

# Introduction to Artificial Intelligence

## Program – The $n$ -Queen Problem

Oct 27, 2023

### Objectives

Practice and get familiar with the way to solve problem by searching. In this assignment you need to make use of the taught subject matters about Informed Search and Exploration (ch. 4) and Genetic Algorithm (ch. 4.3.5).

### Program

Write programs (in C/C++/Python) to solve **the  $n$ -queen problem**.

1. Use Iterative Deepening Search (IDS) or Bidirectional Search
2. Use Hill Climbing (HC)
3. Use Genetic Algorithm (GA)<sup>1</sup>

### Report

Execute your codes of the above methods to solve the  $n$ -queen problem. Due to randomness, HC and GA require the statistics from 30 runs.

1. For the **8**-queen problem ( $n = 8$ ):
  - (a) List all the results (**average #attacks** in the final configuration) from the three methods.
  - (b) Compare the **average running time** for the three methods to get a solution.
  - (c) Compare the **success rate** (SR) of HC and GA.

$$\text{SR} = \frac{\text{Number of times obtaining the **optimal** solution}}{\text{Number of trials}} .$$

2. For the **50**-queen problem ( $n = 50$ ) provided a  $50 \times 50$  chessboard:  
Answer the above questions.vspace\*1ex

Must describe your methods and list their parameter settings for the experiments.

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<sup>1</sup>Choosing Representation, Mutation, and Crossover in Genetic Algorithms, *IEEE Computational Intelligence Magazine*, 17(4):52–53, 2022. <https://ieeexplore.ieee.org/document/9942691/interactive>

## Policy on AI-Generated Contents

*The use of AI-generated contents (e.g., by ChatGPT) in any work done on assignments and projects shall be disclosed. Each part of the work that uses AI-generated contents shall have a citation to the AI system used to generate the contents.*

*Using any AI tool or system at exams is forbidden.*

## Submission

- **2023/11/16 24:00 (degrade by 10 points for each day delay)**
- Source code + Report (no longer than **six** A4 pages)
- Zip the source code and report. Upload it to eclass.