

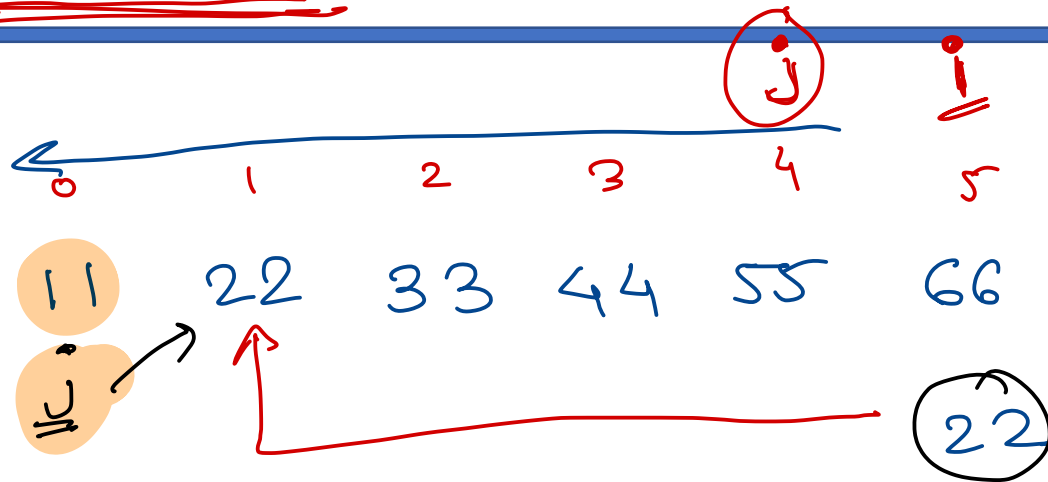


# Data Structure & Algorithms

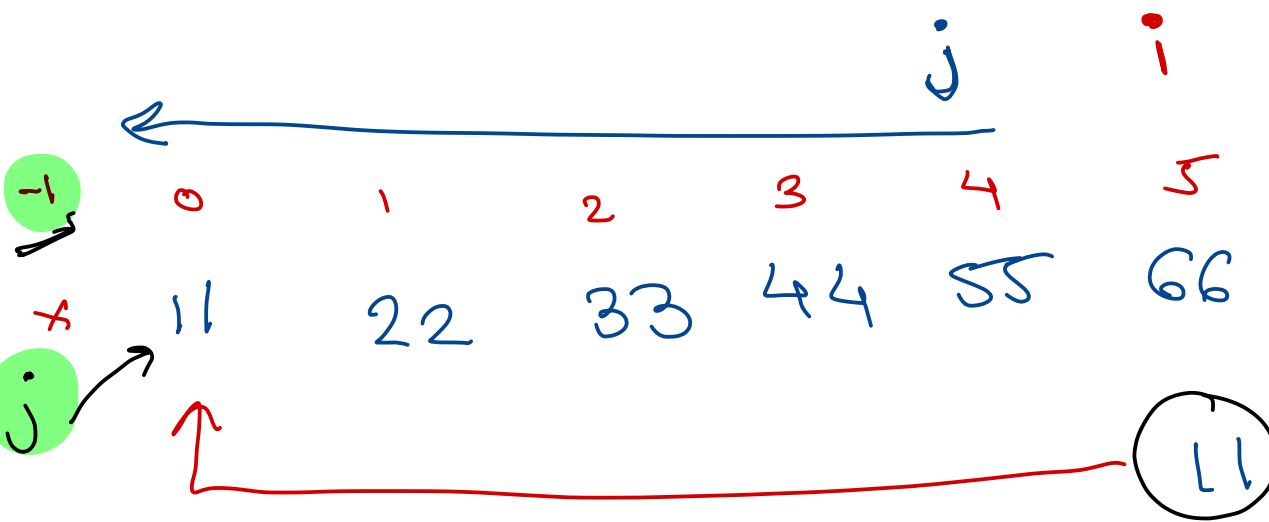
Sunbeam Infotech



# Insertion Sort



0	1	2	3	4	5
55	44	22	66	11	33



```

temp = a[i];
for (j = i - 1; j >= 0 && a[j] > temp; j--)
{
    a[j + 1] = a[j];
}
a[j + 1] = temp;
    
```



# Insertion Sort

theory or approximation  $\rightarrow$

$$\begin{matrix} n > > > 1 \\ n^2 > > > > n \end{matrix}$$

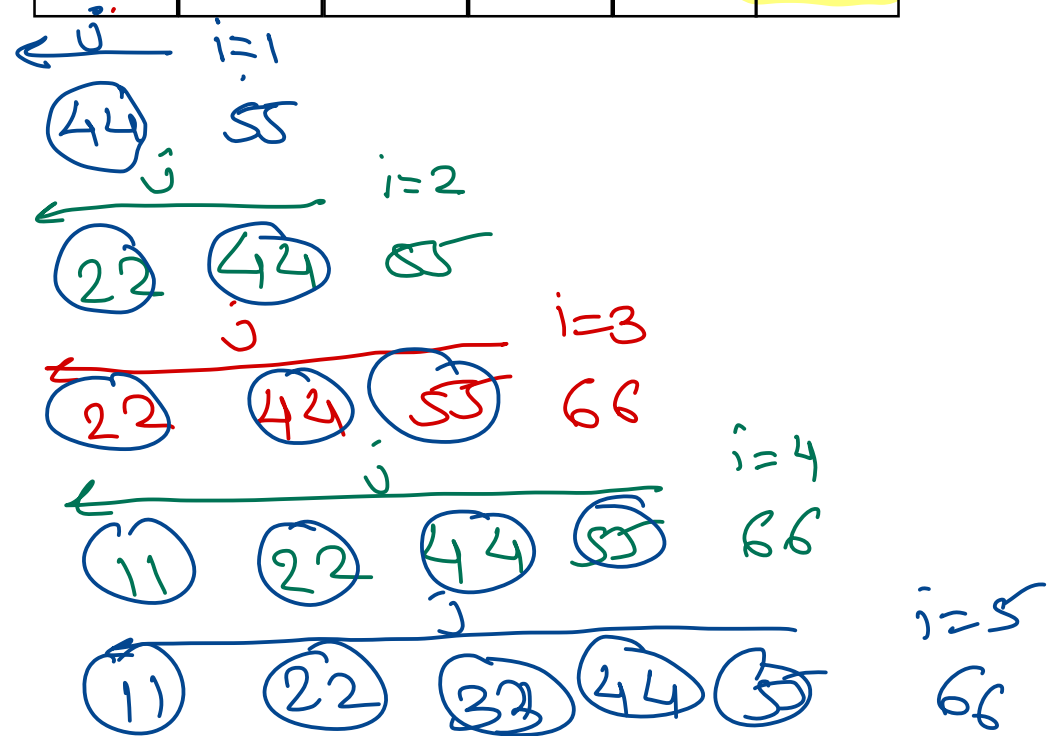
```
for (i=1; i<n; i++)
{
    temp = a[i];
    for (j=i-1; j>=0 && a[j]>temp; j--)
    {
        a[j+1] = a[j];
    }
    a[j+1] = temp;
}
```

pass 1  $\rightarrow$  1  
 pass 2  $\rightarrow$  2  
 pass 3  $\rightarrow$  3  
 pass 4  $\rightarrow$  4  
 pass 5  $\rightarrow$  5

15

iter =  $1+2+3+\dots+n-1$   
 iter =  $\frac{n(n-1)}{2}$   
 $T \propto \frac{n^2-n}{2}$   
 $T \propto n^2$   
 $O(n^2)$

0	1	2	3	4	5
55	44	22	66	11	33



- ① if input array is already sorted, what is the complexity of insertion sort?
- ② if input array is already sorted, what is the complexity of selection sort?
- ③ if input array is already sorted, what is the complexity of further improved bubble sort?
- ④ num of comparisons for each sorting algo.
- ⑤ change your sorting codes to return num of Swappings / shifting.
- ⑥ array of objects (Students) & sort Students by marks in desc. order.



Thank you!

Nilesh Ghule <nilesh@sunbeaminfo.com>

