Sorting

In computer science, arranging data in an ordered sequence is called sorting. Sorting is a common operation in many applications including data processing and making searches more efficient. (Sorting, 2023) There are many different search algorithms. Some examples include Bubble sort, Shell sort and Quick sort.

Bubble sort is the simplest sorting algorithm. It works by comparing the current element with the one after it and swapping them if they are in the wrong order. (Bubble Sort Algorithm, 2023) While Bubble sort is simple it is inefficient. Bubble sort has a best-case complexity of *O*(n), but an average and worst-case complexity of *O*(n2). (Sorting Algorithm, 2023)

Shell sort is a generalized version of the Insertion sort algorithm. It is named after Donald Shell who published the first version of this sort in 1959. (Shell, 1959) Shell sort works by first sorting the elements that are far apart from each other and then continuously reduces the gap between the elements to be sorted. (Shell Sort Algorithm, n.d.) It has a best and average complexity of *O*() and a worst-case complexity of *O*(n2). (Sorting Algorithm, 2023) For many practical variants, however, determining the complexity remains an open problem.

Quick sort is a sorting algorithm based on the divide and conquer approach. Quicksort was created by Tony Hoare in 1959. (Quicksort, 2023) Quick sort works by choosing a “pivot” element from the array and dividing the other elements into two sub-arrays, according to whether they are less than or greater than the pivot. The sub-arrays are then sorted recursively. Quick sort has an average and best-case complexity of *O*() and a worst-case complexity of *O*(n2).

Searching

In computer science, a search algorithm is an algorithm designed to solve a search problem. Search algorithms work to retrieve information stored in a particular data structure. Common applications of search algorithms include factoring an integer (which is important in cryptography), finding the minimum or maximum value in a list and finding a specific value in a list. (Search algorithm, 2023) There are two main search algorithms: Linear search and Binary Search.

Linear search is the simplest search algorithm. It works by sequentially checking each element of the list. Linear search is commonly used because it does not require a list to be sorted. Linear search has an average and worst-case complexity of *O*(n) and a best-case complexity of *O*(n). Linear search makes an average of comparisons. (Linear Search, 2022)

Binary search is a search algorithm that finds the index of a target value in a sorted array. It works by repeatedly dividing in half the portion of the list that could contain the target value until the value is found. Binary search has many variations including the binary search tree and Exponential search. Binary search has an average and worst-case complexity of *O*() and a best-case complexity of *O*(1). Binary search makes an average of comparisons. (Binary Search algorithm, 2023)

In conclusion, sorting and searching algorithms are essential to the computer science field.

# References

*Binary Search algorithm*. (2023, February 13). Retrieved February 20, 2023, from Wikipedia: https://en.wikipedia.org/wiki/Binary\_search\_algorithm

*Bubble Sort Algorithm*. (2023, February 2023). Retrieved February 20, 2023, from geeksforgeeks: https://www.geeksforgeeks.org/bubble-sort/

*Linear Search*. (2022, December 2). Retrieved February 20, 2023, from Wikipedia: https://en.wikipedia.org/wiki/Linear\_search

*Quicksort*. (2023, February 19). Retrieved February 20, 2023, from Wikipedia: https://en.wikipedia.org/wiki/Quicksort

*Search algorithm*. (2023, February 18). Retrieved February 20, 2023, from Wikipedia: https://en.wikipedia.org/wiki/Search\_algorithm

*Shell Sort Algorithm*. (n.d.). Retrieved February 20, 2023, from programiz.com: https://www.programiz.com/dsa/shell-sort

Shell, D. L. (1959, July). A high-speed sorting procedure. *Communications of the ACM, II*(7). Retrieved from https://dl.acm.org/doi/10.1145/368370.368387

*Sorting*. (2023, Febuary 20). Retrieved from Wikipedia: https://en.wikipedia.org/wiki/Sorting

*Sorting Algorithm*. (2023, January 22). Retrieved February 20, 2023, from Wikipedia: https://en.wikipedia.org/wiki/Sorting\_algorithm