**Module 1: Critical Thinking**

Chioma Chance

Colorado State University Global

CSC506: Design and Analysis of Algorithms

Dr. Banerjee

02/16/2025

**Efficient Searching in Online Marketplaces Using Linear Search**

Searching for products in an online marketplace requires efficient retrieval methods, especially when dealing with vast databases. While algorithms like Binary Search or Hashing offer faster performance, Linear Search is still relevant in scenarios where product data is unsorted or small. This paper examines the applicability of Linear Search, its time complexity, and external factors influencing its efficiency in online searches.

Linear Search works by iterating through each element of a dataset until the target item is found. It is useful in online marketplaces where: Products are frequently added or removed without maintaining a strict order, filters and category searches are applied dynamically, limiting the dataset, and the dataset is small, making more complex search optimizations unnecessary.

Linear Search operates with a worst-case time complexity of O(n), meaning search time increases linearly with the number of products. In a large marketplace, this becomes inefficient, leading to longer query times. However, for dynamically changing or small search result sets, it remains practical.

The choice of data structure affects Linear Search efficiency: Lists/Arrays are common in dynamic search results but inefficient for large datasets, Hash Tables reduce lookup time to O(1) but require predefined indexing, and Tree Structures (e.g., BSTs) improve search time to O(log n) but require sorted data.

**Conclusion**

Linear Search remains useful for **small, dynamic, or unsorted datasets** in online marketplaces. However, its inefficiency in large-scale applications suggests that alternative algorithms—such as **Hashing or Binary Search**—should be considered where possible.

**References**

* Cormen, T. H., Leiserson, C. E., Rivest, R. L., & Stein, C. (2009). *Introduction to Algorithms* (3rd ed.). MIT Press.
* Sedgewick, R., & Wayne, K. (2011). *Algorithms* (4th ed.). Addison-Wesley.

**Appendix**

*Screenshot 1: (unfiltered search for wireless headphones)*

A screenshot of a website

AI-generated content may be incorrect.There is a wide variety of options, so I must filter for direct results

*Screenshot 2: (filtered search for wireless headphones shipping within 7 days)*

A screenshot of a website

AI-generated content may be incorrect.The results changed, based on when I needed the product by.