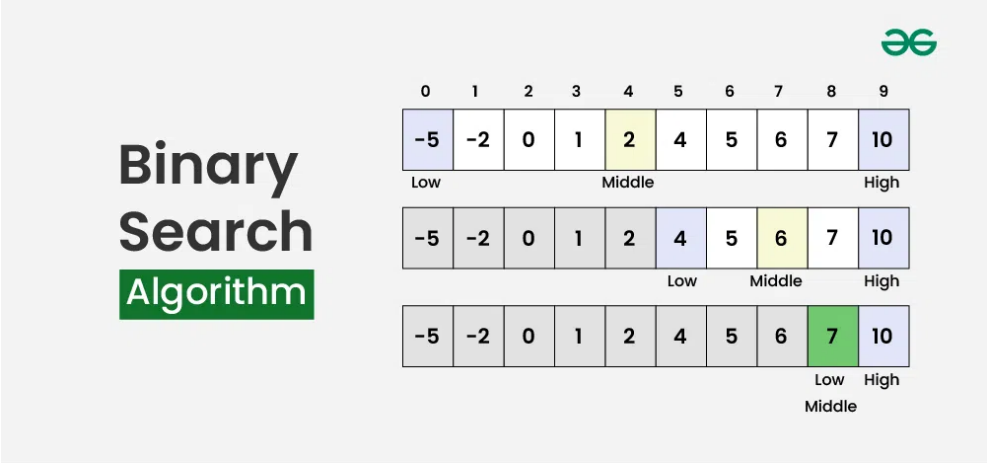
Binary Search

💡 Binary Search Algorithm is a searching algorithm used in a sorted array by repeatedly dividing the search interval in half. The idea of binary search is to use the information that the array is sorted and reduce the time complexity to O(log N).



📌 Binary search can be implemented only on a sorted list of items. If the elements are not sorted already, we need to sort them first.

Binary Search Algorithm can be implemented in two ways

→ Iterative Method

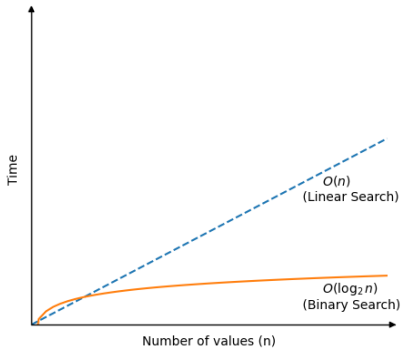
```
do until the pointers low and high meet each other.
    mid = (low + high)/2
    if (x == arr[mid])
        return mid
    else if (x > arr[mid])
        low = mid + 1
    else
        high = mid - 1
```

→ Recursive Method

```
binarySearch(arr, x, low, high)
    if low > high
        return False
    else
        mid = (low + high) / 2
        if x == arr[mid]
            return mid
        else if x > arr[mid]
            return binarySearch(arr, x, mid + 1, high)
        else
            return binarySearch(arr, x, low, mid - 1)
```

Analysis

- The best-case time complexity would be **O(1),** where we find our searching value on first iteration.
- The average-case time complexity of the linear search algorithm would be **O(log n)**.
- The worst-case time complexity of the linear search algorithm would be **O(log n)**.



📌 Binary search can be applied to non-numeric data as long as there is a defined order for the elements. For example, it can be used to search for strings in alphabetical order.

Applications of Binary Search Algorithm

- Binary search can be used as a building block for more complex algorithms used in machine learning, such as algorithms for training neural networks or finding the optimal hyperparameters for a model.
- It can be used for searching in computer graphics such as algorithms for ray tracing or texture mapping.
- It can be used for searching a database.

Advantages of Binary Search

- Binary search is faster than linear search, especially for large arrays.
- More efficient than other searching algorithms with a similar time complexity, such as interpolation search or exponential search.
- Binary search is well-suited for searching large datasets that are stored in external memory, such as on a hard drive or in the cloud.

Disadvantages of Binary Search

- The array should be sorted.
- Binary search requires that the data structure being searched be stored in contiguous memory locations.
- Binary search requires that the elements of the array be comparable, meaning that they must be able to be ordered.

📌 Java implementation can be found under Implementation_Java folder

📚 References

Binary Search (With Code)

Binary Search is a searching algorithm for finding an element's position in a sorted array. In this tutorial, you will understand the working of binary search with working code in C, C++, Java, and Python.

https://www.programiz.com/dsa/binary-search

Binary Search Algorithm

Binary Search Algorithm - Binary search is a fast search algorithm with run-time complexity of O(log n). This search algorithm works on the principle of divide and conquer, since it divides the array into half before searching. For this algorithm to

https://www.tutorialspoint.com/data_structures_algorithms/binary_search_algorithm.htm

W3Schools.com

W3Schools offers free online tutorials, references and exercises in all the major languages of the web. Covering popular subjects like HTML, CSS, JavaScript, Python, SQL, Java, and many, many more.

https://www.w3schools.com/dsa/dsa_algo_binarysearch.php

Binary Search Algorithm - Iterative and Recursive Implementation - GeeksforGeeks

A Computer Science portal for geeks. It contains well written, well thought and well explained computer science and programming articles, quizzes and practice/competitive programming/company interview Questions.

https://www.geeksforgeeks.org/binary-search/

✍🏻 Author → Serhat Kumas

https://www.linkedin.com/in/serhatkumas/

SerhatKumas - Overview

Computer engineering student who loves coding in different fields instead of focusing on a one spesific area. - SerhatKumas

https://github.com/SerhatKumas