02 - E-commerce Search Function Implementation

## 1. Introduction to Search Algorithms

In an e-commerce platform, efficient product search functionality is crucial for fast and accurate user experience. This document compares two fundamental search algorithms — Linear Search and Binary Search — in terms of their time complexity, usage scenarios, and practical considerations.

## 2. Algorithm Definitions

### Linear Search

Linear Search iterates through each element of the array one-by-one to find the target item. It does not require the array to be sorted.

### Binary Search

Binary Search repeatedly divides the sorted array into halves to find the target item. It requires the array to be sorted beforehand.

## 3. Time Complexity Comparison

|  |  |  |  |
| --- | --- | --- | --- |
| Search Type | Best Case | Average Case | Worst Case |
| Linear Search | O(1) | O(n) | O(n) |
| Binary Search | O(1) | O(log n) | O(log n) |

## 4. Practical Comparison and Use Cases

### Linear Search

- Suitable for small datasets or unsorted data.  
- Simpler to implement and does not require preprocessing.  
- Useful for one-time or rare searches in small product lists.

### Binary Search

- Ideal for large datasets that are already sorted or can be sorted once.  
- Highly efficient with O(log n) time complexity for repeated queries.  
- Recommended for high-performance, frequent product search operations.

## 5. Conclusion

Binary Search is generally preferred for large-scale e-commerce systems due to its speed, provided the dataset is sorted. Linear Search remains a valid choice for simpler use cases or when sorting is not feasible.