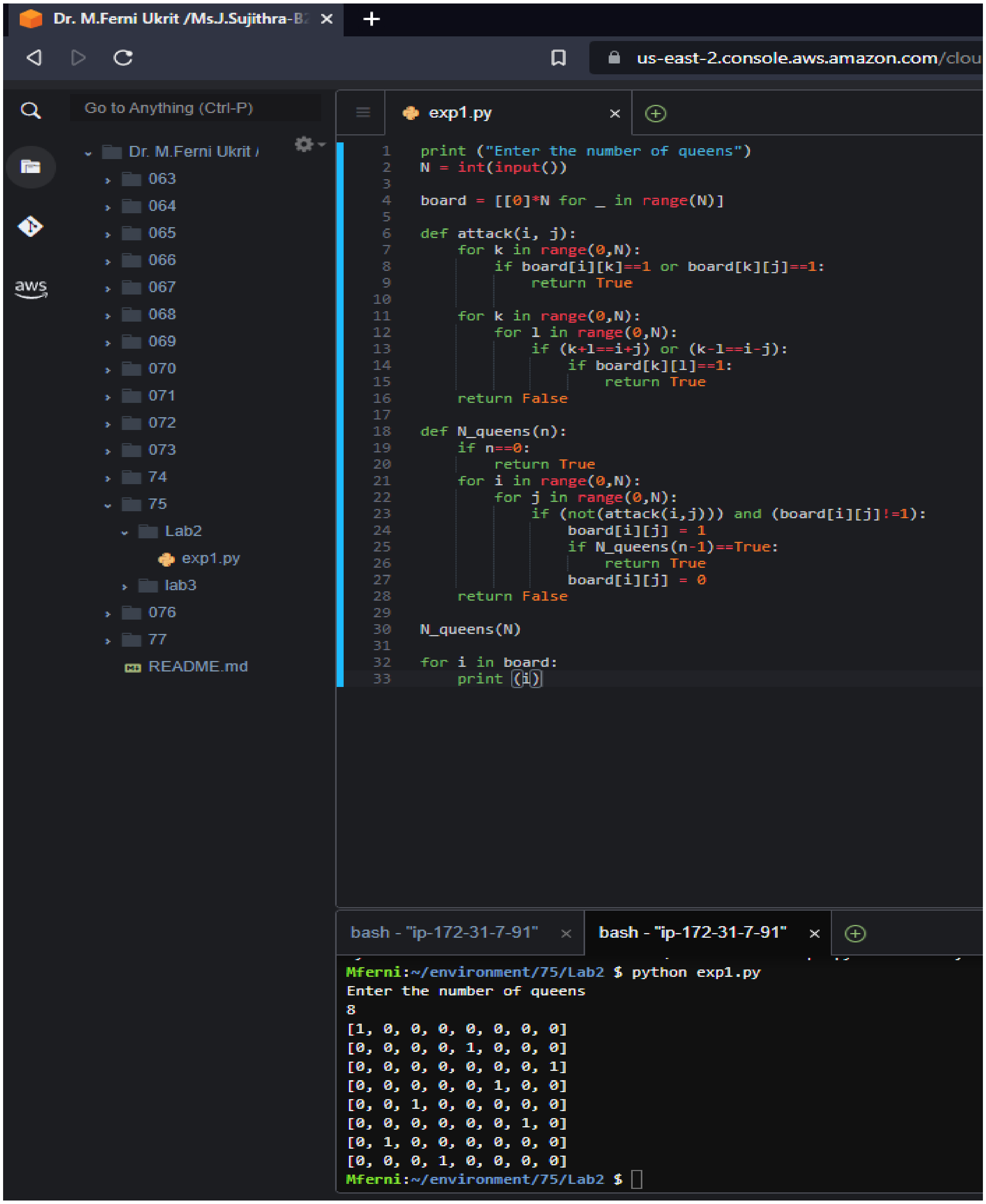
4) If all the queens are placed, return true

5) If all the rows have been tried and nothing worked, return false to trigger backtracking.

STATE SPACE TREE



CODE AND OUTPUT SCREENSHOT



```python
print ("Enter the number of queens")
N = int(input())

board = [[0]*N for _ in range(N)]

def attack(i, j):
    for k in range(0,N):
        if board[i][k]==1 or board[k][j]==1:
            return True

    for k in range(0,N):
        for l in range(0,N):
            if (k+l==i+j) or (k-l==i-j):
                if board[k][l]==1:
                    return True
    return False

def N_queens(n):
    if n==0:
        return True
    for i in range(0,N):
        for j in range(0,N):
            if (not(attack(i,j))) and (board[i][j]!=1):
                board[i][j] = 1
                if N_queens(n-1)==True:
                    return True
                board[i][j] = 0
    return False

N_queens(N)

for i in board:
    print (i)
```

```
Mferni:~/environment/75/Lab2 $ python exp1.py
Enter the number of queens
8
[1, 0, 0, 0, 0, 0, 0, 0]
[0, 0, 0, 0, 1, 0, 0, 0]
[0, 0, 0, 0, 0, 0, 0, 1]
[0, 0, 0, 0, 0, 1, 0, 0]
[0, 0, 1, 0, 0, 0, 0, 0]
[0, 0, 0, 0, 0, 0, 1, 0]
[0, 1, 0, 0, 0, 0, 0, 0]
[0, 0, 0, 1, 0, 0, 0, 0]
Mferni:~/environment/75/Lab2 $
```