Sorting

Sorting algorithm can be classified as either internal or external.

Internal – all data to be sorted is in memory.

External – the data resides on disk and small portions of data are brought into memory to be sorted.

Algorithms can also be either stable or unstable.

Stable: an algorithm is stable if for all resides to be sorted, if R1 occurs before R2 in the original input and R1 and R2 have the same sort key, then R1 occurs before R2 in the sorted output.

Algorithms can be classified by how they work:

Selection-based: repeatedly find the next smallest (or largest) value and add to in the sorted output

Ex. selection sort, heap sort

Insertion-based: repeatedly take the next input value and insert in its proper place in the sorted output

Ex. bubble sort, quick sort

Others: don’t fall into any of the other categories

Ex. radix sort, merge sort

Finally, sorting algorithms are said to be “in place” if we require only a constant amount of space overhead.

Selection sort

Selection sort is a selection-based sorting algorithm that uses sequential search to find the next smallest remaining value.

We could make selection sort stable by shifting rather than swapping. But, that change would negate the main advantage of the algorithm: it does the fewest data more of any sorting algorithms.

Best: O(n^2)

Average: O(n^2)

Worse: O(n^2)

Space overhead: O(1)

Stable? No

Insertion sort

Insertion sort is an insertion-based sorting algorithm that uses shifting to move the next value in the input into its correct place.

Best: O(n)

Average: O(n^2)

Worst: O(n^2)

Space overhead: O(1)

Stable? Yes!