

CS250 - ARTIFICIAL INTELLIGENCE LAB

ASSIGNMENT-7 : Hill Climb Algorithm

Date: March 6, 2024

Total Credit: 10

- Markings will be based on the correctness and soundness of the outputs.
- Marks will be deducted in case of plagiarism.
- Proper indentation and appropriate comments are mandatory.
- *All code needs to be submitted in '.py' format.* Even if you code it in '.IPYNB' format, download it in '.py' format and then submit
- You should zip all the required files and name the zip file as:
 - <roll_no>_assignment_<#>.zip, eg. 1501cs11_assignment_01.zip.

Problem Statement: Solving the 8-Queens Problem using Hill Climbing Algorithm Variants

Objective : The objective of this assignment is to apply different variants of the Hill Climbing algorithm to solve the 8-Queens problem efficiently.

Problem Statement:

The 8-Queens problem is a puzzle where the objective is to place 8 queens on an 8×8 chessboard in such a way that no two queens threaten each other. In other words, no two queens should share the same row, column, or diagonal.

Instructions:

1. First Choice Hill Climbing:

- Describe the First Choice Hill Climbing variant and its application to the 8-Queens problem.
- Implement the First Choice Hill Climbing algorithm to solve the 8-Queens problem.
- Analyze the performance of the algorithm and discuss its strengths and weaknesses.

2. Steepest Ascent Hill Climbing:

- Explain the Steepest Ascent Hill Climbing variant and how it differs from First Choice Hill Climbing.
- Implement the Steepest Ascent Hill Climbing algorithm for the 8-Queens problem.

- Compare the performance of Steepest Ascent Hill Climbing with First Choice Hill Climbing.
3. **Random Restart Hill Climbing:**
- Introduce the Random Restart Hill Climbing approach and its relevance to the 8-Queens problem.
 - Implement the Random Restart Hill Climbing algorithm to solve the 8-Queens problem.
 - Discuss the effectiveness of Random Restart Hill Climbing in finding better solutions compared to other variants.
4. **Stochastic Hill Climbing:**
- Define the Stochastic Hill Climbing variant and its characteristics.
 - Implement the Stochastic Hill Climbing algorithm for the 8-Queens problem.
 - Evaluate the performance of Stochastic Hill Climbing and compare it with other variants.
5. **Experimental Analysis:**
- Conduct experiments to evaluate the performance of each algorithm variant in solving the 8-Queens problem.
 - Measure metrics such as solution quality, convergence speed, and computational efficiency.
 - Present your findings using tables, charts, or graphs for clarity.
6. **Discussion and Conclusion:**
- Summarize the results of your experiments and analysis.
 - Reflect on the strengths and weaknesses of each Hill Climbing variant in tackling the 8-Queens problem.
 - Discuss potential improvements or alternative approaches for solving the problem.

Submission Guidelines:

- Prepare a comprehensive report containing all sections mentioned above.
- Prepare your code in such away that it should ask initial state and algorithm to be implemented as a input from user. Code should print the path from initial state to goal state.

Grading Criteria:

1. Python code for each algorithm (50%)
2. Report (50%)

Submission of report is mandatory and it carries 50% of weightage.

For any queries regarding this assignment, contact:

Utsav Kumar Nareti (utsavkumarnareti@gmail.com)

Kumari Priya(kumariPriya.manit@gmail.com)

Akash Zingade(akashzingade@gmail.com)