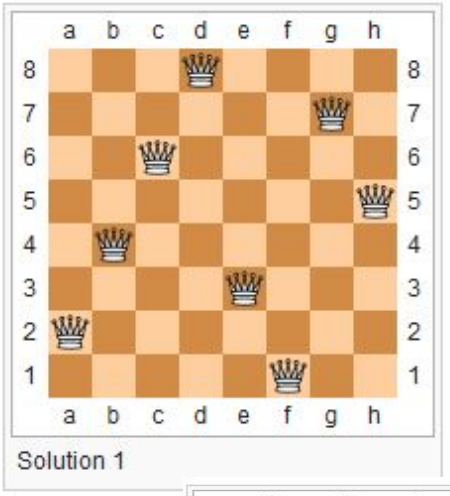
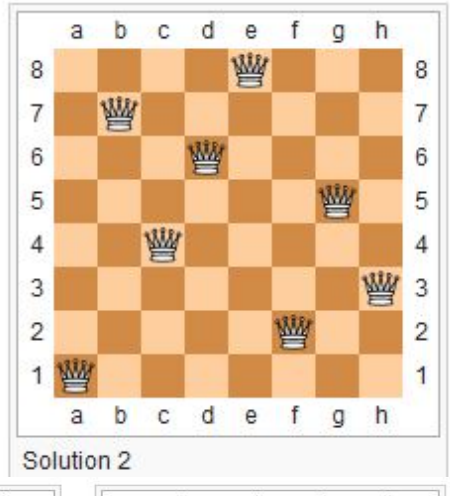
Machine Intelligence

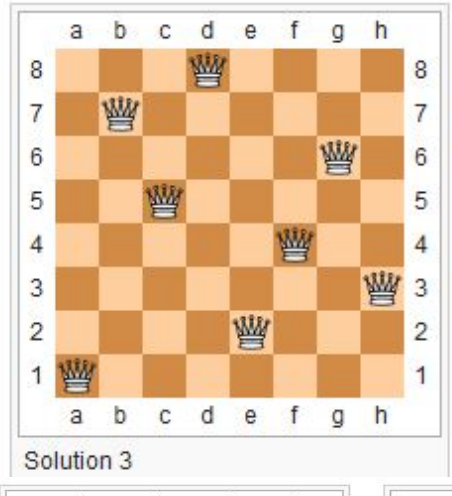
Lab 3:

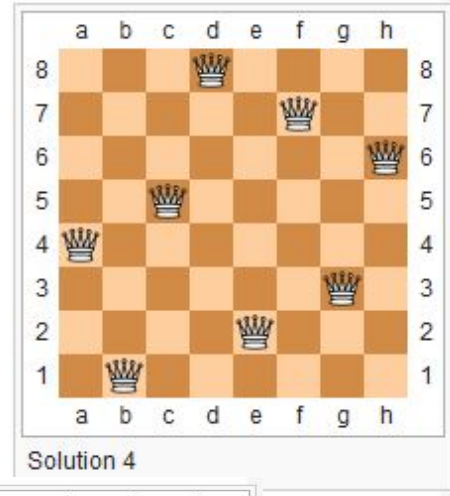
Evolutionary Computing

Possible solutions


Solution 1


Solution 2


Solution 3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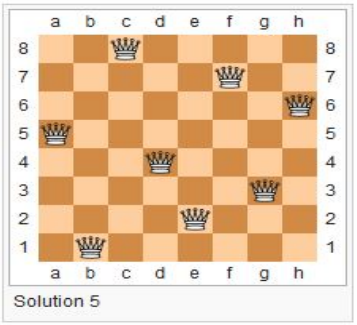
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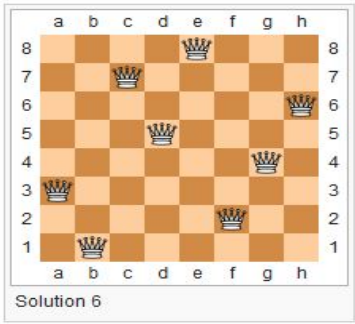
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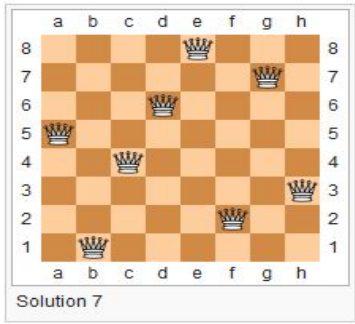
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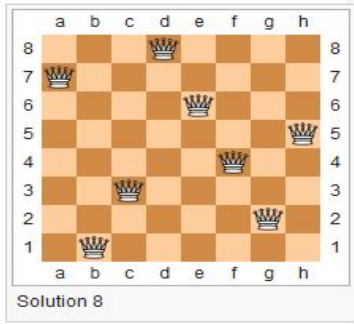
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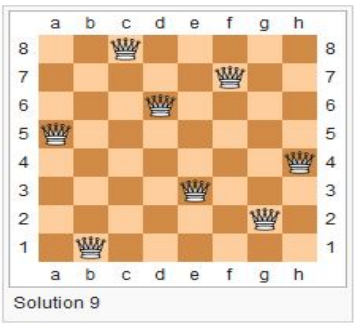
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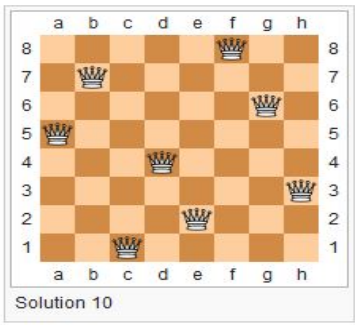
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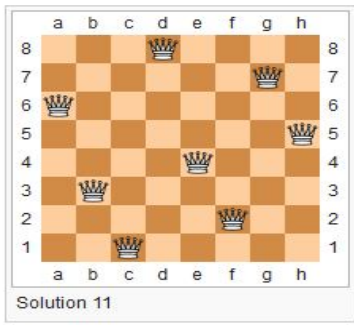
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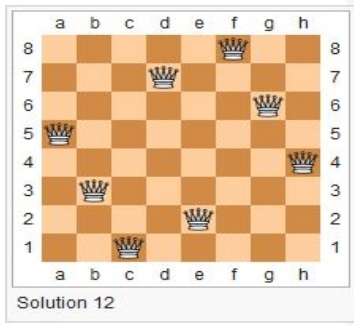
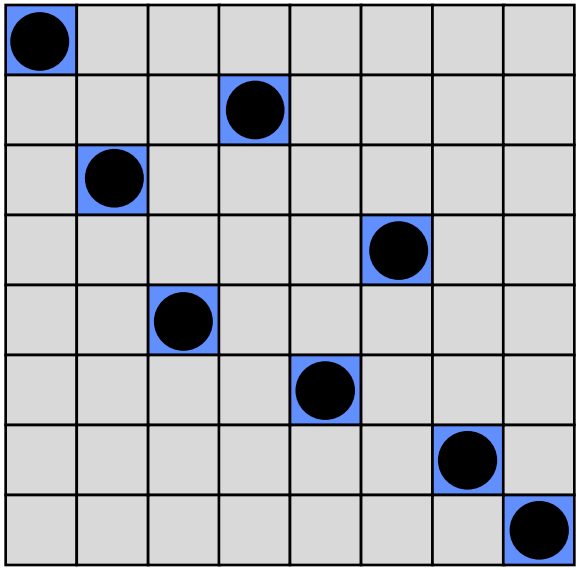

Solution 12

Lab 3

- **Phenotype: a board configuration**
- **Genotype: a permutation of the numbers 1 - 8**



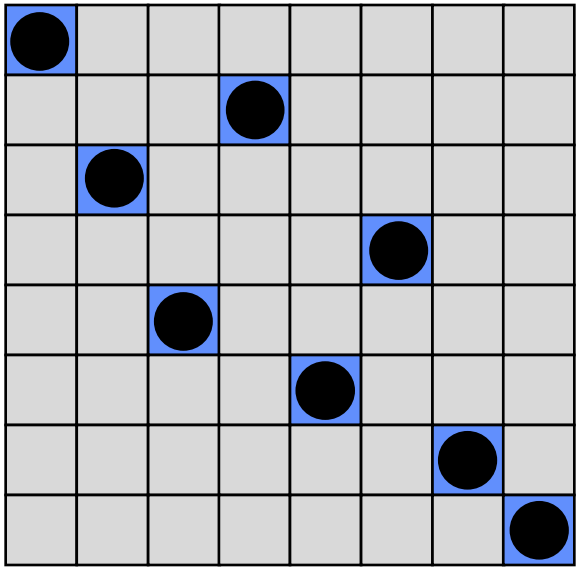
Obvious mapping

Column wise

1	3	5	2	6	4	7	8

Lab 3

- **Alternative 2:**



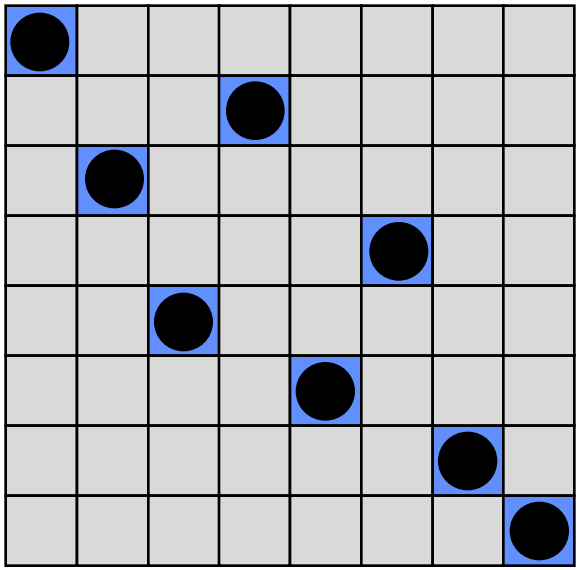
Obvious mapping

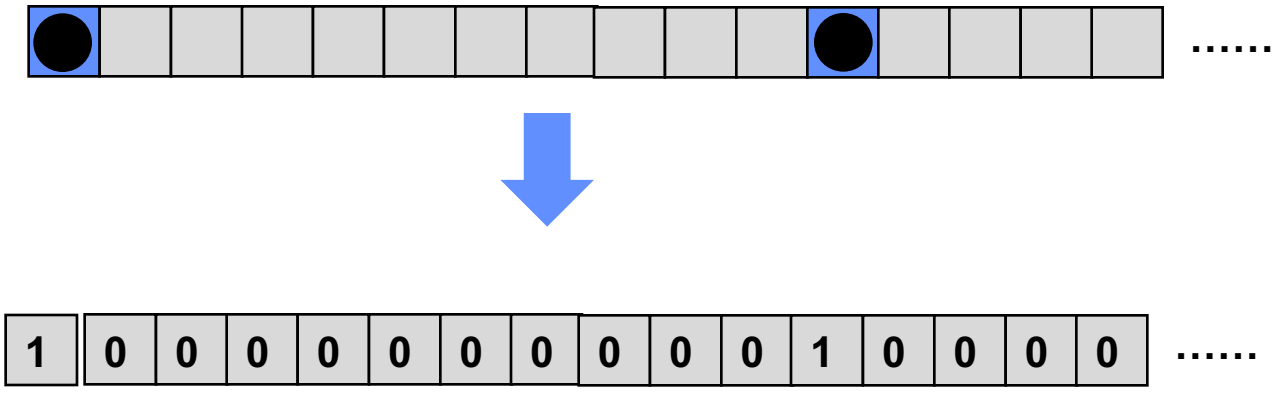
row wise

1	4	2	6	3	5	7	8

❑ Alternative 3:

- **Binary representation: matrix is represented as a an array resulting from concatenating the rows/column**
  - **An allele would then be 1 of a queen appears in a particular position (particular row, particular column), otherwise it is 0 (meaning that the position is free)**
  -





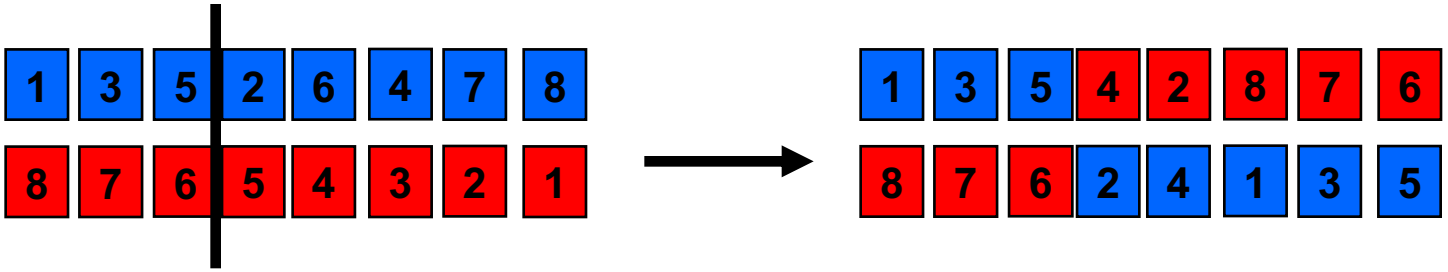
Lab 3

Fitness evaluation

- **Penalty of one queen**: the number of violations.
- **Penalty of a configuration**: the sum of the penalties of all queens.
- **Note: penalty is to be minimized**
- **Fitness of a configuration**: inverse penalty to be maximized

Lab 3

- **Recombination:** Combining two permutations into two new permutations:
  - Choose random crossover point
  - Copy first parts into children
  - Create second part by inserting values from other parent:
    - in the order they appear there
    - beginning after crossover point
    - skipping values already in child



Lab 3

Mutation

- Small variation in one permutation
  - e.g.: swapping values of two randomly chosen positions

Lab 3

- **Selection:**
  - **Parent selection:**
    - Pick 5 parents and take best two to undergo crossover
  - **Survivor selection (replacement)**
    - When inserting a new child into the population, choose an existing member to replace by:
    - sorting the whole population by decreasing fitness
    - enumerating this list from high to low
    - replacing the first with a fitness lower than the given child