Today I learnt about stable and unstable sort.

Theese are the types of sort ~~which are done~~ not any algorithm as such,

(Merge Sort
Radix Sort) ⟹ Stable sort

(Quick Sort
Heap Sort) ⟶ Unstable Sort.

Now lets understand what does stable and unstable sort mean?

Stable sort means that relative ordering is always preserved in case of sorting.

For example

Consider → (4,'a'), (2,'b'), (4,'c'), (1,'d')

⇓ After stable sort

[(1,'d'), (2,'b'), (4,'a'), (4,'c')]

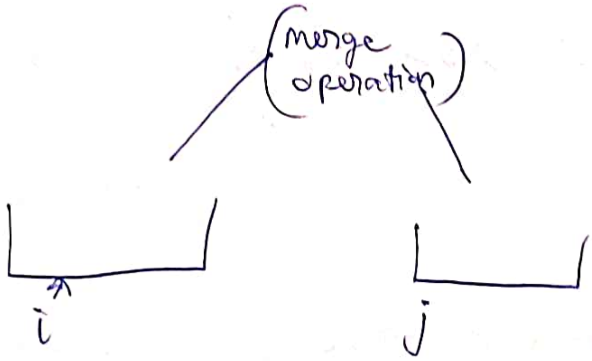
So the relative ordering b/w element is not changing.

(4, 'a'), (4, 'c')

remain as they were before only

merge sort is stable.

My mind immediately understood why merge sort is stable sort.



When this merge operation is happening, during that time

if (val[i] == val[j])

then we ~~merge~~ take

[left ~~after~~ then the right]

Hence ordering (is always preserved)

(Non-Stable Sort)

(4, 'a'), (2, 'b'), (4, 'c'), (1, 'd')

⇓ (Non-stable sort)

(1, 'd'), (2, 'b'), (4, 'c') (4, 'a')

⇓ relative ordering is not preserved.

Now, Quick Sort is unstable because of the nature of the algo.

[It picks any element as the pivot and then does swapping and brings element smaller than it to the left and element bigger than it to the right]

[So no gurantee of preserving order].

Then a question came to my mind,

why is the concept of stable sort and unstable sort introduced?

Like why does it matter?

So in UI like in Zomato, swiggy
or even in data bases.
we have the option of sorting by multiple columns.

lets say we sort by col1 first and then by col2,

" Dont confuse that we have a comparator on col1,
if col1 is same then
col2.
"

No, its just sort(col1), sort(col2).

Lets say you sorted by popularity first
Then you sorted by price → [Restaurants with the same prices will maintain their popularity order]

lets say, you sort by name first

{ ["Alice", 25]
["Charlie", 25] } ⇒ sorted by name,

then sort by age.

stable sort

["Alice", 25]
["Charlie", 25]

unstable sort

["Charlie", 25
"Alice", 25] relative order might get changed, Depending on how you have implemented quicksort.

(might happen.)

if you are swapping for pivot [≤, ≥] ⇒ (this = can cause issues.)