116 . Sudoku solver

AIM: Write a python program for sudoku solver problem

PROGRAM:

```
def is_valid(board, row, col, num):
    for i in range(9):
        if board[row][i] == num or board[i][col] == num:
            return False
    start_row, start_col = 3 * (row // 3), 3 * (col // 3)
    for i in range(3):
        for j in range(3):
            if board[i + start_row][j + start_col] == num:
                return False
    return True

def solve_sudoku(board):
    empty = find_empty_location(board)
    if not empty:
        return True
    row, col = empty
    for num in range(1, 10):
        if is_valid(board, row, col, num):
            board[row][col] = num
            if solve_sudoku(board):
                return True
            board[row][col] = 0
    return False

def find_empty_location(board):
    for i in range(9):
        for j in range(9):
            if board[i][j] == 0:
```

```
                return (i, j)
    return None

def print_board(board):
    for row in board:
        print(row)

# Example Sudoku board
board = [
    [5, 3, 0, 0, 7, 0, 0, 0, 0],
    [6, 0, 0, 1, 9, 5, 0, 0, 0],
    [0, 9, 8, 0, 0, 0, 0, 6, 0],
    [8, 0, 0, 0, 6, 0, 0, 0, 3],
    [4, 0, 0, 8, 0, 3, 0, 0, 1],
    [7, 0, 0, 0, 2, 0, 0, 0, 6],
    [0, 6, 0, 0, 0, 0, 2, 8, 0],
    [0, 0, 0, 4, 1, 9, 0, 0, 5],
    [0, 0, 0, 0, 8, 0, 0, 7, 9]
]

if solve_sudoku(board):
    print("Sudoku Solved:")
    print_board(board)
else:
    print("No solution exists.")
```

OUTPUT:

```
Sudoku Solved:
[5, 3, 4, 6, 7, 8, 9, 1, 2]
[6, 7, 2, 1, 9, 5, 3, 4, 8]
[1, 9, 8, 3, 4, 2, 5, 6, 7]
[8, 5, 9, 7, 6, 1, 4, 2, 3]
[4, 2, 6, 8, 5, 3, 7, 9, 1]
[7, 1, 3, 9, 2, 4, 8, 5, 6]
[9, 6, 1, 5, 3, 7, 2, 8, 4]
[2, 8, 7, 4, 1, 9, 6, 3, 5]
[3, 4, 5, 2, 8, 6, 1, 7, 9]
```

TIME COMPLEXIY: $O(9^{N2)}$