**LIBRARY MANAGEMENT SYSTEM**

Linear search is a basic algorithm that searches for an element in the list, going through each element one by one and checking it sequentially. This process initiates from the very first element in the list. It compares the element with the target value and if it matches, then the search gets successful; otherwise, it moves to the next element and repeats the process until the target value is found or the end of the list is reached. While simple to implement, this algorithm is slow for large datasets.

On the other hand, binary search is an intrinsically efficient algorithm for finding an element in a sorted list. This is done by dividing the list in half repeatedly. It starts with a comparison of the target value with the middle element in the list. In case of a match, the search ends successfully. If the target value is less than the middle element of the list, it repeats with the left half; otherwise, if it is greater, then it repeats with the right half until the target value is found or until a list has been narrowed down to a single element. Whereas in binary search it is way faster than a linear search on datasets of this magnitude, binary search requires a sorted list.

Time Complexity Comparison:

Linear Search: O(n). The search has to check potentially every element in the list, making it less efficient for large datasets.

Binary Search: O(log n). This method is much faster for sorted datasets, especially large ones, because it repeatedly halves the number of elements to search through.