Linear Search

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what is it ??

The Simplest searching algorithm.

Also known as

Sequential search

Method

It traverses a list/array sequentially (one by one) to locate a specific target value.

How it works?

1. Start from the very first element (index 0) of the list.
2. Compare the current element with Target value.
3. If Match: Return the index of the element. Stop.
4. If no match: Move to the next element.
5. Repeat until a match is found (or) the end of the list is reached.
6. If list Ends: Return a distinct value (often -1 (or) null) to indicate "Not found".

Algorithm Complexity (Big O)

- Time Complexity
  - Best Case: O(1)

    The target element is at the very first position.
  - Worst Case: O(n)

    The target is at the very last position (or) not in the list at all.
  - Average Case: O(n)

- Space Complexity

  It is an iterative process that requires no extra memory space.

Key Characteristics

- Pre-requisities: None. The data doesn't need to be sorted. (unlike Binary Search).
- Efficiency: highly inefficient for large datasets ($n > 10,000$)
- Implementation: very easy to implement & understand.

Comparision

feature	Linear Search	Binary Search
Data state	Unsorted (or) Sorted	must be Sorted
Approach	Sequential access	Divide & Conquer
Speed	Slow (O(n))	Fast (O(log n))