Summary

In this project, I implemented a hybrid sorting algorithm that combines the efficiency of Quick Sort with the effectiveness of Insertion Sort in handling smaller datasets. The goal was to leverage the strengths of both algorithms to optimize performance across various list sizes. By implementing a static threshold, the sorting strategy shifts between Quick Sort and Insertion Sort based on the list size, which was determined through trial and error.

Performance benchmarks across different list sizes reveal significant improvements:

- For smaller lists (up to 100 elements), all algorithms performed comparably, showing minimal execution time.
- In medium-sized lists (1,000 elements), the hybrid algorithm outperformed Insertion Sort and was nearly as fast as Quick Sort.
- With larger lists (10,000 to 100,000 elements), the hybrid approach generally showed superior performance to Insertion Sort and comparable or slightly slower results than Quick Sort, especially at the upper limit.

The following is data from the benchmarks of the different sorting algorithms. The benchmark is based on sorting a random list of x elements and this time is then measured and recorded.

Insertion Sort Time for 10 elements time taken(ms): 0

Quick Sort Time for 10 elements time taken(ms): 0

Hybrid Quick/Insertion Sort Time for 10 elements time taken(ms): 0

Insertion Sort Time for 100 elements time taken(ms): 0

Quick Sort Time for 100 elements time taken(ms): 0

Hybrid Quick/Insertion Sort Time for 100 elements time taken(ms): 0

Insertion Sort Time for 1000 elements time taken(ms): 19

Quick Sort Time for 1000 elements time taken(ms): 1

Hybrid Quick/Insertion Sort Time for 1000 elements time taken(ms): 2

Insertion Sort Time for 10000 elements time taken(ms): 136

Quick Sort Time for 10000 elements time taken(ms): 4

Hybrid Quick/Insertion Sort Time for 10000 elements time taken(ms): 5

Insertion Sort Time for 100000 elements time taken(ms): 13655

Quick Sort Time for 100000 elements time taken(ms): 46

Hybrid Quick/Insertion Sort Time for 100000 elements time taken(ms): 91