Data Structures and Algorithms

Insertion Sort Algorithm

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Today's Plan

- Insertion sort algorithm

Insertion Sort

- ***Insertion sort*** orders a values by repetitively inserting a particular value into a sorted subset of the list
- More specifically:
  - consider the first item to be a sorted sublist of length 1
  - insert the second item into the sorted sublist, shifting the first item if needed
  - insert the third item into the sorted sublist, shifting the other items as needed
  - repeat until all values have been inserted into their proper positions

Insertion Sort

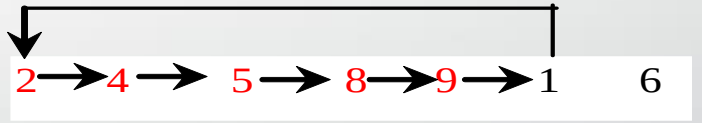
Step 1: Initially, the sorted sublist contains the first element in the list. Insert 9 into the sublist.

Step2: The sorted sublist is {2, 9}. Insert 5 into the sublist.

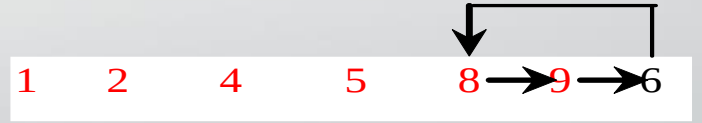
Step 3: The sorted sublist is {2, 5, 9}. Insert 4 into the sublist.

Step 4: The sorted sublist is {2, 4, 5, 9}. Insert 8 into the sublist.

Step 5: The sorted sublist is {2, 4, 5, 8, 9}. Insert 1 into the sublist.

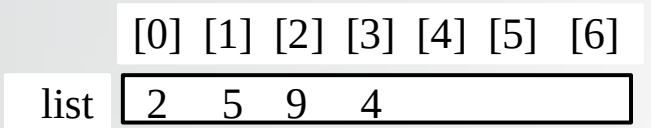


Step 6: The sorted sublist is {1, 2, 4, 5, 8, 9}. Insert 6 into the sublist.

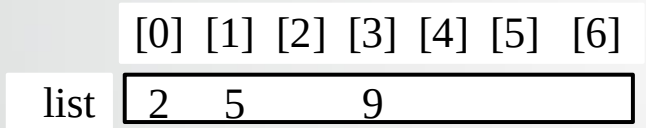


Step 7: The entire list is now sorted.

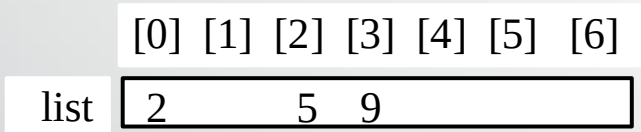
How to Insert?



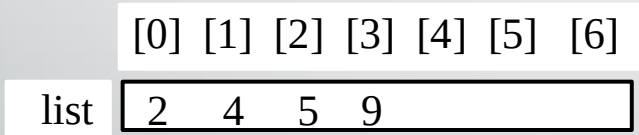
Step 1: Save 4 to a temporary variable currentElement



Step 2: Move list[2] to list[3]



Step 3: Move list[1] to list[2]



Step 4: Assign currentElement to list[1]

Insertion Sort Animation

- https://visualgo.net/bn/sorting

Pseudocode Insertion Sort Algorithm

```
for i = 1 up to i < numOfElements
   keyelement = elementAt(i);
   pos = i;

   while pos > 0 and elementAt(pos - 1) > keyelement
      elementAt(pos) = elementAt(pos – 1)
      pos = pos - 1;
   end while loop

   elementAt(pos) = keyelement;

end of for loop
```

Coding Time

- Go ahead and get coding this!

That’s all folks

- Any questions?