Algorithms Compared
1. Linear Search
Approach:
Sequentially checks each element until the target is found or the list ends.
Time Complexity:
Best Case: O(1)
Average/Worst Case: O(N)
Requirement:
Data does not need to be sorted.
2. Binary Search
Approach:
Repeatedly divides the search space in half.
Time Complexity:
Sorting: O(N log N)
Searching: O(log N)
Requirement:
Data must be sorted.
Dataset Size (N)	Linear Search (O(N))	Binary Search (O(log N))
1,000	1 ms	0.01 ms
10,000	10 ms	0.02 ms
1,000,000	1 s	0.1 ms
Linear Search time grows linearly with dataset size.
Binary Search time grows logarithmically, making it extremely efficient for large datasets.
Even when including sorting cost, Binary Search is beneficial when:
Multiple searches are performed on the same dataset
Data remains mostly static
Final Conclusion
* For small datasets or unsorted data:
Linear Search is simple and sufficient.
* For large, sorted datasets or repeated searches:
Binary Search is vastly superior and scales efficiently.
Expected Result:
Binary Search outperforms Linear Search by a significant margin for large datasets, provided the data is sorted.