For benchmarking the timeout was set to 4 seconds for each iteration. The number of iterations was set to 384. This means that the maximum time for the benchmark is 1536 seconds = 25.6 minutes so we have no problem when running the benchmark on the lcc3, which could have problem when running >= 30 minutes.

2 * 4 * 4 * 3 * 4 = 384 Iterations * 4 seconds = 1536 seconds = 25.6 minutes = 384 Iteartions * 5 seconds = 1920 seconds = 32 minutes >= 30 minutes

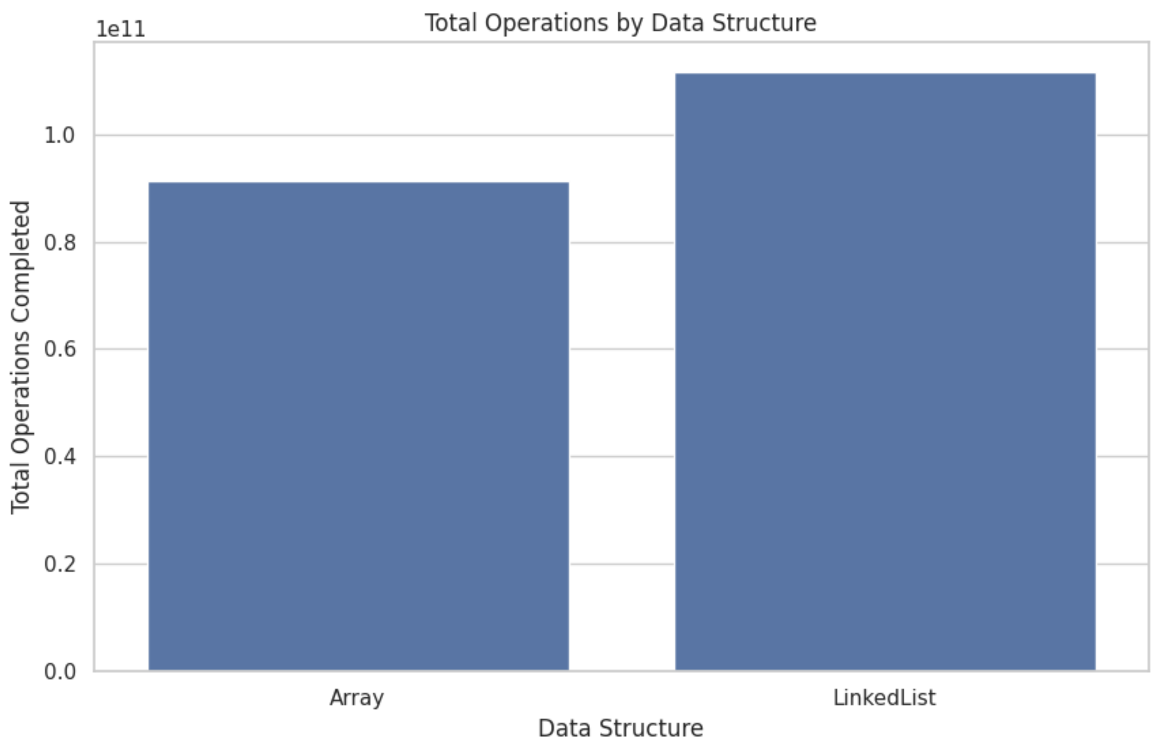
Array vs. Linked List

	ArrayList	LinkedList
get()	O(1)	O(n)
add()	O(1)	O(1) amortized
remove()	O(n)	O(n)

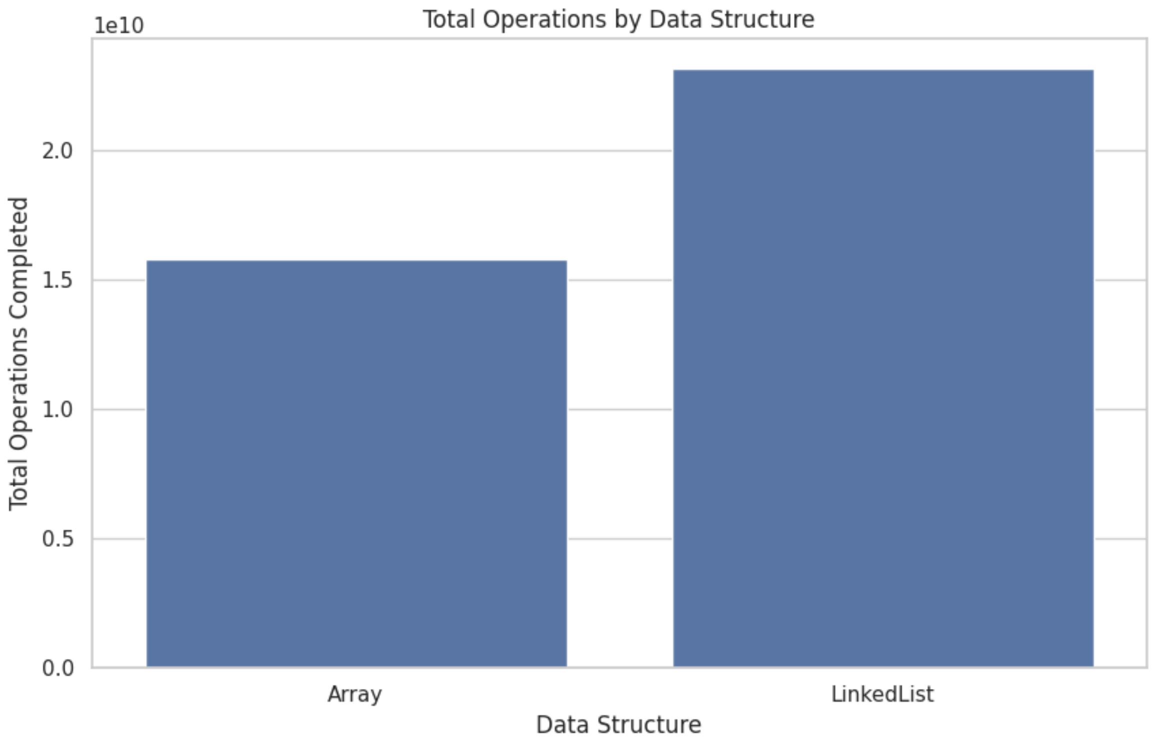
Analysis

In general we can say that more operations are performed with the datastructure "LinkedList" than with the datastructure "Array".

Locally



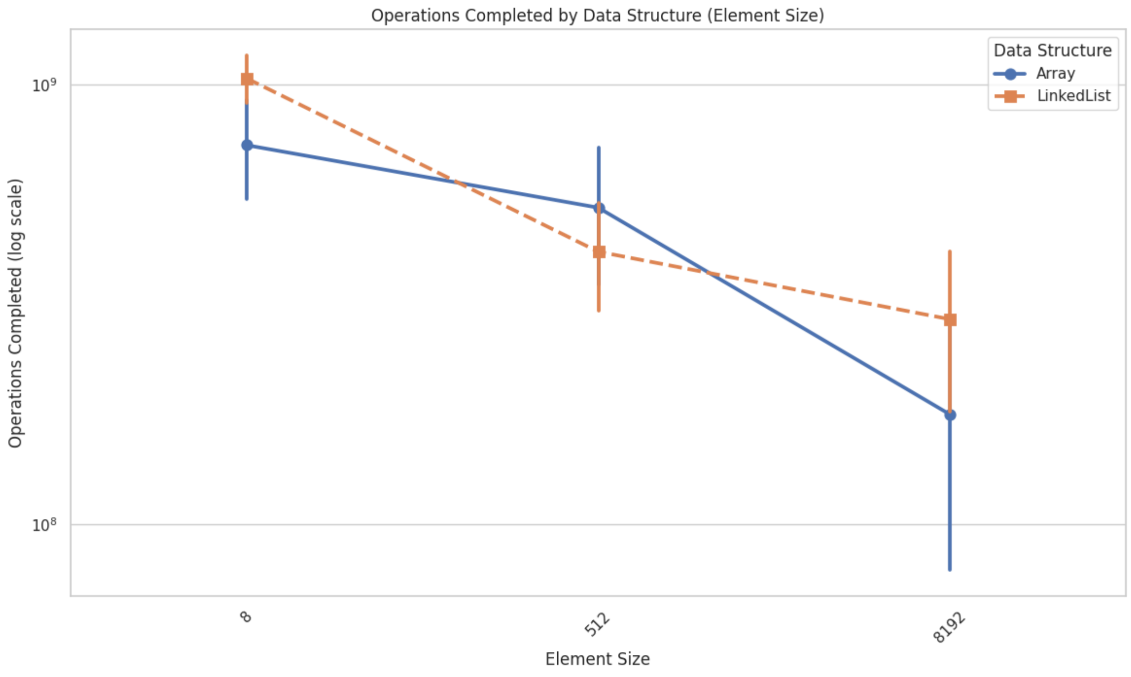
LCC3



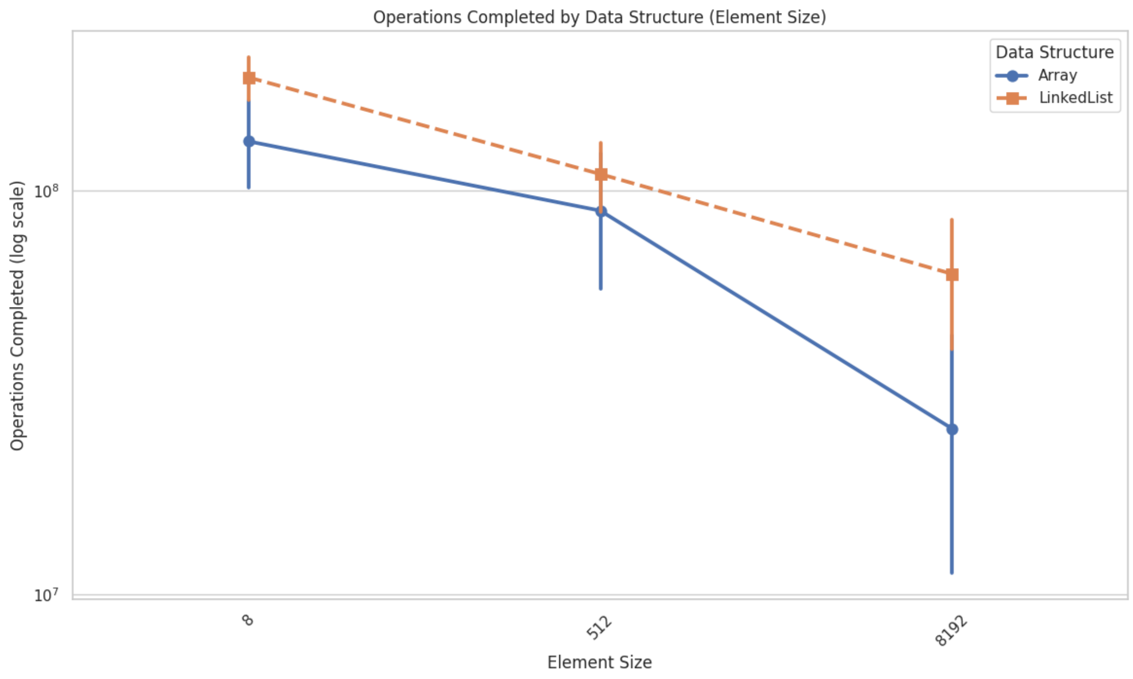
Elements size & Operations Completed

On lcc3

Locally



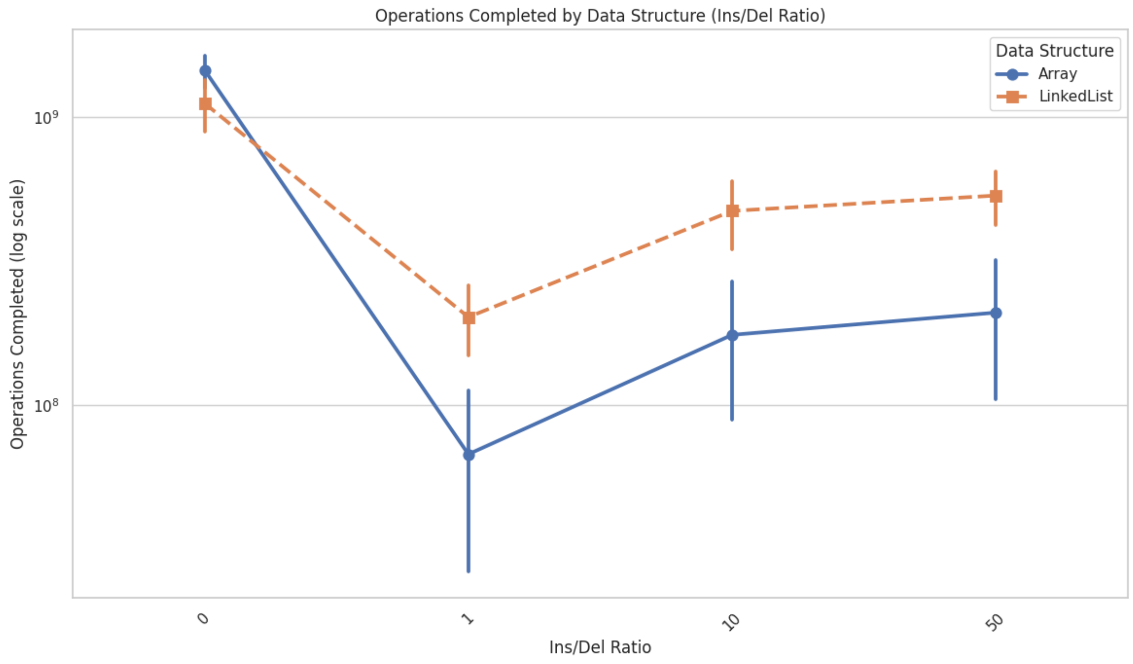
LCC3



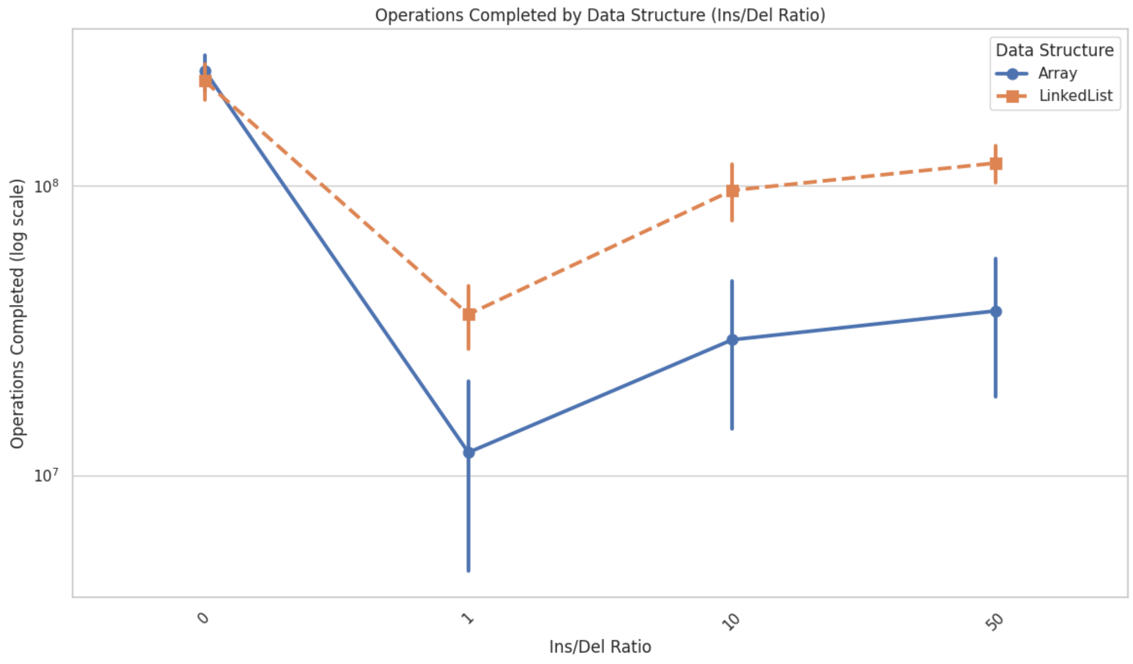
Insertion / Delete Ratio & Operations Completed

When the ratio of insertions and deletions is 0%, indicating only read and write operations are performed. Conversely, when the ratio is 50%, linked lists outperform arrays because linked lists have O(1) time complexity for insertion and deletion, while arrays have O(n) due to potential shifting of elements.

Locally



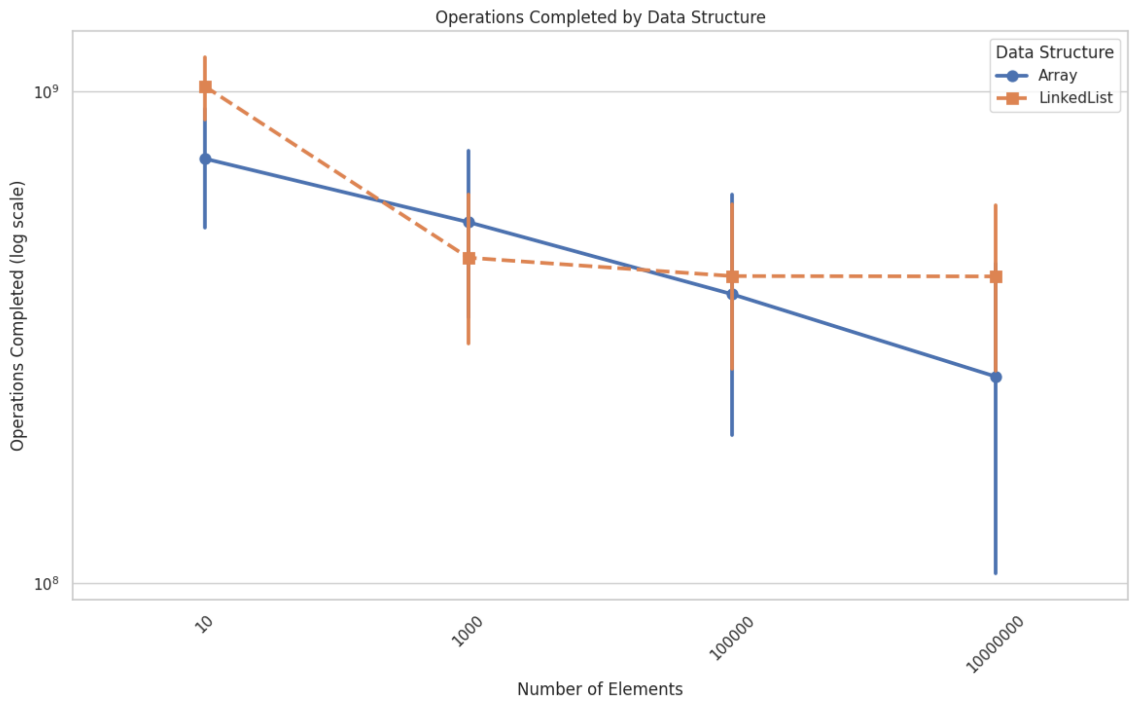
LCC3



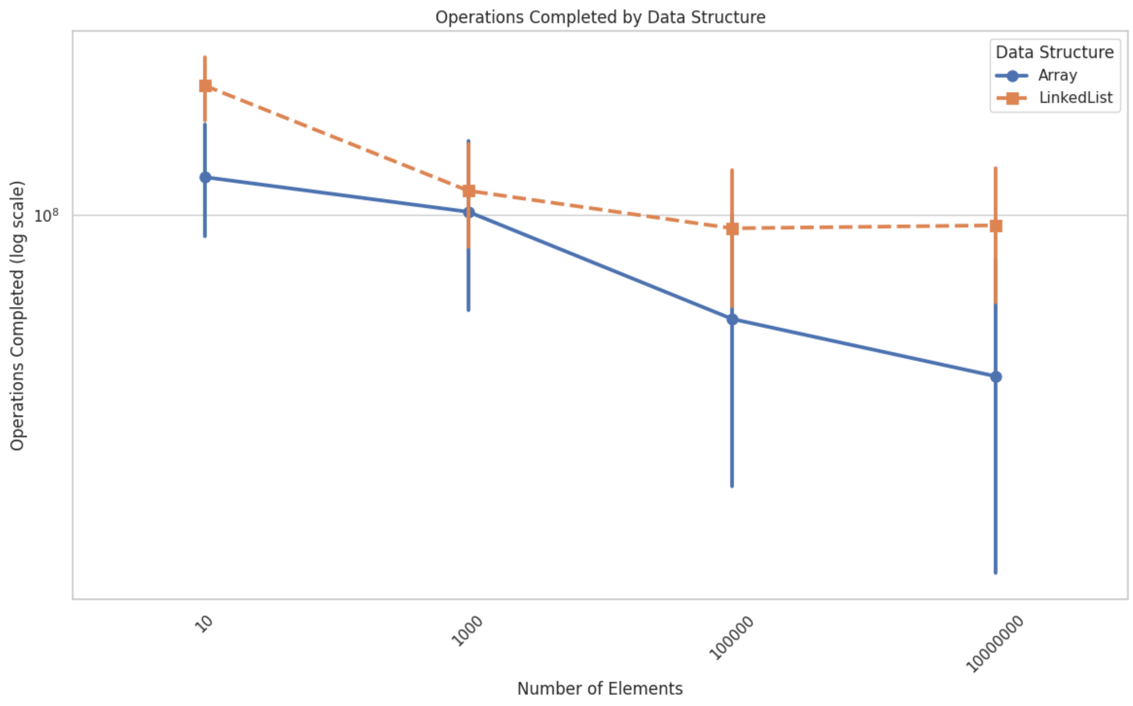
Number of elements & Operations Completed

For a small number of elements, arrays are slightly better than linked lists due to their contiguous memory storage. However, as the number of elements increases, arrays become much more efficient compared to linked lists, as accessing elements in arrays is O(1) time complexity, whereas in linked lists, it's O(n). When the number of elements is extremely large, the performance difference between arrays and linked lists narrows, as the overhead of traversing a large array can offset the benefits of its contiguous memory storage.

Locally



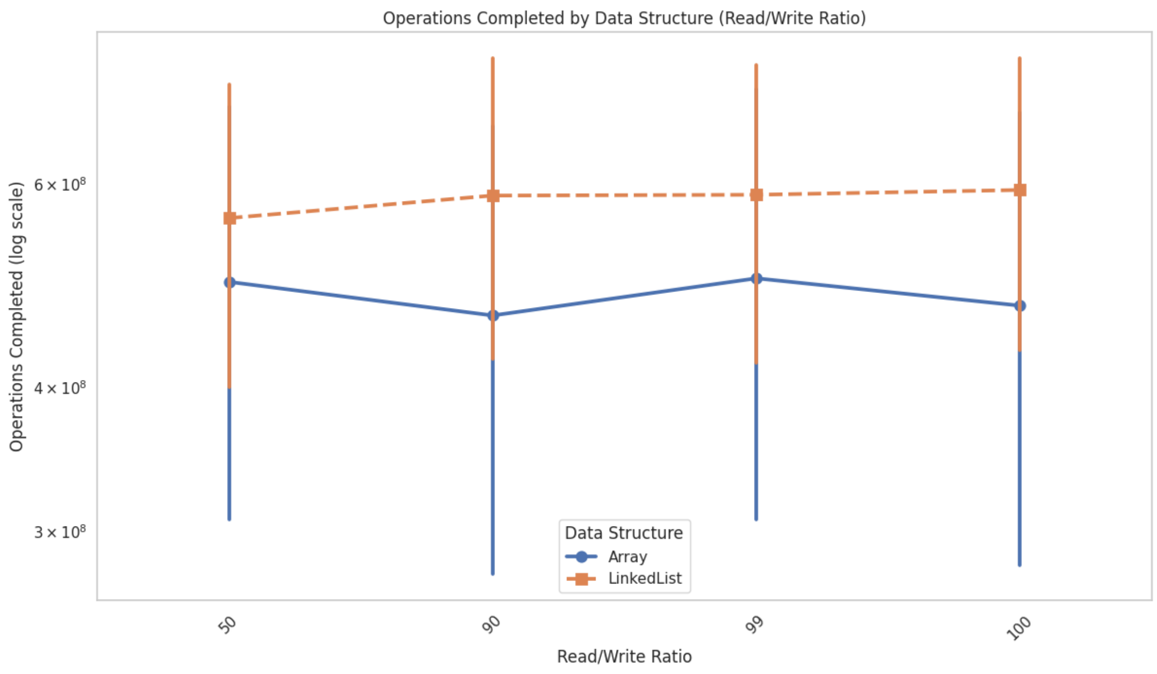
LCC3



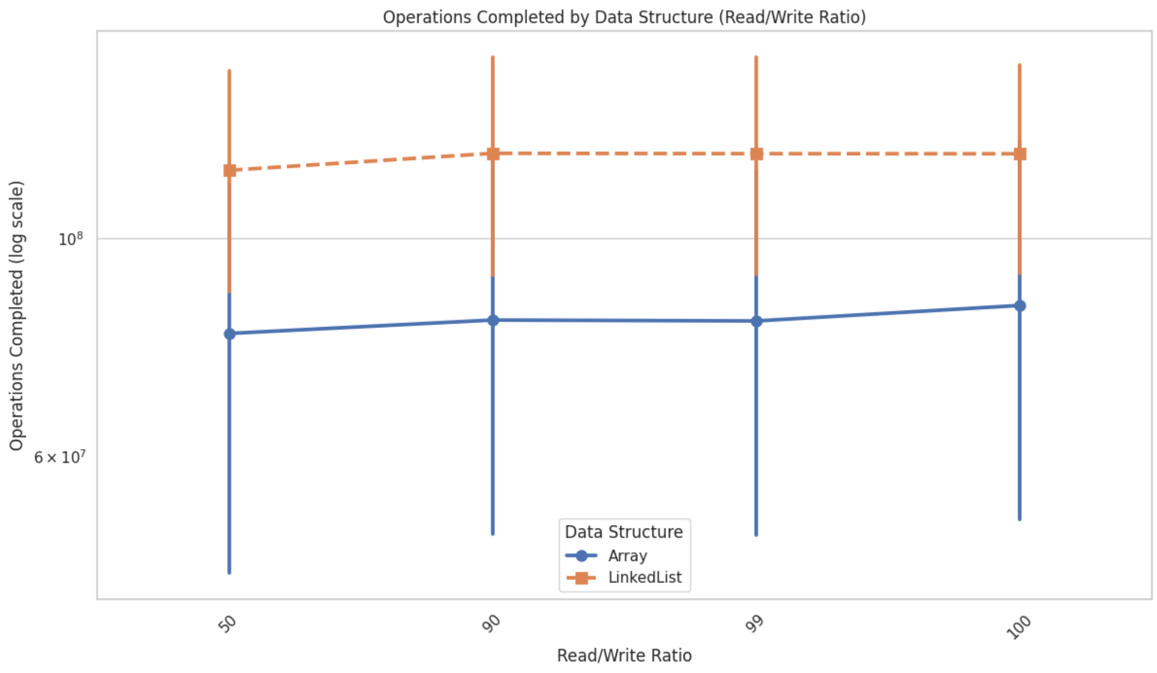
Read / Write Ratio & Operations Completed

Arrays significantly outperform linked lists in terms of read/write operations due to their O(1) time complexity for these operations. Linked lists, on the other hand, have O(n) time complexity for both read and write operations since they require traversing the list to access or modify elements.

Locally


Operations Completed by Data Structure (Read/Write Ratio)
Operations Completed (log scale)
6 × 10^8
4 × 10^8
3 × 10^8
Data Structure
Array
LinkedList
50
90
99
100
Read/Write Ratio

LCC3


Operations Completed by Data Structure (Read/Write Ratio)
Operations Completed (log scale)
10^8
6 × 10^7
Data Structure
Array
LinkedList
50
90
99
100
Read/Write Ratio