Sorting Algorithms

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1 Bubble Sort

Given a list of numbers a.

We check each pair of adjacent numbers in the list (a_i, a_{i+1}).
If $a_i > a_{i+1}$, we swap a_i and a_{i+1}.
We repeat this process until we check every tuple without performing the swap operation.

	Best-case	**Average-case**	**Worst-case**
comparison	$O(n)$	$O(n^2)$	$O(n^2)$
swap	$O(1)$	$O(n^2)$	$O(n^2)$

Algorithm 1 Bubble Sort

```
swapped ← false
do
    swapped ← false
    for i ← 0 to length(a) − 1 do
        if a_i > a_{i+1} then
            swapped ← true
            swap a_i and a_{i+1}
while swapped
```

2 Selection Sort

Given a list of numbers a.

We find the minimum value in the list starting from an offset of 1.
We swap the minimum value and the value before the offset.
We increment the offset by 1 and repeat this process while the offset is less than the length of the list.

	Best-case	**Average-case**	**Worst-case**
comparison	$O(n^2)$	$O(n^2)$	$O(n^2)$
swap	$O(1)$	$O(n)$	$O(n)$

Algorithm 2 Selection Sort

```
for i ← 0 to length(a) − 1 do
    min ← i
    for j ← i + 1 to length(a) do
        if a_j < a_min then
            min ← j
    swap a_i and a_min
```