# Lab 9

## A study of sorting algorithms and their performance

Investigate the run-time and space complexities for the following sorting algorithms. When filling in the “Best Case,” “Average Case,” and “Worst Case,” do so by using Big-O notation, e.g., ***and*** by describing the type of data that leads to this case, e.g., “This occurs when the data is already sorted,” or “This occurs when the data is originally in reverse-sorted order.” The “Resource” column is for citing your resources, e.g., “Our textbook, page …” or <https://some.incredible.site.org>

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Run-time (Time) Complexity | | | | |
| Algorithm | Best Case | Average Case | Worst Case | Resource |
| Bubble Sort | O(n) | O(n^2) | O(n^2) | Textbook pg. 333 |
| Selection Sort | O(n^2) | O(n^2) | O(n^2) | https://big-o.io/algorithms/comparison/selection-sort/ |
| Insertion Sort | O(n) | O(n^2) | O(n^2) | Textbook pg. 339 |
| Merge Sort | O(n log(n)) | O(n log(n)) | O(n log(n)) | https://big-o.io/algorithms/comparison/merge-sort/ |
| Quick Sort | O(n log(n)) | O(n log(n)) | O(n^2) | https://big-o.io/algorithms/comparison/quicksort/ |
| Radix Sort | O(nk) | O(nk) | O(nk) | https://en.wikipedia.org/wiki/Radix\_sort |

With the space complexity table, just fill in your answers using Big-O notation.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Space Complexity | | | | |
| Algorithm | Best Case | Average Case | Worst Case | Resource |
| Bubble Sort | O(1) | O(1) | O(1) | https://www.studytonight.com/data-structures/bubble-sort |
| Selection Sort | O(1) | O(1) | O(1) | https://en.wikipedia.org/wiki/Selection\_sort |
| Insertion Sort | O(1) | O(1) | O(1) | https://en.wikipedia.org/wiki/Insertion\_sort |
| Merge Sort | O(n) | O(n) | O(n) | https://en.wikipedia.org/wiki/Merge\_sort |
| Quick Sort | O(n) | O(n) | O(n) | https://en.wikipedia.org/wiki/Quicksort |
| Radix Sort | O(n+k) | O(n+k) | O(n+k) | https://en.wikipedia.org/wiki/Radix\_sort |