



Algorithms & Data Structures

Semester Project Report

Osmáiny Raimundo
LSTI | e20191506

Tiago Valente
LSTI | 20211650

Sara Lyra
LSTI | 20211565

Group 1

June 5, 2022

1 Contribution to the Project

- 1.Sorting Algorithms _____ Tiago Valente (100%)
- 2.Intervals _____ Sara Lyra (60%) & Tiago Valente (40%)
- 3.Sliding Tile Puzzle _____ Osmainy (100%)

2 Average Time Complexity

Sorting Algorithms

Algorithm	Average Time Complexity
Bubble Sort	$O(n^2)$
Counting Sort	$O(n+k)$
Heap Sort	$O(n \log(n))$
Insertion Sort	$O(n^2)$
Merge Sort	$O(n \log(n))$
Quick Sort	$O(n \log(n))$
Radix Sort	$O(n+k)$
Selection Sort	$O(n^2)$

Intervals

Function	Average Time Complexity
new_interval	$O(n + 2)$
is_pair	$O(1)$
shuffle_list	$O(n)$
counting_sort	$O(4n+1)$
sort_matrix	$O(n^2)$
get_extremes	$O(n \log_2 n)$
remove_common	$O(n \log n)$
matrix_inverse	$O(n \log n^2)$
final_list	$O(n^2)$
Total	$n^2 + 2n \log n^2 + n \log_2 n + n \log n + (4n+1) + (n + 2) + n + 1 = \mathbf{O(n^2)}$

5x5 Sliding tile Puzzle

Function	Average Time Complexity
main	$O(n^3)$
getNewBoard	$O(1)$
displayBoard	$O(1)$
findBlankSpace	$O(n^2)$
askForPlayerMove	$O(n)$
makeMove	$O(1)$
makeRandomMove	$O(1)$
makeNewPuzzle	$O(n)$
Total	$n^3 + n^3 + 2n + 4 = O(n^3)$