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#Roll No: TI24

#N queens

import random  
  
# Function to calculate the number of attacking pairs of queens  
def calculate\_attacking\_pairs(queens):  
 n = len(queens)  
 attacking\_pairs = 0  
 for i in range(n):  
 for j in range(i + 1, n):  
 if queens[i] == queens[j] or abs(queens[i] - queens[j]) == abs(i - j):  
 attacking\_pairs += 1  
 return attacking\_pairs  
  
# Function to generate a random initial state  
def generate\_random\_state(n):  
 queens = [random.randint(0, n - 1) for \_ in range(n)]  
 return queens  
  
# Function to get the next neighbor state with the minimum number of attacking pairs  
def get\_next\_neighbor(state):  
 n = len(state)  
 min\_attacking\_pairs = calculate\_attacking\_pairs(state)  
 next\_state = list(state)  
  
 for i in range(n):  
 for j in range(n):  
 if j != state[i]:  
 temp\_state = list(state)  
 temp\_state[i] = j  
 attacking\_pairs = calculate\_attacking\_pairs(temp\_state)  
 if attacking\_pairs < min\_attacking\_pairs:  
 min\_attacking\_pairs = attacking\_pairs  
 next\_state = temp\_state  
  
 return next\_state  
  
# Hill Climbing algorithm to solve the N-Queens problem  
def hill\_climbing(n):  
 current\_state = generate\_random\_state(n)  
 current\_attacking\_pairs = calculate\_attacking\_pairs(current\_state)  
  
 while True:  
 next\_state = get\_next\_neighbor(current\_state)  
 next\_attacking\_pairs = calculate\_attacking\_pairs(next\_state)  
  
 if next\_attacking\_pairs >= current\_attacking\_pairs:  
 break  
  
 current\_state = next\_state  
 current\_attacking\_pairs = next\_attacking\_pairs  
  
 return current\_state  
  
# Main program  
n = int(input("Enter the number of queens: "))  
solution = hill\_climbing(n)  
  
# Print the solution  
print("Solution:")  
for row in range(n):  
 line = ""  
 for col in range(n):  
 if solution[col] == row:  
 line += "Q "  
 else:  
 line += "- "  
 print(line)

#OUTPUT

Enter the number of queens: 8

Solution:

- - - - - - Q -

- Q - - - - - -

- - - Q - - - -

- - - - - - - Q

Q - - - - - - -

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Process finished with exit code 0