



Experiment No. - 7

Title - write a program to create access, modify and start multidimensional Numpy arrays

Objective - To understand various numerical operation using numpy.

Theory -

Information of Numpy

1) create array -

Numpy is used to work with arrays. The array object in Numpy is called ndarray.

We can create a Numpy ndarray object by using the array() function.

Example -

```
import numpy as np
arr = np.array([1, 2, 3, 4, 5])
print(arr)
print(type(arr))
```

~~Dimensions in Arrays -~~

A dimension in array is one level of array depth (nested arrays)

0D arrays - 0D arrays (zero Dimension) arrays or scalars, are the elements in an array. Each



value in an array is a-D array.

Example - import numpy as np
arr = np.array(42)
print(arr)

* 1D array - An array that has 0-D arrays as its elements is called unidimensional or 1-D array.

Example -

```
import numpy as np  
arr = np.array([1, 2, 3, 4])  
print(arr)
```

* 2D array - An array has 1D arrays as its element is called a 2D array.

Example -

```
import numpy as np  
arr = np.array([[1, 2, 3], [4, 5, 6]])  
print(arr)
```

Sorting Arrays -

Sorting means putting elements in ordered sequence. ordered sequence in any sequence that has an order corresponding to elements, like numeric or alphabetical, ascending or descending. The Numpy ndarray object has a function called sort().



Example -

```
import numpy as np  
arr = np.array([3, 2, 0, 1])  
print(arr) print(np.sort(arr))  
O/P → [0, 1, 2, 3]
```

you can sort the string.

```
import numpy as np  
arr = np.array(['banana', 'cherry',  
               'apple'])  
print(np.sort(arr))  
O/P → ['apple', 'banana', 'cherry']
```

What is NumPy ?

NumPy is python library used for working with array .

it also has functions for working in domain of linear algebra , fourier transform , and matrices .

NumPy was created 2005 by Travis oliphant it is an open source project and you can use it freely .

NumPy Stands for numerical python .

why is use NumPy ?

In python we have list that serve the purpose of arrays , but they are slow to process .

NumPy aim to provide an array object that is up to 50 x faster traditional python list .



The array object is Numpy called ndarray, it provides a lot of supporting functions that make working with ndarray very easy.

Conclusion - students are know about the what is Numpy why they use in python, How to create array using numpy and there some operation. Now students are able to perform the operation with / program with numpy.



Experiment No - 9

Title - Write a program to implement various sorting operations.

Objective - To implement selection sort example -

Theory -

Sorting - Sorting refers to arrange the data in a particular format

- Sorting algorithm specifies the way to arrange data in particular order
- Example, of sorting in real time
 - 1) telephone dict directory
 - 2) Dictionary
- A Increasing order - the successive element is greater than the previous one
- Decreasing order - the successive element is less than previous one.

Types of sorting 1 -

- Selection sort
- Insertion sort
- Merge sort
- Radix sort

Selection sort - Selection Sort is a simple sorting algorithm.

this sorting algorithm is an in place comparison-based algorithm.



In this algorithm, the array is divided into two part 1) sorted part 2) unsorted part at the sorted part at left and unsorted part at the right end.

- initially, the sorted part is empty
- unsorted part given entire array
- The smallest element is repeatedly selected from the unsorted array and swapped with the leftmost element.

Working - select the first smallest element from the unsorted array

- place the smallest element at the first position by swapping the smallest element with the first element.
- traverse the unsorted array and select the second smallest element.
- place it in the second position by swapping it with second element.
- The process continues until the array is entirely sorted in a ascending order.

algorithm -

- 1) step 1 - set the min to location 0
- 2) step 2 - search the minimum element in the array
- 3) step 3 - swap with value at location min
- 4) step 4 - increment min to point to next element
- 5) step 5 - Repeat until array is sorted.



Example

14 33 27 10 35 19 42 44

14 33 27 10 35 19 42 44

Find smallest element and re swap it by index 0

10 33 24 14 35 19 42 44

repeat increment the min index by one
and these step repeat again and again until the
all array is sorted.

10 14 33 27 10 35 19 42 44

10 33 27 14 35 19 42 44

10 14 27 33 35 19 42 44

10 14 19 33 35 27 42 44

10 14 19 27 35 33 42 44

10 14 19 27 33 35 42 44

Sorted array - 10 14 19 27 33 35 42 44

Conclusion - stu

students are understand about the

what is sorting , types of sorting , the basic

~~Idea~~ , algorithm and example of Selection

sort, now students are able to understand

perform sorting practically.

Ch 6



Radix Sort

123 199 147 101 119 ← given array

first find max number
in array

max = 199.
there are 3 passes pass

123 199 147 101 119

Pass 1

0th digit → 101 123 147 199 119

(1)

Pass 2

10th digit → 101 119 123 147 199

(2)

Pass 3

100th digit → | 101 | 119 | 123 | 147 | 199 |

Sorted array.



Experiment No - 10

Title - write a program to implement various stack operation

Objectives - to implement push & pop & display operation.

Theory -

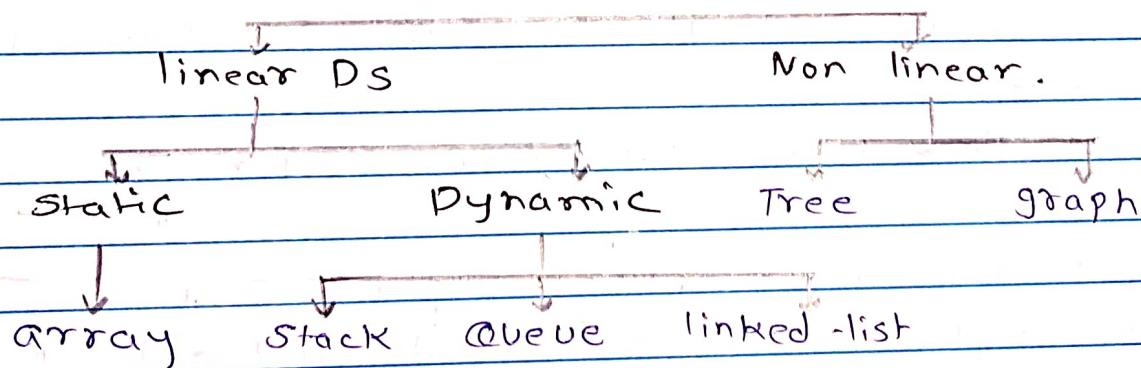
What is Data structure - A data structure is a technique of organizing the data so that data can be utilized efficiently.

Type of Data structure - There are various type we can arrange the data.

example , array , linked list , stack , graph , tree .

That type is used to store data in memory one by one sequentially or may be in the Hierarchical way .

Data structure





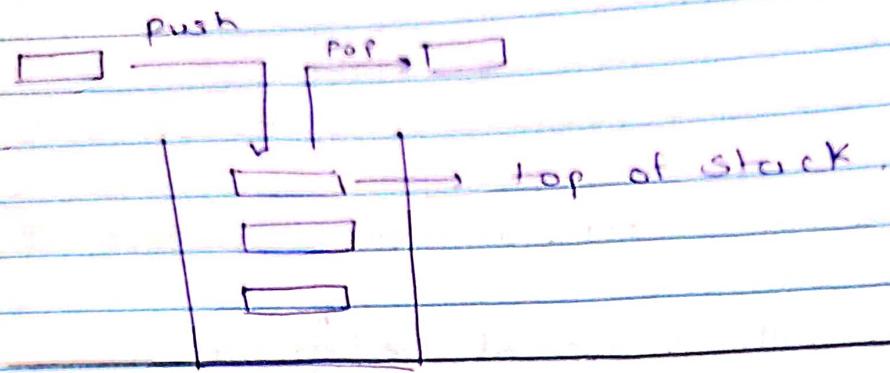
- array - it is used to store data in one by one using index. index start with 0 and end with $n-1$.
- Stack - it is used to store data sequentially. stack has only one end we can perform push or pop operation.
- Queue - it is a one kind of data structure used to store data sequentially. it has two end. front end to remove, rear end to insert.
- Linked list - is used to store data in memory using addresses \Rightarrow there are elements one element linked with node.
- Graph - it is a data structure. we store data in random fashion one element connected with multiple elements.
- tree - it is used to store data in hierarchical way. we store data in parent node or child relation.

Stack - A stack is a linear data structure.

• it is used to store the collection of elements.

• Stack follows LIFO (last in first out) principle.

• element is added top most of the stack, and element can be deleted only from the top of the stack.



algorithm - (Push operation)

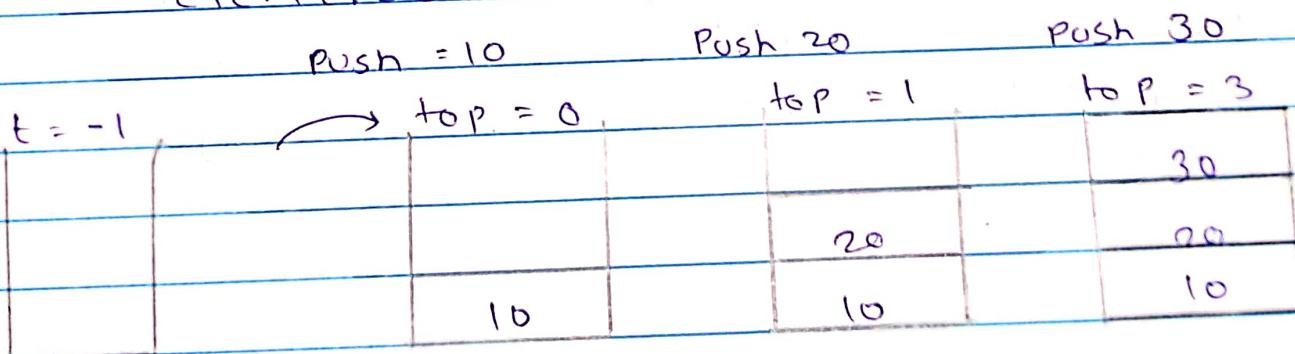
- 1) check if the stack is full.
- 2) if stack is full, produces an error and exit.
- 3) if stack is not full, increments top / sp to point next empty space.
 - 4) Adds element to the stack location where top / sp is pointing
 - 5) Returns SUCCESS.

push operation - (Example)

Stack size = 3

insert

elements = 10, 20, 30, 40



$\text{top} = 3 \leftarrow \text{Push } 40$

40

30

20

10

Stack is full



algorithm (POP operation)

- 1) checks if the stack is empty
- 2) if stack is empty, produces an error and exit.
- 3) if stack is not empty, accesses element at which top / sp is pointing.
 - a) Decreases the value of top / sp by 1
- 4) Return RV: success

example - Remove 18, 45

18	top of stack				
45		45	top of stack		
10	<u>POP 18</u>	10	<u>POP 45</u>	10	
20		20		20	

POP operation.

Conclusion - Students are understood about the Data structure, why they use, their types and small explanation about all the types also closely know the Stack, what is Stack their operations push & pop with algorithm and example. Students are able to implement the stack pr in program.

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