**Report on Pai Lab Task 4**

**Overview:** Pai Lab Task 4 is a Python program that solves the **N-Queens Problem** using **backtracking**. The goal is to place N queens on an N×N chessboard such that no two queens threaten each other.

**Key Components:**

* **Backtracking Algorithm:**
  + The recursive backtrack() function attempts to place queens row by row.
  + It ensures that no two queens are in the same column, main diagonal, or anti-diagonal.
  + If all queens are placed successfully, it counts the solution.
* **Bitwise Optimization:**
  + Instead of using arrays to track columns and diagonals, bitwise operations improve efficiency.
  + cols, diag1, and diag2 are used to track occupied positions, allowing quick validity checks.
* **Example Execution:**
  + The program runs with n = 8 by default (8-Queens Problem).
  + It prints the total number of solutions found.

**Possible Improvements:**

* Extending the program to **print chessboard solutions** for visualization.
* Implementing **parallel computation** to speed up larger board sizes.
* Adding a **graphical interface (GUI)** for user interaction.