Instructions:

This workshop aims to analyze the best, average, and worst-case empirical time complexities of three sorting algorithms: Selection, Insertion, and Merge sort.

The theoretical time complexities are as follows:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Sorting Algorithm | Time Complexity | | | | Space Complexity |
| Best Case | Average Case | | Worst Case |
| Selection Sort |  |  |  | |  |
| Insertion Sort |  |  |  | |  |
| Merge Sort |  |  |  | |  |

1. Random input

Repeatedly generate random input instances of different sizes (i.e., small to medium to large); execute the three algorithms to sort the data. Record the running time of algorithms and plot them. Discuss the plots and whether the empirical results validate the theory (i.e., asymptotic notation).

1. Sorted input

Repeat the same process as in task 1 with an already sorted input. And analyze the results again. How are the results different when the input is already sorted?

1. Sorted input reversed

Repeat the same process as in task 1 with a reversed sorted input. And analyze the results again. How are the results different when the input is reversed sorted?

1. Analyze the three tasks previously and make a link with best, average, and worst case.