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## Reading: Create and Apply Algorithms

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Now we will learn how these algorithms are implemented in python.

### Types of Algorithms are:

1. Sorting Algorithms
2. Searching Algorithms
3. Geometric Algorithms
4. Graph Algorithms

**1. Sorting Algorithms:** A **Sorting Algorithm** is used to **rearrange** a given array or list elements according to a comparison operator on the elements.

**Example:** Here we will use bubble sort to sort an array or list.

```
def bubble_sort(array):  
  
    n = len(array)  
  
    for i in range(n):  
  
        # Create a flag that will allow the function to  
  
        # terminate early if there's nothing left to sort  
  
        already_sorted = True  
  
        # Start looking at each item of the list one by one,  
  
        # comparing it with its adjacent value. With each  
  
        # iteration, the portion of the array that you look at  
  
        # shrinks because the remaining items have already been  
  
        # sorted.  
  
        for j in range(n - i - 1):  
  
            if array[j] > array[j + 1]:  
  
                # If the item you're looking at is greater than its
```

```
# adjacent value, then swap them

array[j], array[j + 1] = array[j + 1], array[j]


# Since you had to swap two elements,

# set the already, or ted flag to False so the

# algorithm doesn't finish prematurely

already_sorted = False


# If there were no swaps during the last iteration,

# the array is already sorted, and you can terminate

if already_sorted:

    break


return array
```

**2. Searching Algorithms:** The **Searching algorithms** are used to **search** or find one or more than one element from a dataset.

**Linear search example:** a sequential search is made over all items one by one.

Find the number **13** in the given list.

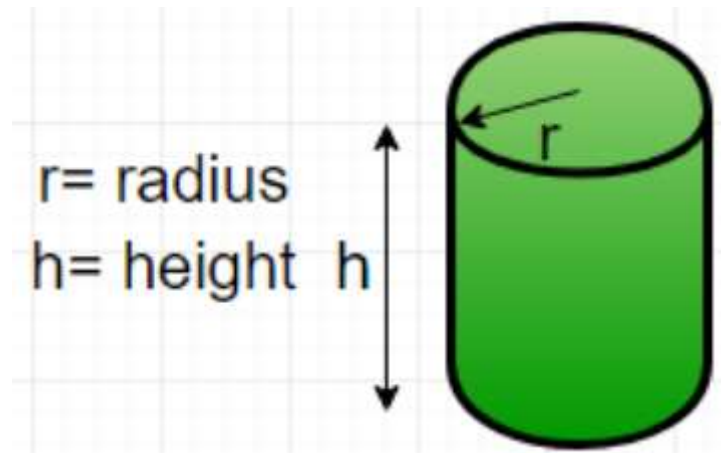
7	16	4	9	13	2	8
---	----	---	---	----	---	---

```
def linear_search(array, num):  
    for index, element in enumerate(array):  
        if element == num:  
            return index  
    return -1
```

**3. Geometric Algorithms:** These **algorithms** are designed to solve **Geometric** Problems and solve diverse problems in AI and Machine learning. Used in Deep learning and 2D data, also called as convolutional neural networks (**CNN**).

**Examples:** Given diameter and height, find the perimeter of a cylinder.

Diameter=5, height=10



```
# Function to calculate  
  
# the perimeter of a cylinder  
  
def perimeter( diameter, height ) :  
  
    return 2 * ( diameter + height )  
  
  
# Driver function  
  
diameter = 5 ;  
  
height = 10 ;
```

```
print ("Perimeter = ",  
      perimeter(diameter, height))
```

- 4. Graph Algorithms:** These **algorithms** are designed to describe more complex data and **relationship** between them. Used in 3D objects and graph, also called as Graph convolutional networks (**GCN**).

**Examples:** Function to generate the list of all edges:

```
def generate_edges(graph):  
  
    edges = []  
  
    for node in graph:  
  
        for neighbour in graph[node]:  
  
            edges.append((node, neighbour))  
  
    return edges  
  
print(generate_edges(graph))
```

You've now completed the materials for Module 3. Move on to the next topic to take the module exam.

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