AI1103
Assignment 4

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Download Python code and Latex from below link :
https://github.com/KRISHNASAI1105/demo/tree/main/Assignment4

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An array of 25 distinct elements is to be sorted using quicksort. Assume that the pivot element is chosen uniformly at random. The probability that the pivot element gets placed in the worst possible location in the first round of partitioning (rounded off to 2 decimal places) is —-

Solution

Given an array of 25 distinct elements, and pivot element is chosen randomly. Quicksort puts the pivot in its correct place after 1st iteration. The worst place, the pivot element can be placed is at extreme left or extreme right. Because in that case the array is divided in the ratio 1:n-1. So, there are only 2 worst possible locations in the first round of partitioning that pivot element gets placed is either in the first or last position of array.

Quicksort works by comparing each element with the pivot, those larger than the pivot are placed on the right side of the pivot, and those smaller than the pivot are placed on the left side of the pivot (Also possible and same in reverse direction).

Consider the sequence of pivot elements as (x1,x2,.....,x25). So, picking up x1 in the first round from the whole array will cause comparison with x25 (and vice-versa) and the probability of worst possible location of pivot is $\frac{2}{n}$.

Total number of pivot elements = 25.
Number of worst possible location of pivot element gets placed after first round of partitioning = 2.

Probability of placing pivot element in worst possible locations = $\frac{2}{25}$ = 0.08.
Hence, The probability that the pivot element gets placed in the worst possible location in the first round is 0.08.