

Theory: Selection sort in Python

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Selection sort is a simple algorithm that performs an in-place sorting. At the first iteration, the algorithm finds the smallest element in a whole list and exchange it with the first element. At the second iteration, the algorithm considers all elements except the first one, finds the smallest among them and put it in the second position. The same process continues until the whole list is sorted.

For a list of size n , the algorithm works in $O(n^2)$. The algorithm is unstable: it is not guaranteed that the order of equal elements is preserved after the sorting is done.

§1. Implementation in Python

Below is an implementation of the algorithm in Python:

```
1 def selection_sort(elements):
2     for i in range(len(elements) - 1):
3         index = i
4
5         for j in range(i + 1, len(elements)):
6             if elements[j] < elements[index]:
7                 index = j
8
9         elements[i], elements[index] = elements[index], elements[i]
```

The `selection_sort` function takes a list named `elements` as input and sorts the list in ascending order. At each step of the outer `for` loop, we create a variable `index` to store the position of the minimum element in an unsorted part of the list. Then, in the inner `for` loop, we compare each element of the unsorted part of the list with the current minimum and update it if necessary. After the minimum element is found, we move it to the sorted part of the list.

§2. Usage examples

Here is an example of how the function can be used:

```
1 elems = [6, 4, 3, 3, 2, 1, 1, 4, 5]
2 selection_sort(elems)
3 print(elems) # [1, 1, 2, 3, 3, 4, 4, 5, 6]
```

As expected, the elements are sorted in ascending order.

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