

Design and Analysis of Algorithms

Quick Sort

Description

Quick sort is a divide and conquer algorithm. It works by selecting a 'pivot' element from the array and partitioning the other elements into two sub-arrays according to whether they are less than or greater than the pivot. The sub-arrays are then sorted recursively. This can be done in-place, requiring small additional amounts of memory to perform the sorting.

Complexity

- **Time complexity:** $O(n \log n)$ average, $O(n^2)$ worst case
- **Space complexity:** $O(\log n)$

References

- [Wikipedia](#)
- [GeeksforGeeks](#)

Merge Sort

Description

Merge sort is an efficient, stable, comparison-based, divide and conquer sorting algorithm. Most implementations produce a stable sort, meaning that the implementation preserves the input order of equal elements in the sorted output. Merge sort is a divide and conquer algorithm that was invented by John von Neumann in 1945.

Complexity

- **Time complexity:** $O(n \log n)$
- **Space complexity:** $O(n)$

References

- [Wikipedia](#)
- [GeeksforGeeks](#)

Convex Hull

Description

The convex hull of a set of points is the smallest convex polygon that contains all the points of the set. It is a fundamental problem in computational geometry.

Complexity

- **Time complexity:** $O(n \log n)$
- **Space complexity:** $O(n)$

References

- [Wikipedia](#)
- [GeeksforGeeks](#)