DHANALAKSHMI SRINIVASAN ENGINEERING COLLEGE
(AUTONOMOUS)
(Approved by AICTE, New Delhi and Affiliated to Anna University, Chennai)
Re-Accredited with 'A' Grade By NAAC, Accredited by TCS.
Accredited by NBA (AERO, CSE, IT & MECH)
Re-Accredited by NBA (BME, ECE, EEE)
PERAMBALUR - 621212.

LAB RECORD

BIG DATA ANALYTICS LABORATORY

B.E/B.Tech., Degree Practical Examination

Name …….

Branch …….

Semester …….

Reg. No. …….

Academic Year …….

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Sem. /Branch …….

Subject Code / Name …….

Certified that this is the Bonafide record of the Practical done for the above subject in the Laboratory during the period

……

Staff in Charge **Head of the Department**

Submitted for the University Practical Examination held at DHANALAKSHMI SRINIVASAN ENGINEERING COLLEGE (Autonomous), PERAMBALUR on ……

INTERNAL EXAMINER **EXTERNAL EXAMINER**

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EXP. NO.	DATE	NAME OF THE EXPERIMENT	PAGE NO.	STAFF SIGN

AIM:

To Installing and Running Applications On python, numpy and pandas.

ALGORITHM:

1. Download and install **Python** from the official website and enable the **Add Python to PATH** installation.
2. Open **Command Prompt** and verify the installation by typing `python --version`.
3. Install the required libraries by running `pip install numpy` and `pip install pandas`.
4. Open Python or Jupyter Notebook to start working with Python programs.
5. Import the libraries using `import numpy` and `import pandas`.
6. Run a simple program to verify that **NumPy and Pandas** are installed and working correctly.

PROGRAM:

How to Install Anaconda on Windows?

Anaconda is an open-source software that contains Jupyter, spyder, etc that are used for large data processing, data analytics, heavy scientific computing. Anaconda works for R and python programming language. Spyder(sub-application of Anaconda) is used for python. Opencv for python will work in spyder. Package versions are managed by the package management system called conda.

To begin working with Anaconda, one must get it installed first. Follow the below instructions to Download and install Anaconda on your system:

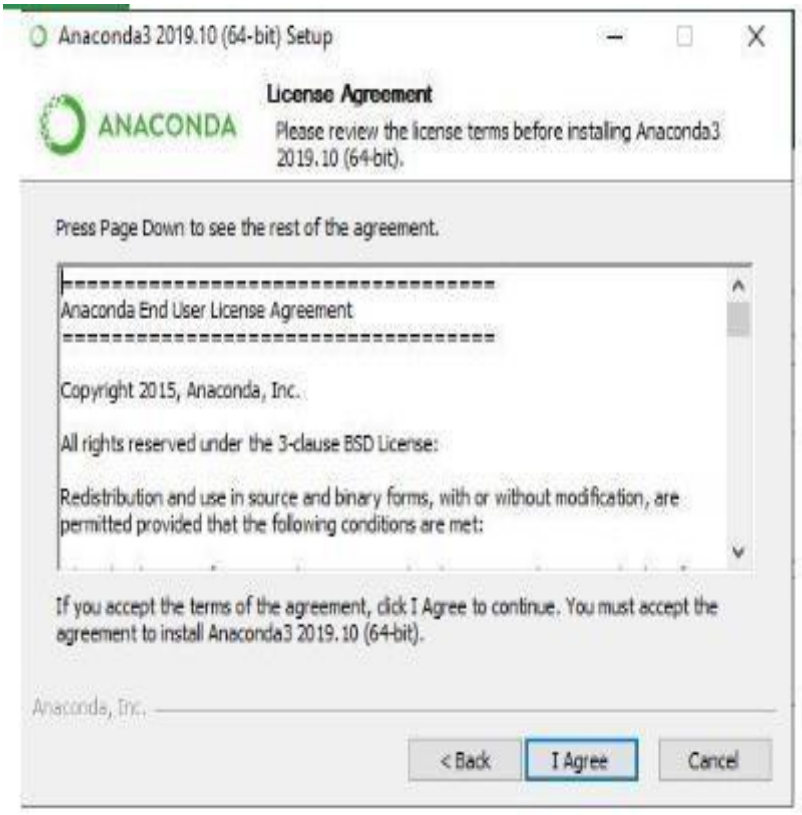
Download and install Anaconda:
Head over to anaconda.com and install the latest version of Anaconda. Make sure to download the

―Python 3.7 Version‖ for the appropriate architecture.

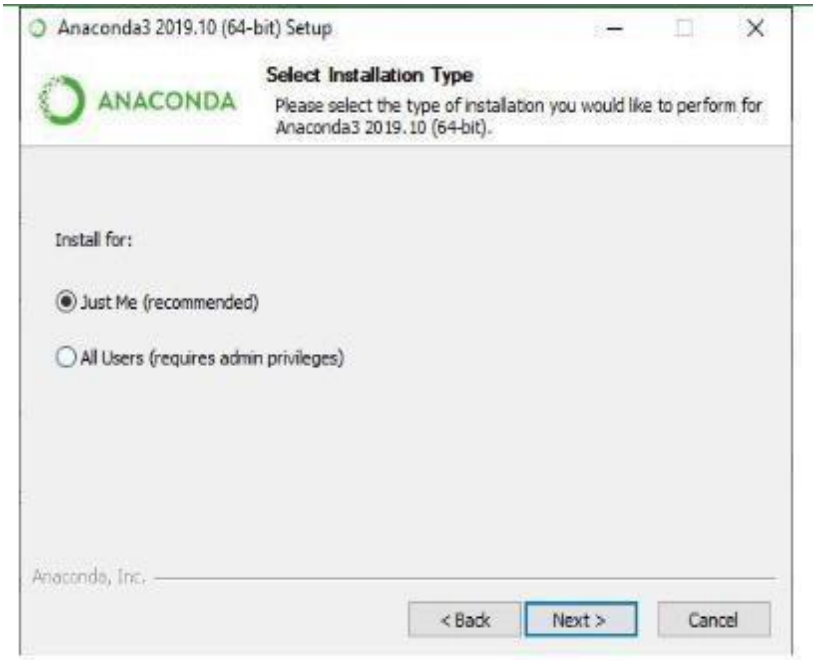
Begin with the installation process:

- **Getting Started**

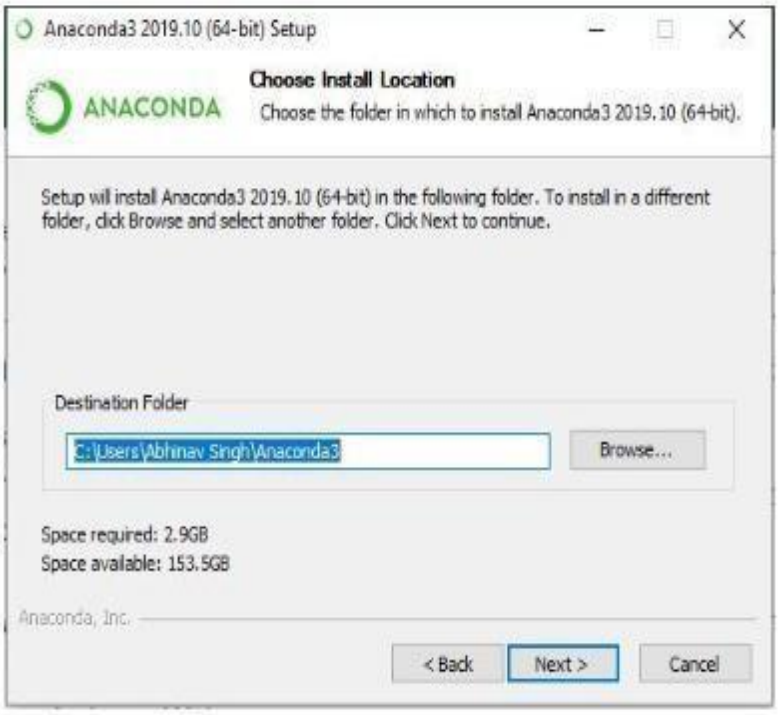
Getting through the License Agreement:



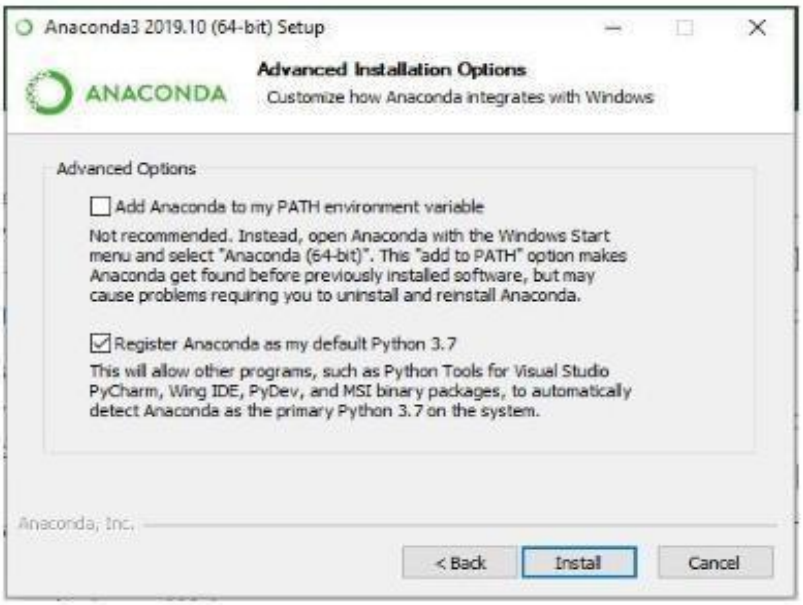
Select Installation Type: Select **Just Me** if you want the software to be used by a single User



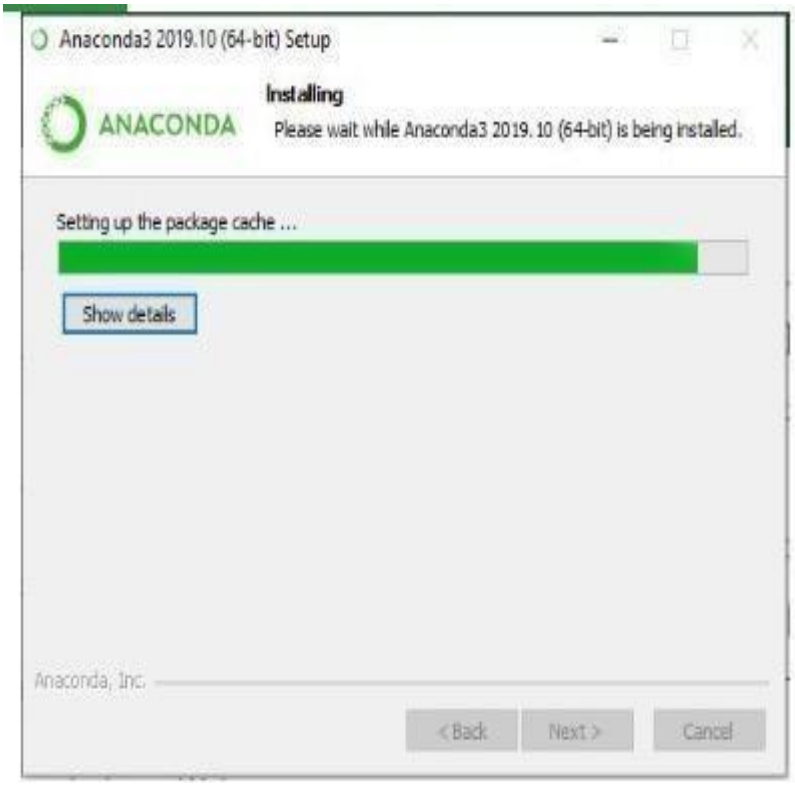
Choose Installation Location:



Advanced Installation Option:



Getting through the Installation Process:

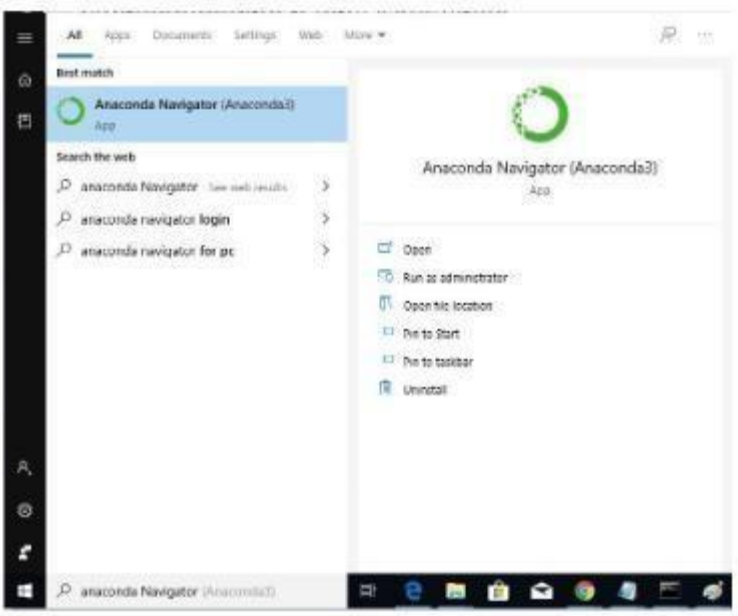


Recommendation to Install Pycharm:

Finishing up the Installation:

Working with Anaconda:

Once the installation process is done, Anaconda can be used to perform multiple operations. To be Using Anaconda search for navigator from the start menu in windows



Program:

```
#import pandas in jupyter notebook
import pandas

#loading the dataset which is excel file
dataset = pandas.read_csv("crime.csv")

#displaying the data
dataset
```

	Year	Population	Murder	Rape	Robbery	Assault	Burglary	CarTheft
0	1965	18073000	836	2320	28182	27464	183443	58452
1	1966	18258000	882	2439	30098	29142	196127	64368
2	1967	18336000	996	2665	40202	31261	219157	83775
3	1968	18113000	1185	2527	59857	34946	250918	104877
4	1969	18321000	1324	2902	64754	36890	248477	115400
5	1970	18190740	1444	2875	81149	39145	267474	125674
6	1971	18391000	1823	3225	97682	42318	273704	127658
7	1972	18366000	2026	4199	86391	45926	239886	105081
8	1973	18265000	2040	4852	80795	47781	246246	112328
9	1974	18111000	1919	5240	86814	51454	271824	104095
10	1975	18120000	1996	5099	93499	54593	301996	116274
11	1976	18084000	1969	4663	95718	54638	318919	133504
12	1977	17924000	1919	5272	84703	57193	309735	133669
13	1978	17748000	1820	5168	83785	58484	292956	119264
14	1979	17649000	2092	5394	93471	60949	308302	124343
15	1980	17506690	2228	5405	112273	60329	360925	133041
16	1981	17594000	2166	5479	120344	60189	350422	136849
17	1982	17659000	2013	5159	107843	59818	295245	137880
18	1983	17667000	1958	5296	94783	59452	249115	127861
19	1984	17735000	1786	5599	89900	64872	222956	115392
20	1985	17783000	1683	5706	89706	68270	219633	106537
21	1986	17772000	1907	5415	91360	76528	217010	113247
22	1987	17825000	2016	5537	89721	82417	216826	125329
23	1988	17898000	2244	5479	97434	91239	218060	153898
24	1989	17950000	2246	5242	103983	91571	211130	171007
25	1990	17990455	2605	5368	112380	92105	208813	187591
26	1991	18058000	2571	5085	112342	90186	204499	181287
27	1992	18119000	2397	5152	108154	87608	193548	168922
28	1993	18197000	2420	5008	102122	85802	181709	151949
29	1994	18169000	2016	4700	86617	82100	164650	128873
30	1995	18136000	1550	4290	72492	74351	146562	102596
31	1996	18185000	1353	4174	61822	64857	129828	89900

```
import pandas as pd
dataset1 = pd.read_csv("crime.csv")
dataset1
```

	Year	Population	Murder	Rape	Robbery	Assault	Burglary	CarTheft
0	1965	18073000	836	2320	28182	27464	183443	58452
1	1966	18258000	882	2439	30098	29142	196127	64368
2	1967	18336000	996	2665	40202	31261	219157	83775
3	1968	18113000	1185	2527	59857	34946	250918	104877
4	1969	18321000	1324	2902	64754	36890	248477	115400
5	1970	18190740	1444	2875	81149	39145	267474	125674
6	1971	18391000	1823	3225	97682	42318	273704	127658
7	1972	18366000	2026	4199	86391	45926	239886	105081
8	1973	18265000	2040	4852	80795	47781	246246	112328
9	1974	18111000	1919	5240	86814	51454	271824	104095
10	1975	18120000	1996	5099	93499	54593	301996	116274
11	1976	18084000	1969	4663	95718	54638	318919	133504
12	1977	17924000	1919	5272	84703	57193	309735	133669
13	1978	17748000	1820	5168	83785	58484	292956	119264
14	1979	17649000	2092	5394	93471	60949	308302	124343
15	1980	17506690	2228	5405	112273	60329	360925	133041
16	1981	17594000	2166	5479	120344	60189	350422	136849
17	1982	17659000	2013	5159	107843	59818	295245	137880
18	1983	17667000	1958	5296	94783	59452	249115	127861
19	1984	17735000	1786	5599	89900	64872	222956	115392
20	1985	17783000	1683	5706	89706	68270	219633	106537
21	1986	17772000	1907	5415	91360	76528	217010	113247
22	1987	17825000	2016	5537	89721	82417	216826	125329
23	1988	17898000	2244	5479	97434	91239	218060	153898
24	1989	17950000	2246	5242	103983	91571	211130	171007
25	1990	17990455	2605	5368	112380	92105	208813	187591
26	1991	18058000	2571	5085	112342	90186	204499	181287
27	1992	18119000	2397	5152	108154	87608	193548	168922
28	1993	18197000	2420	5008	102122	85802	181709	151949
29	1994	18169000	2016	4700	86617	82100	164650	128873
30	1995	18136000	1550	4290	72492	74351	146562	102596
31	1996	18185000	1353	4174	61822	64857	129828	89900

dataset1.head()
dataset1.tail()

	Year	Population	Murder	Rape	Robbery	Assault	Burglary	CarTheft
42	2007	19297729	801	2926	31094	45094	64857	28030
43	2008	19467789	836	2799	31789	42122	65537	25096
44	2009	19541453	781	2582	28141	43606	62769	21871
45	2010	19395206	868	2797	28630	44197	65839	20639
46	2011	19465197	774	2752	28396	45568	65397	19311

dataset1.head(10)

	Year	Population	Murder	Rape	Robbery	Assault	Burglary	CarTheft
0	1965	18073000	836	2320	28182	27464	183443	58452
1	1966	18258000	882	2439	30098	29142	196127	64368
2	1967	18336000	996	2665	40202	31261	219157	83775
3	1968	18113000	1185	2527	59857	34946	250918	104877
4	1969	18321000	1324	2902	64754	36890	248477	115400
5	1970	18190740	1444	2875	81149	39145	267474	125674
6	1971	18391000	1823	3225	97682	42318	273704	127658
7	1972	18366000	2026	4199	86391	45926	239886	105081
8	1973	18265000	2040	4852	80795	47781	246246	112328
9	1974	18111000	1919	5240	86814	51454	271824	104095

dataset1.tail(10)

	Year	Population	Murder	Rape	Robbery	Assault	Burglary	CarTheft
37	2002	19134293	909	3885	36653	53583	76700	47366
38	2003	19212425	934	3775	35790	48987	75453	45204
39	2004	19280727	889	3608	33506	46911	70696	41002
40	2005	19315721	874	3636	35179	46150	68034	35736
41	2006	19306183	921	3169	34489	45387	68565	32134
42	2007	19297729	801	2926	31094	45094	64857	28030
43	2008	19467789	836	2799	31789	42122	65537	25096
44	2009	19541453	781	2582	28141	43606	62769	21871
45	2010	19395206	868	2797	28630	44197	65839	20639
46	2011	19465197	774	2752	28396	45568	65397	19311

type(dataset1)
pandas.core.frame.DataFrame

```
pandas.core.frame.DataFrame
```

#to find any null values in the last 5 rows
dataset1.isnull().tail()

	Year	Population	Murder	Rape	Robbery	Assault	Burglary	CarTheft
42	False	False	False	False	False	False	False	False
43	False	False	False	False	False	False	False	False
44	False	False	False	False	False	False	False	False
45	False	False	False	False	False	False	False	False
46	False	False	False	False	False	False	False	False

#to makesure that no null values exists
dataset1.notnull().tail()

	Year	Population	Murder	Rape	Robbery	Assault	Burglary	CarTheft
42	True	True	True	True	True	True	True	True
43	True	True	True	True	True	True	True	True
44	True	True	True	True	True	True	True	True
45	True	True	True	True	True	True	True	True
46	True	True	True	True	True	True	True	True

#displays the number of null values in each column
dataset1.isnull().sum()

```
Year          0
Population    0
Murder        0
Rape          0
Robbery       0
Assault       0
Burglary      0
CarTheft      0
dtype: int64
```

#helps to find null values with respect to ROBBERY column
dataset1[dataset1.Robbery.isnull()]

	Year	Population	Murder	Rape	Robbery	Assault	Burglary	CarTheft

dataset1.shape

#helps to find how many times values in a particular column has repeated
dataset1['Robbery'].value_counts()

```
94783     1
34489     1
86814     1
86617     1
80795     1
97434     1
108154    1
120344    1
56094     1
28182     1
31094     1
30098     1
91360     1
59857     1
35790     1
36555     1
40202     1
83785     1
```

#consolidated value counts for all the columns in the dataset
for col in dataset1.columns:
display(dataset1[col].value_counts())

```
1983    1
1995    1
2004    1
2003    1
2002    1
2001    1
2000    1
1999    1
1998    1
1997    1
1996    1
1994    1
2006    1
1993    1
1992    1
1991    1
1990    1
1989    1
1988    1
```

#helps to find number of rows in the dataset
dataset_length=len(dataset1)
dataset_length

47

#helps to find number of columns in the dataset
dataset_col=len(dataset1.columns)
dataset_col

8

#helps to find the summary of numerical columns
dataset1.describe()

	Year	Population	Murder	Rape	Robbery	Assault	Burglary	CarTheft
count	47.000000	4.700000e+01	47.000000	47.000000	47.000000	47.000000	47.000000	47.000000
mean	1988.000000	1.834426e+07	1549.978723	4200.425532	70429.297872	58022.234043	189119.829787	97573.553191
std	13.711309	6.024504e+05	590.454265	1096.569507	30204.823764	17455.534367	90256.257143	46707.064488
min	1965.000000	1.750669e+07	774.000000	2320.000000	28141.000000	27464.000000	62769.000000	19311.000000
25%	1976.500000	1.793700e+07	922.500000	3197.000000	36604.000000	45477.500000	90581.500000	56246.000000
50%	1988.000000	1.816900e+07	1683.000000	4199.000000	81149.000000	57193.000000	208813.000000	106537.000000
75%	1999.500000	1.868373e+07	2016.000000	5241.000000	94141.000000	64864.500000	250016.500000	128367.000000
max	2011.000000	1.954145e+07	2605.000000	5706.000000	120344.000000	92105.000000	360925.000000	187591.000000

#helps to describe individual column
dataset1.Murder.describe()

```
count      47.000000
mean     1549.978723
std       590.454265
min       774.000000
25%       922.500000
50%      1683.000000
75%      2016.000000
max      2605.000000
Name: Murder, dtype: float64
```

dataset1.skew()

```
Year          0.000000
Population    0.795669
Murder        0.059733
Rape         -0.237130
Robbery      -0.134085
Assault       0.464637
Burglary     -0.020278
CarTheft     -0.129653
dtype: float64
```

dataset1.var()

```
Year          1.880000e+02
Population    3.629465e+11
Murder        3.486362e+05
Rape          1.202465e+06
Robbery       9.123314e+08
Assault       3.046957e+08
Burglary      8.146192e+09
CarTheft      2.181550e+09
dtype: float64
```

dataset1.kurtosis()

```
Year         -1.200000
Population   -0.692220
Murder       -1.513564
Rape         -1.471445
Robbery      -1.527674
Assault      -0.482013
Burglary     -1.186281
CarTheft     -0.951036
dtype: float64
```

print(dataset1.dtypes)

```
Year          int64
Population    int64
Murder        int64
Rape          int64
Robbery       int64
Assault       int64
Burglary      int64
CarTheft      int64
dtype: object
```

NUMPY

Numpy is the core library for scientific and numerical computing in Python. It provides high performance multi dimensional array object and tools for working with arrays.
Numpy main object is the multidimensional array, it is a table of elements (usually numbers) all of the same type indexed by a positive integers.

In Numpy dimensions are called as axes.
Numpy is fast, convenient and occupies less memory when compared to python list.

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

NumPy is usually imported under the np alias.

```
import numpy as np
```

Now the NumPy package can be referred to as np instead of numpy.

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

Checking NumPy Version
The version string is stored under __version___attribute.

```
import numpy as np
print(np._version_)
```
```
1.18.1
```

Create a NumPy ndarray Object
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.

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

type(): This built-in Python function tells us the type of the object passed to it. Like in above code it shows that arr is numpy.ndarray type.
To create an ndarray, we can pass a list, tuple or any array-like object into the array() method, and it will be converted into an ndarray:

Use a tuple to create a NumPy array:

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

```
[1 2 3 4 5]
```

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

nested array: are arrays that have arrays as their elements.

0-D Arrays
0-D arrays, or Scalars, are the elements in an array. Each value in an array is a 0-D array.

```
#Create a 0-D array with value 42
import numpy as np
arr = np.array(42)
print(arr)
```

```
42
```

1-D Arrays
These are the most common and basic arrays.

```
#Create a 1-D array containing the values 1,2,3,4,5:
import numpy as np
arr = np.array([1, 2, 3, 4, 5])
print(arr)
```

```
[1 2 3 4 5]
```

2-D Arrays
An array that has 1-D arrays as its elements is called a 2-D array.
These are often used to represent matrix or 2nd order tensors.

```
#Create a 2-D array containing two arrays with the values 1,2,3 and 4,5,6:
import numpy as np
arr = np.array([[1, 2, 3], [4, 5, 6]])
print(arr)
```

```
[[1 2 3]
 [4 5 6]]
```

3-D arrays
An array that has 2-D arrays (matrices) as its elements is called 3-D array.
These are often used to represent a 3rd order tensor.

```
#Create a 3-D array with two 2-D arrays, both containing two arrays with the values 1,2,3 and 4,5,6:
import numpy as np
```

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

```
[[[1 2 3]
  [4 5 6]]

 [[1 2 3]
  [4 5 6]]]
```

Check Number of Dimensions?

NumPy Arrays provides the ndim attribute that returns an integer that tells us how many dimensions the array have.

```
#Check how many dimensions the arrays have:
import numpy as np
a = np.array(42)
b = np.array([1, 2, 3, 4, 5])
c = np.array([[1, 2, 3], [4, 5, 6]])
d = np.array([[[1, 2, 3], [4, 5, 6]], [[1, 2, 3], [4, 5, 6]]])
print(a.ndim)
print(b.ndim)
print(c.ndim)
print(d.ndim)
```

```
0
1
2
3
```

```
#Create an array with 5 dimensions and verify that it has 5 dimensions:
import numpy as np
arr = np.array([1, 2, 3, 4], ndmin=5)
print(arr)
print('number of dimensions :', arr.ndim)
```

```
[[[[[1 2 3 4]]]]]
number of dimensions : 5
```

NumPy Array Indexing

Access Array Elements

Array indexing is the same as accessing an array element.

You can access an array element by referring to its index number.

The indexes in NumPy arrays start with 0, meaning that the first element has index 0, and the second has index 1 etc.

```
#Get the first element from the following array:
import numpy as np
arr = np.array([1, 2, 3, 4])
print(arr[0])
```

```
#Get the second element from the following array.
import numpy as np
arr = np.array([1, 2, 3, 4])
```

```
print(arr[1])
```

#Get third and fourth elements from the following array and add them.

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

```
1
2
7
```

Access 2-D Arrays

To access elements from 2-D arrays we can use comma separated integers representing the dimension and the index of the element.
Think of 2-D arrays like a table with rows and columns, where the dimension represents the row and the index represents the column.

#Access the element on the first row, second column:

```
import numpy as np
arr = np.array([[1,2,3,4,5], [6,7,8,9,10]])
print('2nd element on 1st row: ', arr[0, 1])
```

```
2nd element on 1st row:  2
```

#Access the element on the 2nd row, 5th column:

```
import numpy as np
arr = np.array([[1,2,3,4,5], [6,7,8,9,10]])
print('5th element on 2nd row: ', arr[1, 4])
```

```
5th element on 2nd row:  10
```

RESULT:

AIM:

To Installing and Running Applications On Hadoop and HDFS

ALGORITHM:

1. Download and install **Apache Hadoop** on the system.
2. Configure Hadoop environment variables and edit configuration files such as `core-site.xml` and `hdfs-site.xml`.
3. Start Hadoop services including **NameNode** and **DataNode**.
4. Create directories in **Hadoop Distributed File System** using HDFS commands.
5. Upload input files into HDFS using the `hdfs dfs -put` command.
6. Run the Hadoop application (such as MapReduce) and view the output from HDFS.

PROGRAM:

.

HADOOP INSTALATION IN WINDOWS

1. Prerequisites

Hardware Requirement

* RAM — Min. 8GB, if you have SSD in your system then 4GB RAM would also work.
* CPU — Min. Quad core, with at least 1.80GHz

2. JRE 1.8 — Offline installer for JRE

3. Java Development Kit — 1.8

4. A Software for Un-Zipping like 7Zip or Win Rar

* I will be using a 64-bit windows for the process, please check and download the version supported by your system x86 or x64 for all the software.

5. Download Hadoop zip

* I am using Hadoop-2.9.2, you can use any other STABLE version for hadoop.

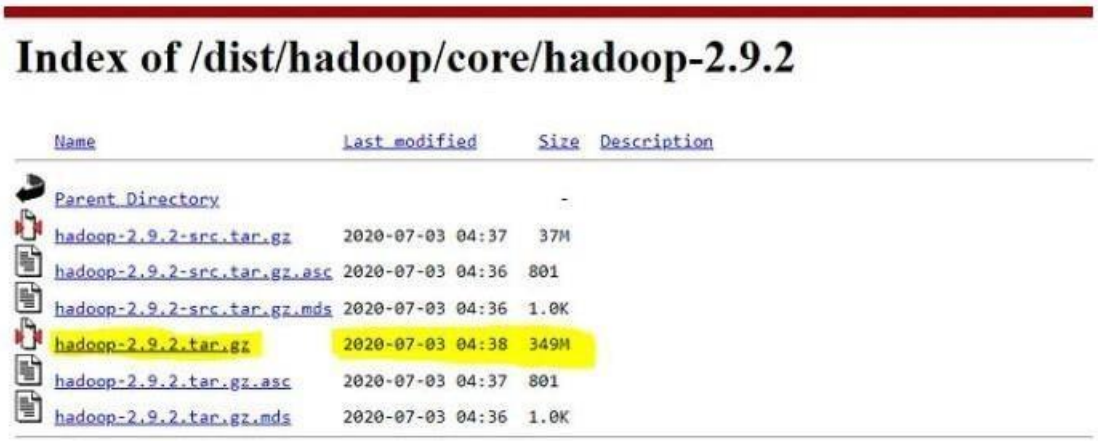


Fig. 1:- Download Hadoop 2.9.2

Once we have Downloaded all the above software, we can proceed with next steps in installing the Hadoop.

2. Unzip and Install Hadoop

After Downloading the Hadoop, we need to Unzip the hadoop-2.9.2.tar.gz file.

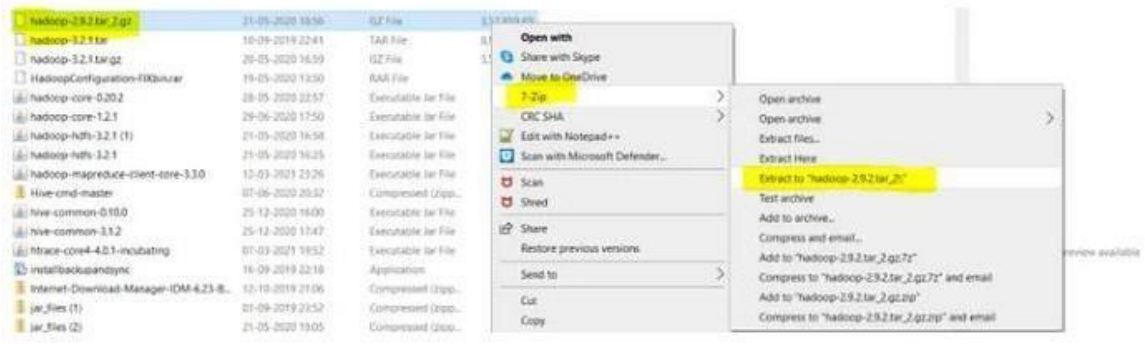


Fig. 2:- Extracting Hadoop Step-1

Once extracted, we would get a new file hadoop-2.9.2.tar.

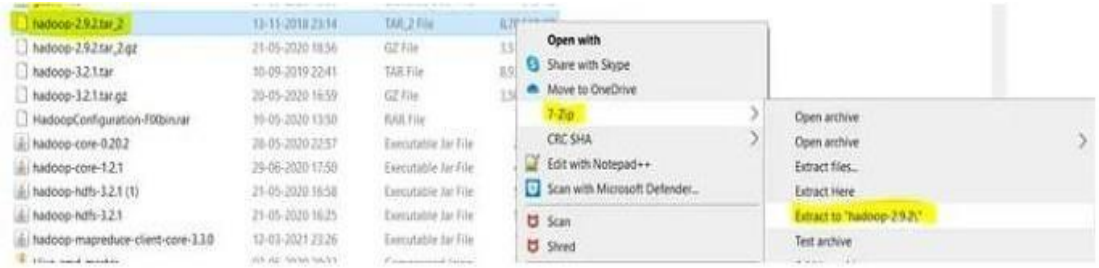


Fig. 3:- Extracting Hadoop Step-2

Now, once again we need to extract this tar file.

Now we can organize our Hadoop installation, we can create a folder and move the final extracted file in it. For Eg. :-

Please note while creating folders, DO NOT ADD SPACES IN BETWEEN THE FOLDER NAME.(it can cause issues later)
I have placed my Hadoop in D: drive you can use C: or any other drive also.

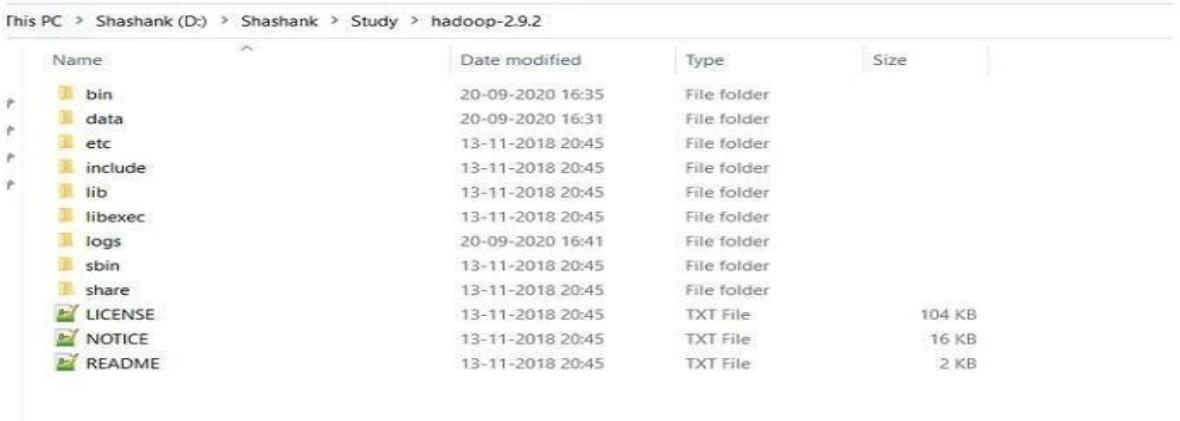


Fig. 4:- Hadoop Directory

3. Setting Up Environment Variables

Another important step in setting up a work environment is to set your Systems environment variable.

To edit environment variables, go to Control Panel > System > click on the ―Advanced system settings‖ link

Alternatively, We can Right click on This PC icon and click on Properties and click on the ―Advanced system settings‖ link

Or, easiest way is to search for Environment Variable in search bar and there you GO…

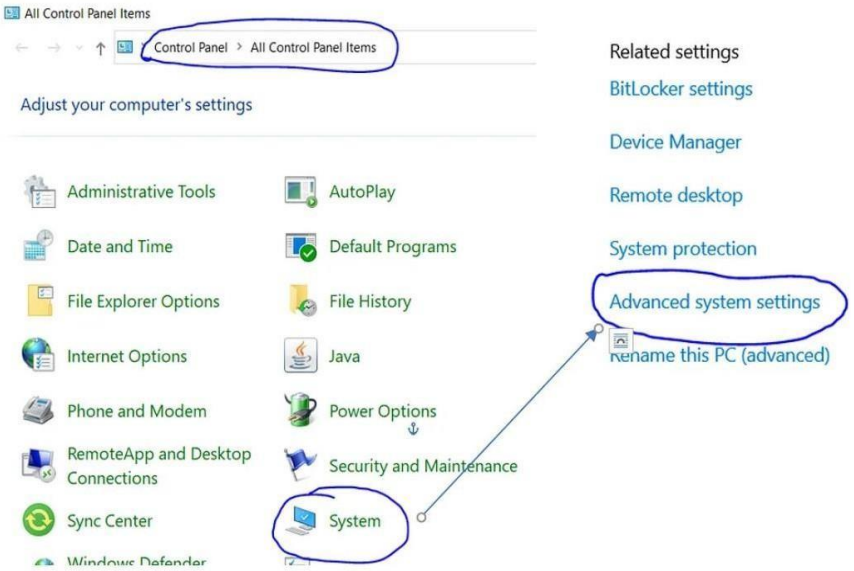


Fig. 5:- Path for Environment Variable

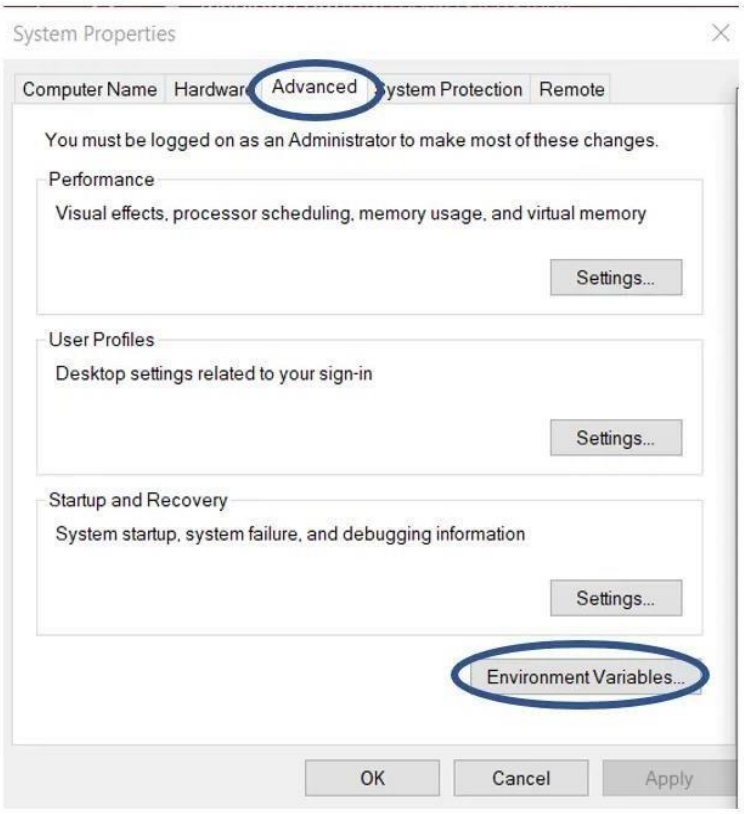


Fig. 6:- Advanced System Settings Screen

3.1 Setting JAVA_HOME

Open environment Variable and click on ―New‖ in ―User Variable‖

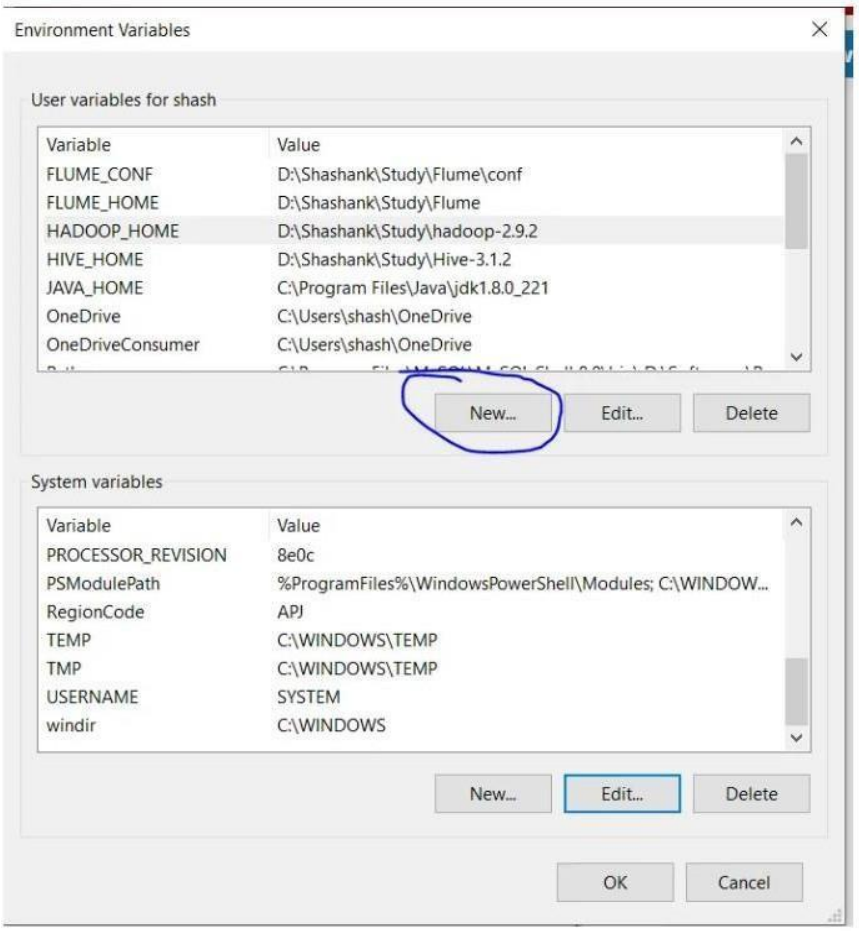


Fig. 7:- Adding Environment Variable

On clicking ―New‖, we get below screen.

Now as shown, add JAVA_HOME in variable name and path of Java(jdk) in Variable Value. Click OK and we are half done with setting JAVA_HOME.

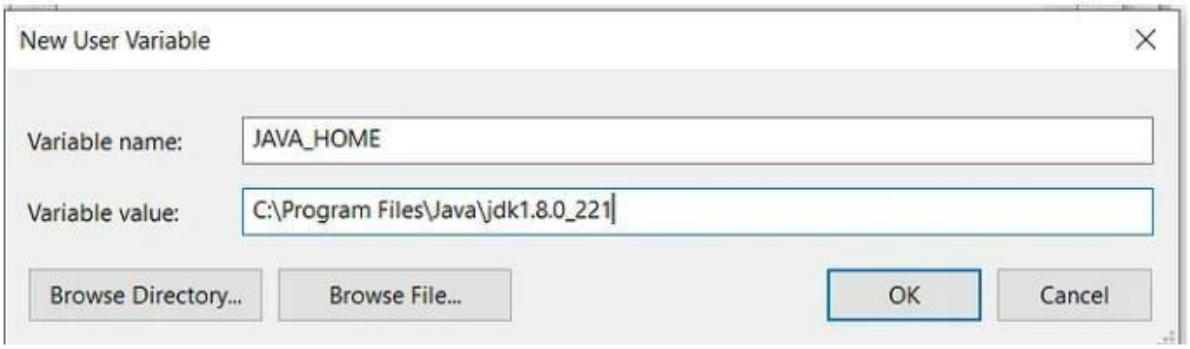


Fig. 8:- Adding JAVA_HOME

3.2 Setting HADOOP_HOME

Open environment Variable and click on ―New‖ in ―User Variable‖

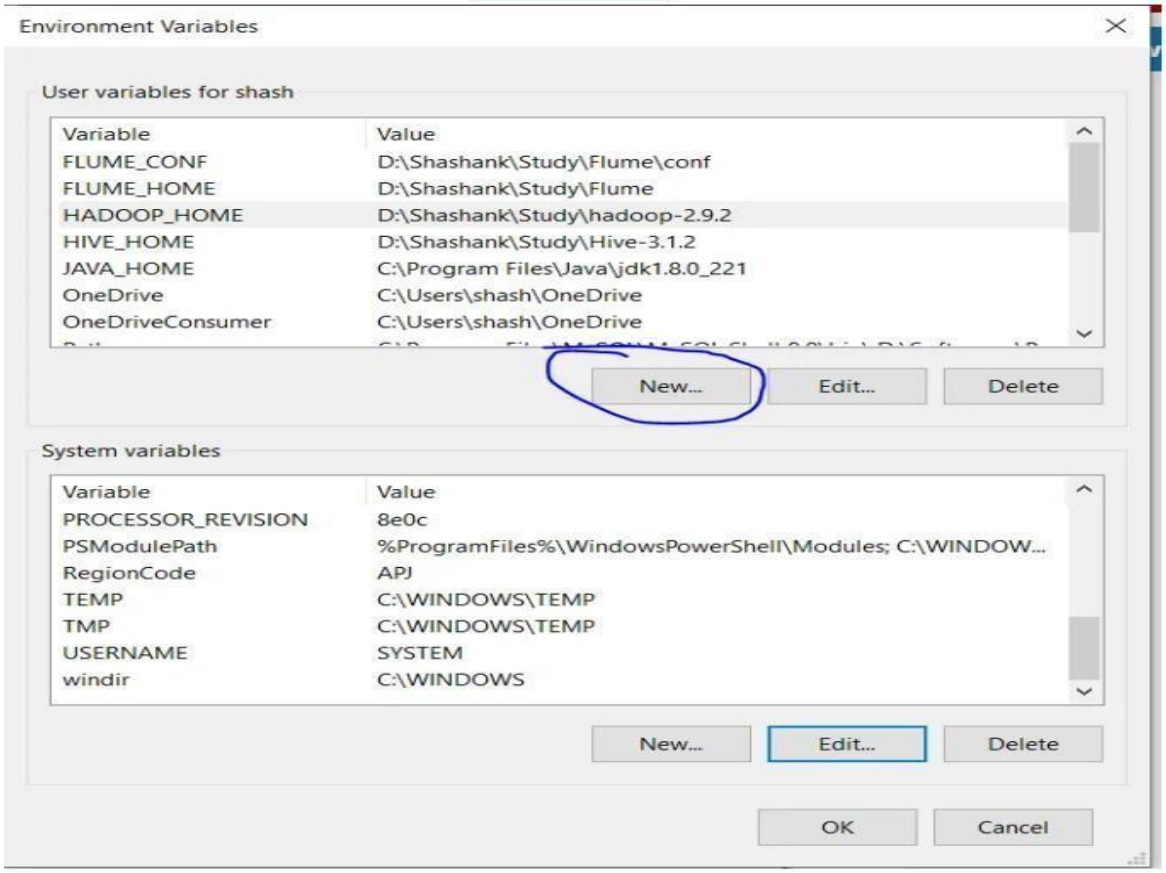


Fig. 9:- Adding Environment Variable

On clicking ―New‖, we get below screen.

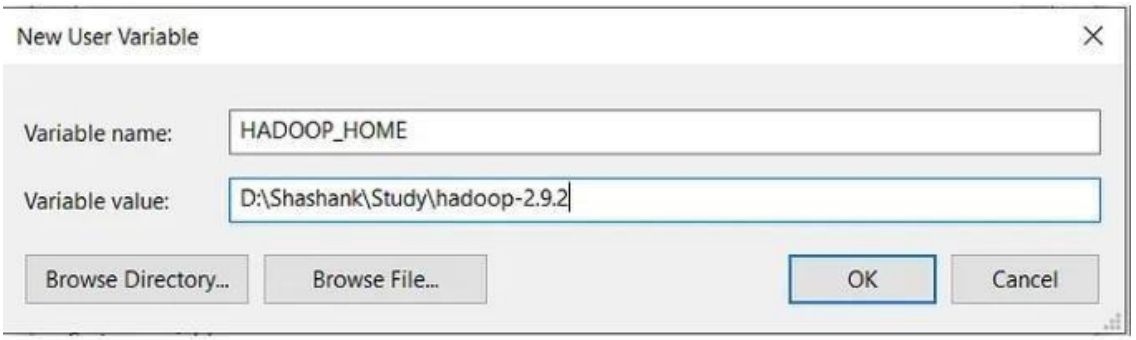


Fig. 10:- Adding HADOOP_HOME

Now as shown, add HADOOP_HOME in variable name and path of Hadoop folder in Variable Value.

Click OK and we are half done with setting HADOOP_HOME.

Note:- If you want the path to be set for all users you need to select ―New‖ from System Variables.

3.3 Setting Path Variable

Last step in setting Environment variable is setting Path in System Variable.

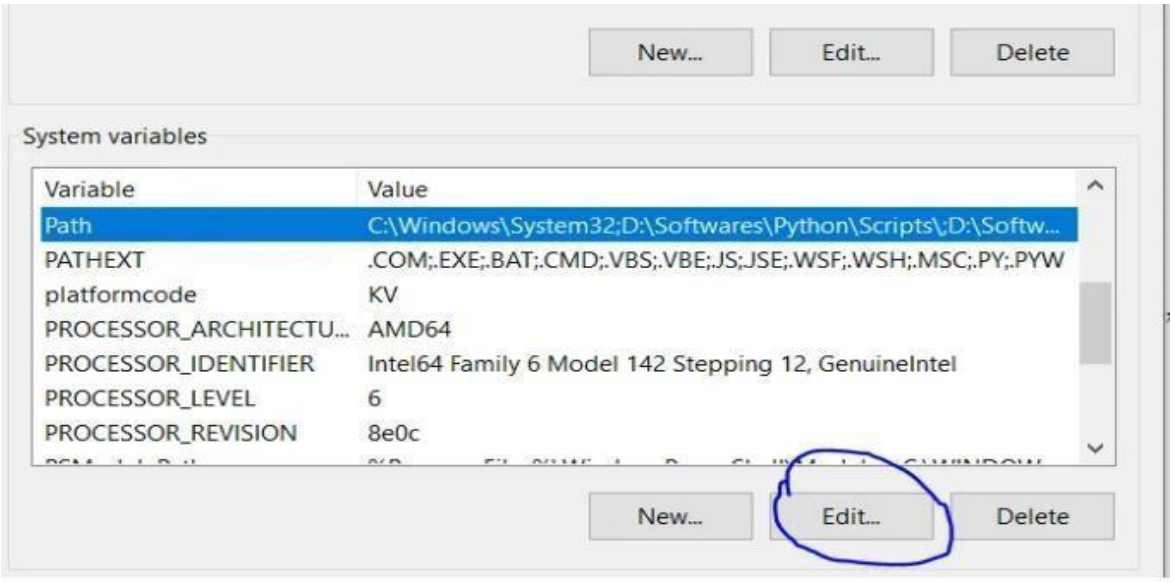


Fig. 11:- Setting Path Variable

Select Path variable in the system variables and click on ―Edit‖.

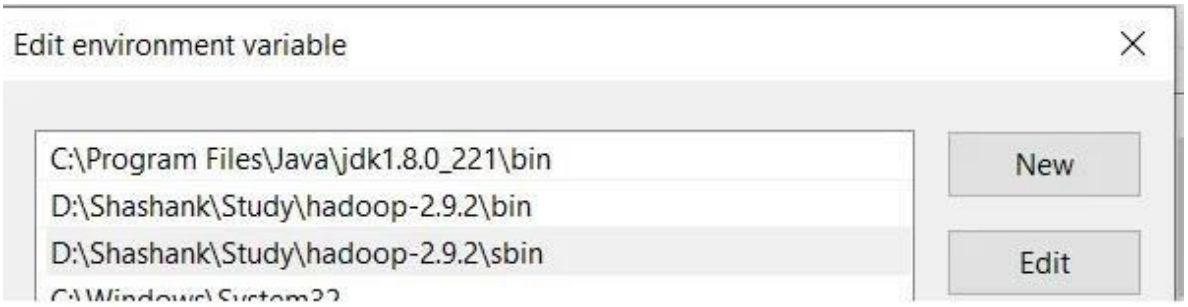


Fig. 12:- Adding Path

Now we need to add these paths to Path Variable one by one:-
* %JAVA_HOME%\bin
* %HADOOP_HOME%\bin
* %HADOOP_HOME%\sbin
Click OK and OK. & we are done with Setting Environment Variables.

3.4 Verify the Paths

Now we need to verify that what we have done is correct and reflecting.
Open a NEW Command Window

Run following commands

echo %JAVA_HOME%
echo %HADOOP_HOME%
echo %PATH%

4. Editing Hadoop files

Once we have configured the environment variables next step is to configure Hadoop. It has 3 parts:-

4.1 Creating Folders

We need to create a folder data in the hadoop directory, and 2 sub folders namenode and datanode

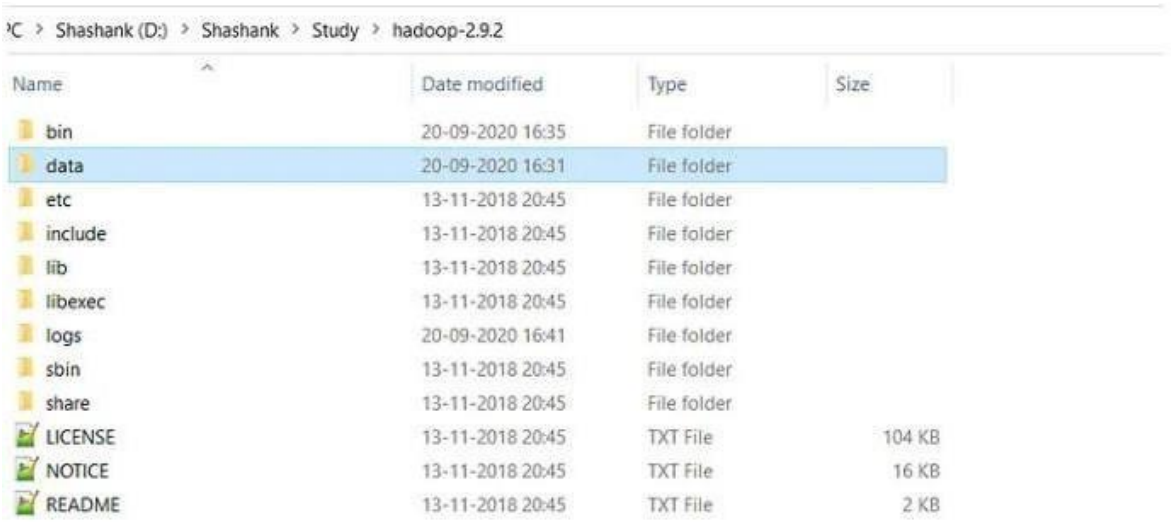


Fig. 13:- Creating Data Folder

Create DATA folder in the Hadoop directory

Fig. 14:- Creating Sub-folders

Once DATA folder is created, we need to create 2 new folders namely, namenode and datanode inside the data folder

These folders are important because files on HDFS resides inside the datanode.

4.2 Editing Configuration Files

Now we need to edit the following config files in hadoop for configuring it :-

(We can find these files in Hadoop -> etc -> hadoop)

* core-site.xml
* hdfs-site.xml
* mapred-site.xml
* yarn-site.xml
* hadoop-env.cmd

4.2.1 Editing core-site.xmlRight click on the file, select edit and paste the following content within <configuration>

</configuration> tags.

Note:- Below part already has the configuration tag, we need to copy only the part inside it.

```
<configuration>
<property>
  <name>fs.defaultFS</name>
  <value>hdfs://localhost:9000</value>
 </property>
</configuration>
```

4.2.2 Editing hdfs-site.xml

Right click on the file, select edit and paste the following content within <configuration></configuration>tags.
Note:- Below part already has the configuration tag, we need to copy only the part inside it.
Also replace PATH~1 and PATH~2 with the path of namenode and datanode folder that we created recently(step 4.1).

```
<configuration>
 <property>
  <name>dfs.replication</name>
  <value>1</value>
 </property>
 <property>
  <name>dfs.namenode.name.dir</name>
  <value>C:\hadoop\data\namenode</value>
   </property>
 <property>
  <name>dfs.datanode.data.dir</name>
  <value>C:\hadoop\data\datanode</value>
 </property>
</configuration>
```

4.2.3 Editing mapred-site.xml

Right click on the file, select edit and paste the following content within <configuration> </configuration> tags.
Note:- Below part already has the configuration tag, we need to copy only the part inside it.

```
<configuration>
 <property>
  <name>mapreduce.framework.name</name>
  <value>yarn</value>
 </property>
</configuration>
```

4.2.4 Editing yarn-site.xml

Right click on the file, select edit and paste the following content within <configuration> </configuration> tags.
Note:- Below part already has the configuration tag, we need to copy only the part inside it.

```
<configuration>
 <property>
  <name>yarn.nodemanager.aux-services</name>
  <value>mapreduce_shuffle</value>
 </property>
 <property>
  <name>yarn.nodemanager.auxservices.mapreduce.shuffle.class</name>
  <value>org.apache.hadoop.mapred.ShuffleHandler</value>
 </property>
</configuration>
```

4.2.5 Verifying hadoop-env.cmd

Right click on the file, select edit and check if the JAVA_HOME is set correctly or not.
We can replace the JAVA_HOME variable in the file with your actual JAVA_HOME that we configured in the System Variable.

```
set JAVA_HOME=%JAVA_HOME%
        OR
set JAVA_HOME="C:\Program Files\Java\jdk1.8.0_221"
```

4.3 Replacing bin

Last step in configuring the hadoop is to download and replace the bin folder.

* Go to this GitHub Repo and download the bin folder as a zip.
* Extract the zip and copy all the files present under bin folder to %HADOOP_HOME%\bin
Note:- If you are using different version of Hadoop then please search for its respective bin folder and download it.

5. Testing Setup

Congratulation..!!!!!
We are done with the setting up the Hadoop in our System.
Now we need to check if everything works smoothly…

5.1 Formatting Namenode

Before starting hadoop we need to format the namenode for this we need to start a NEW Command Prompt and run below command
hadoop namenode –format

Fig. 15:- Formatting Namenode

Note:- This command formats all the data in namenode. So, its advisable to use only at the start and do not use it every time while starting hadoop cluster to avoid data loss.

5.2 Launching Hadoop

Now we need to start a new Command Prompt remember to run it as administrator to avoid permission issues and execute below commands
start-all.cmd

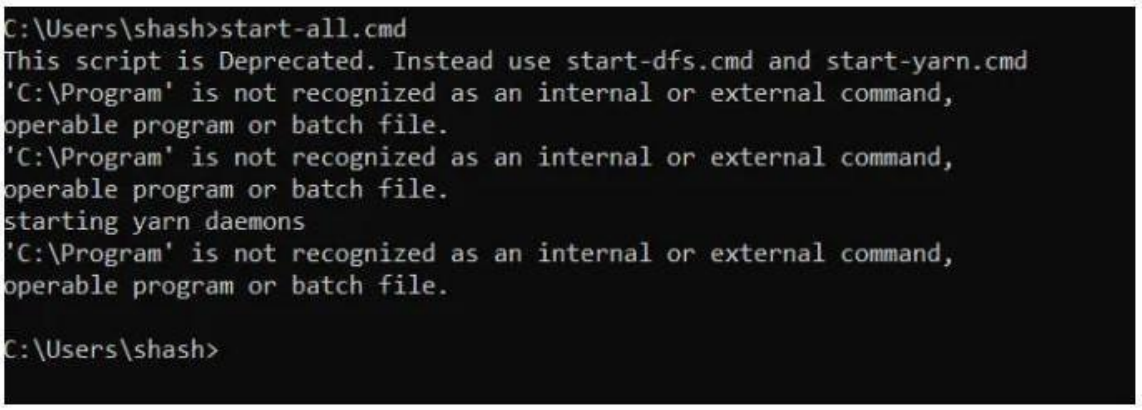


Fig. 16:- start-all.cmd

This will open 4 new cmd windows running 4 different Daemons of hadoop:-
* Namenode
* Datanode
* Resourcemanager
* Nodemanager

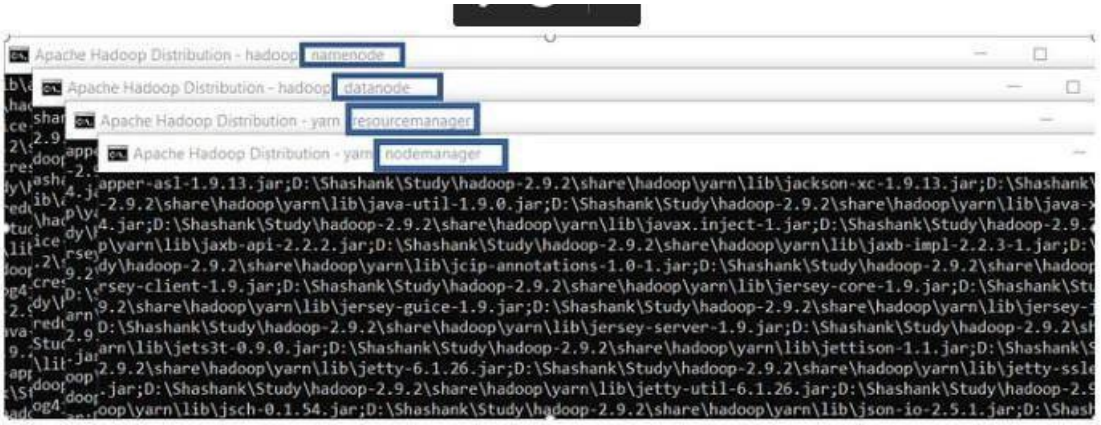


Fig. 17:- Hadoop Deamons

Note:- We can verify if all the daemons are up and running using jps command in new cmd window.

6. Running Hadoop (Verifying Web UIs)

6.1 Namenode

Open localhost:50070 in a browser tab to verify namenode health.

Fig. 18:- Namenode Web UI

6.2 Resourcemanger

Open localhost:8088 in a browser tab to check resourcemanager details.

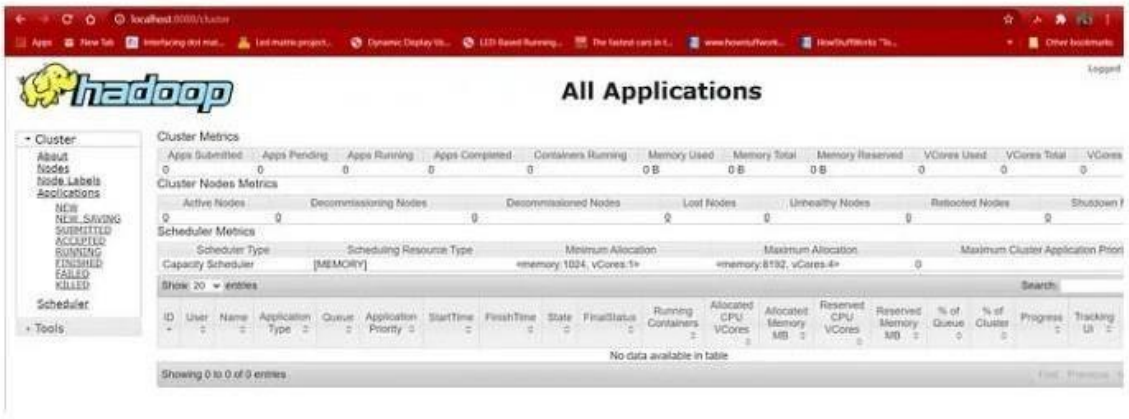


Fig. 19:- Resourcemanager Web UI

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6.3 Datanode

Open localhost:50075 in a browser tab to checkout datanode

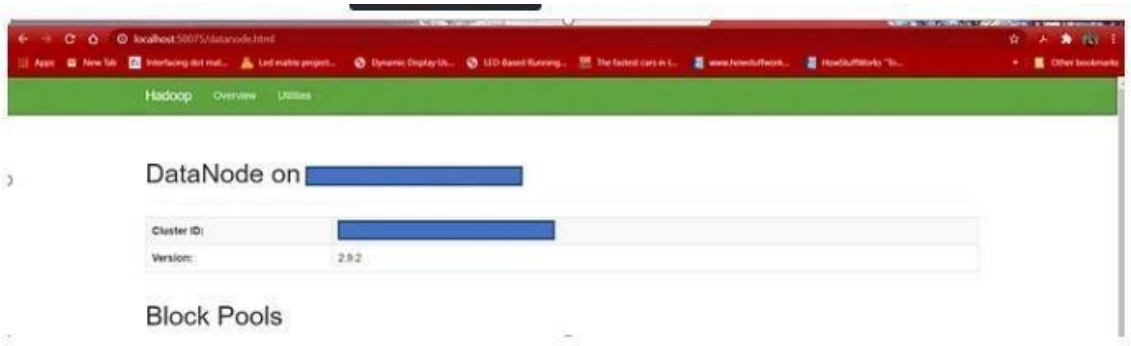


Fig. 20:- Datanode Web UI

RESULT:

AIM:

To create an application that takes the Visualize Data Using Basic Plotting Techniques

ALGORITHM:

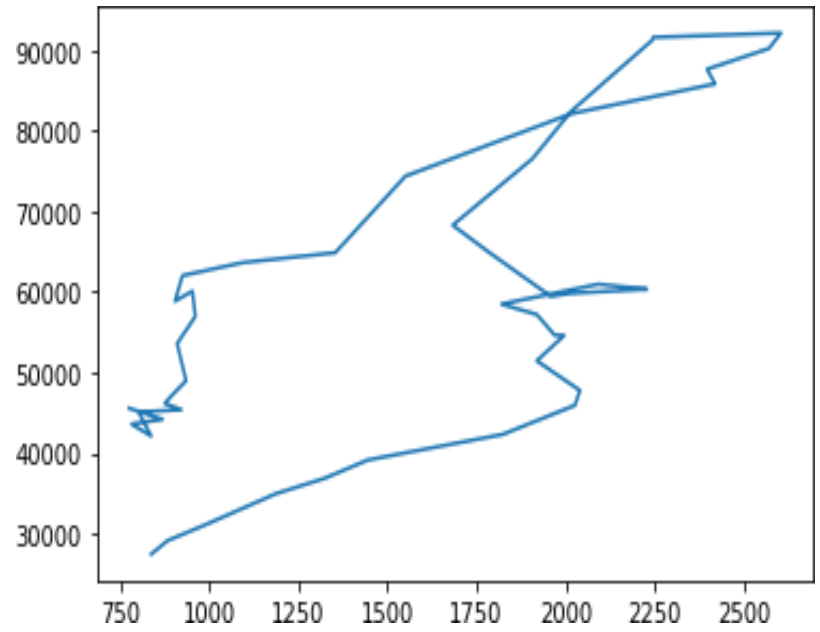
1. Install and import required libraries such as **NumPy**, **pandas**, and **Matplotlib**.
2. Load or create the dataset using pandas or NumPy.
3. Prepare the data by selecting the required columns or values for plotting.
4. Use basic plotting functions such as line plot, bar chart, or scatter plot.
5. Add labels, title, and legends to make the plot understandable.
6. Display the graph using the `show()` function.

PROGRAM:

```
. import pandas as pb
import matplotlib.pyplot as plt
import seaborn as sns
crime=pb.read_csv('crime.csv')
crime
```

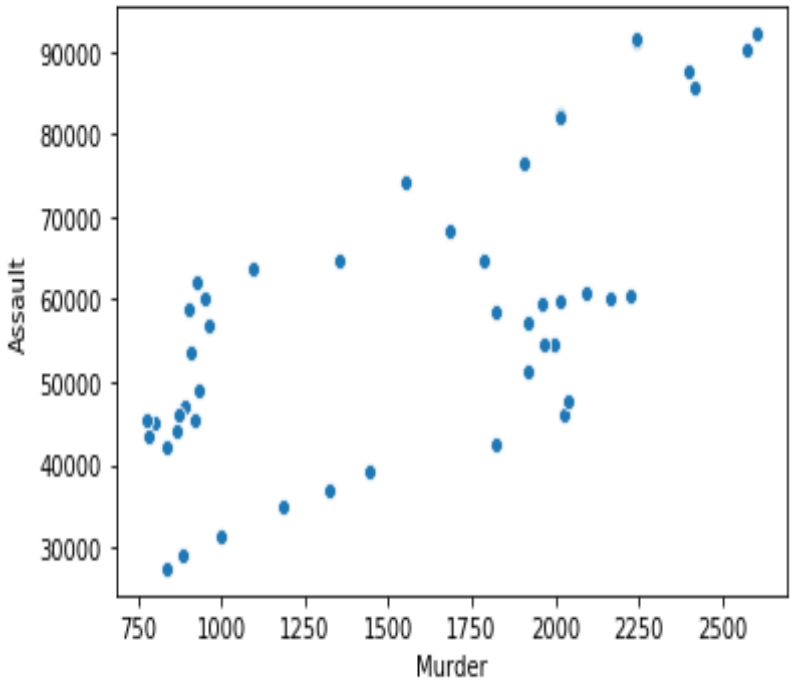
	Year	Population	Murder	Rape	Robbery	Assault	Burglary	CarTheft
0	1965	18073000	836	2320	28182	27464	183443	58452
1	1966	18258000	882	2439	30098	29142	196127	64368
2	1967	18336000	996	2665	40202	31261	219157	83775
3	1968	18113000	1185	2527	59857	34946	250918	104877
4	1969	18321000	1324	2902	64754	36890	248477	115400
5	1970	18190740	1444	2875	81149	39145	267474	125674
6	1971	18391000	1823	3225	97682	42318	273704	127658
7	1972	18366000	2026	4199	86391	45926	239886	105081
8	1973	18265000	2040	4852	80795	47781	246246	112328
9	1974	18111000	1919	5240	86814	51454	271824	104095
10	1975	18120000	1996	5099	93499	54593	301996	116274
11	1976	18084000	1969	4663	95718	54638	318919	133504
12	1977	17924000	1919	5272	84703	57193	309735	133669
13	1978	17748000	1820	5168	83785	58484	292956	119264
14	1979	17649000	2092	5394	93471	60949	308302	124343
15	1980	17506690	2228	5405	112273	60329	360925	133041
16	1981	17594000	2166	5479	120344	60189	350422	136849
17	1982	17659000	2013	5159	107843	59818	295245	137880
18	1983	17667000	1958	5296	94783	59452	249115	127861
19	1984	17735000	1786	5599	89900	64872	222956	115392
20	1985	17783000	1683	5706	89706	68270	219633	106537

plt.plot(crime.Murder,crime.Assault);

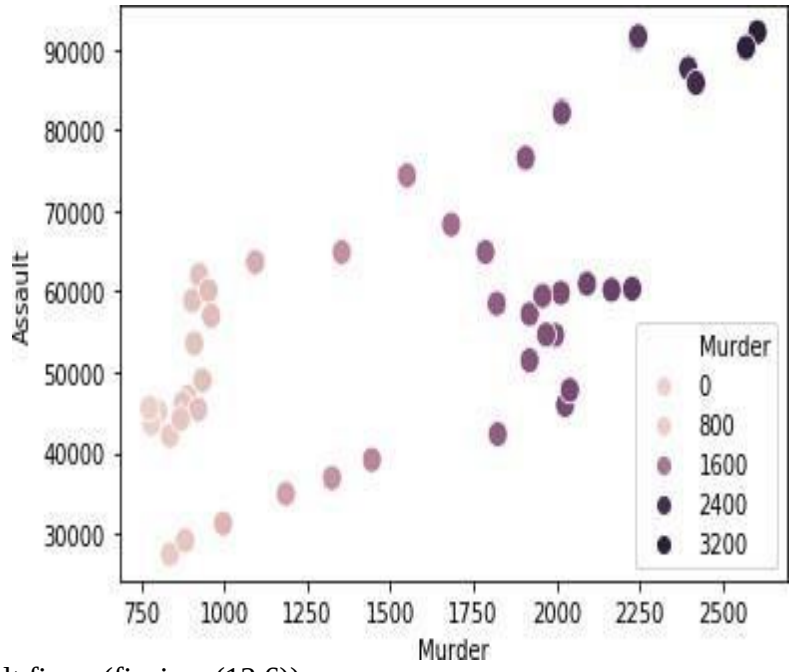


import seaborn as sns

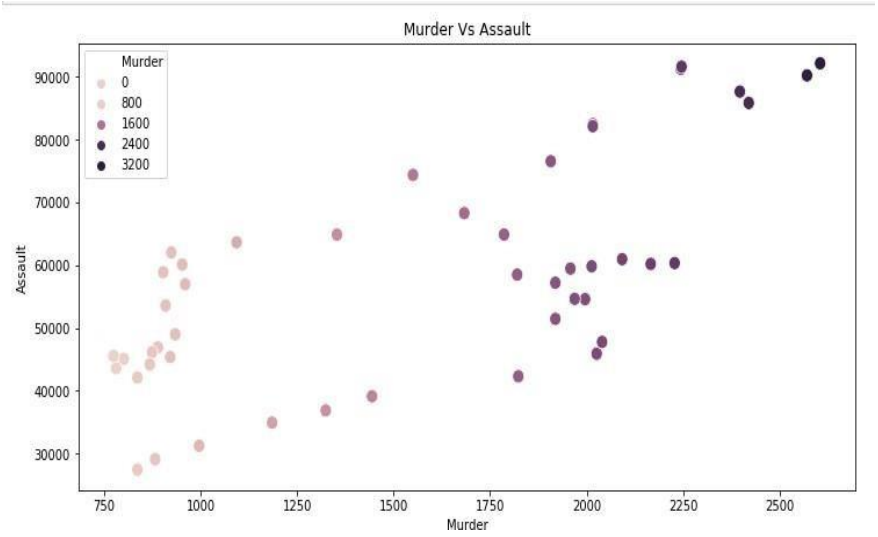
sns.scatterplot(crime.Murder,crime.Assault);



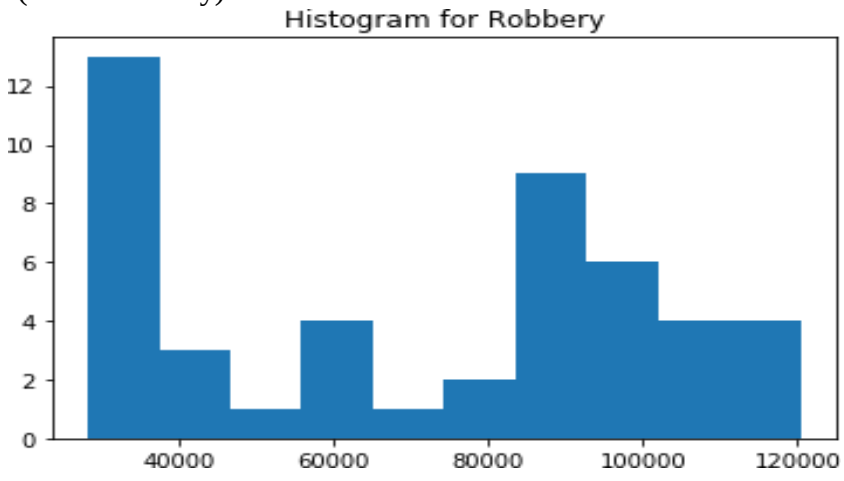
sns.scatterplot(crime.Murder,crime.Assault,hue=crime.Murder,s=100);



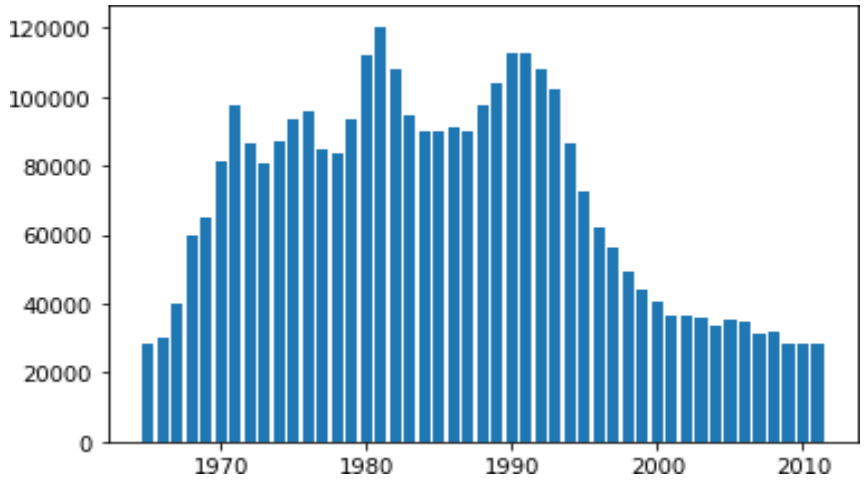
plt.figure(figsize=(12,6))
plt.title('Murder Vs Assault')
sns.scatterplot(crime.Murder,crime.Assault,hue=crime.Murder,s=100);



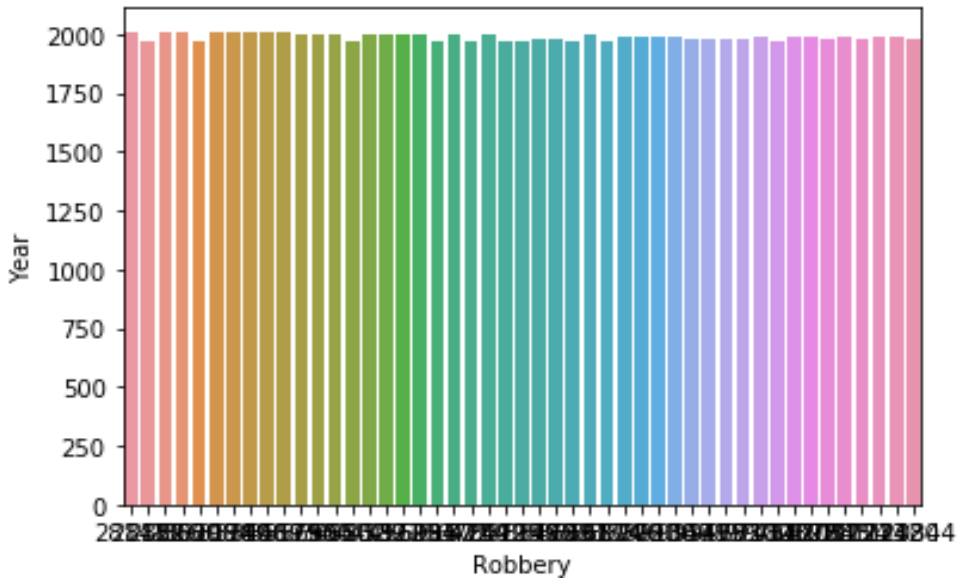
plt.title('Histogram for Robbery')
plt.hist(crime.Robbery)



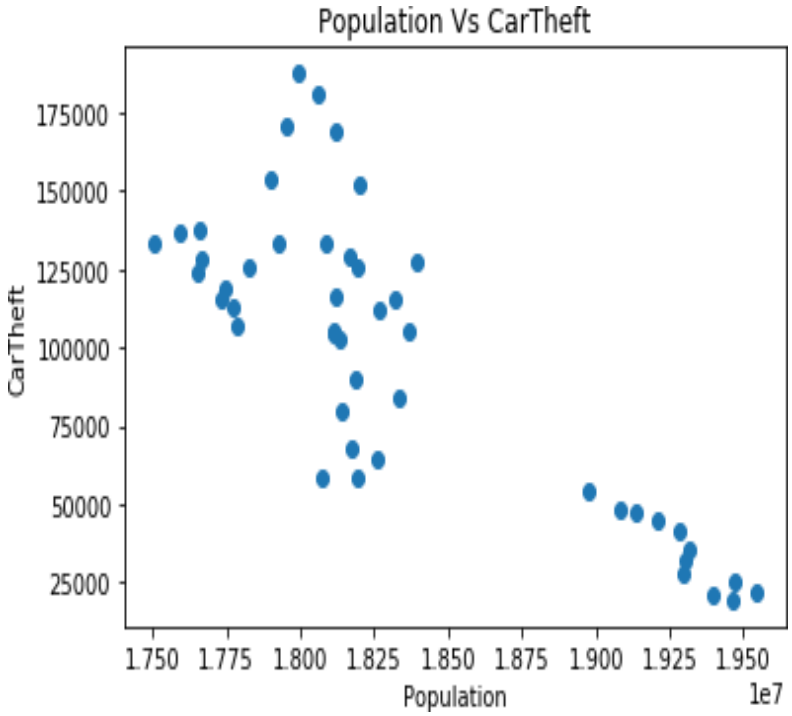
```
plt.bar(crime_bar.index,crime_bar.Robbery);
```




```
sns.barplot('Robbery','Year',data=crime);
```




```
import matplotlib.pyplot as plt
import pandas as pd
import numpy as np
data=pd.read_csv('crime.csv')
x=data.Population
y=data.CarTheft
plt.scatter(x,y)
plt.xlabel('Population')
plt.ylabel('CarTheft')
plt.title('Population Vs CarTheft')
plt.show();
```


Population Vs CarTheft
CarTheft
175000
150000
125000
100000
75000
50000
25000
1.750
1.775
1.800
1.825
1.850
1.875
1.900
1.925
1.950
1e7
Population

RESULT:

AIM:

To Create a operations for crud and arrays without no sql datasbase.

ALGORITHM:

1. Start the program and create an array to store the data.
2. Insert new elements into the array to perform the **Create** operation.
3. Display the stored elements in the array to perform the **Read** operation.
4. Modify an existing element in the array to perform the **Update** operation.
5. Remove an element from the array to perform the **Delete** operation.
6. End the program after performing all CRUD operations on the array.

PROGRAM:

TITLE: Basic CRUD operations in MongoDB.

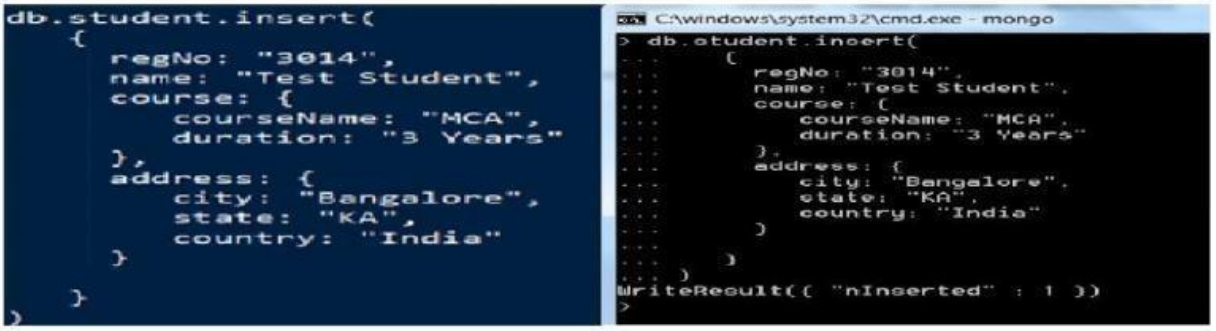
CRUD operations refer to the basic Insert, Read, Update and Delete operations.

Inserting a document into a collection (Create)

➢ The command db.collection.insert()will perform an insert operation into a collection of a document. ➢ Let us insert a document to a student collection. You must be connected to a database for doing any insert. It is done as follows:

```
db.student.insert({
regNo: "3014",
 name: "Test Student",
course: { courseName: "MCA", duration: "3 Years" },
address: {
city: "Bangalore",
state:  "KA",
country: "India" } })
```

An entry has been made into the collection called student.



Querying a document from a collection (Read)

To retrieve (Select) the inserted document, run the below command. The find() command will retrieve all the documents of the given collection.

```
db.collection_name.find()
```

➢ If a record is to be retrieved based on some criteria, the find() method should be called passing parameters, then the record will be retrieved based on the attributes specified.
db.collection_name.find({"fieldname":"value"})

➢ For Example: Let us retrieve the record from the student collection where the attribute regNo is 3014and the query for the same is as shown below:
db.students.find({"regNo":"3014"})

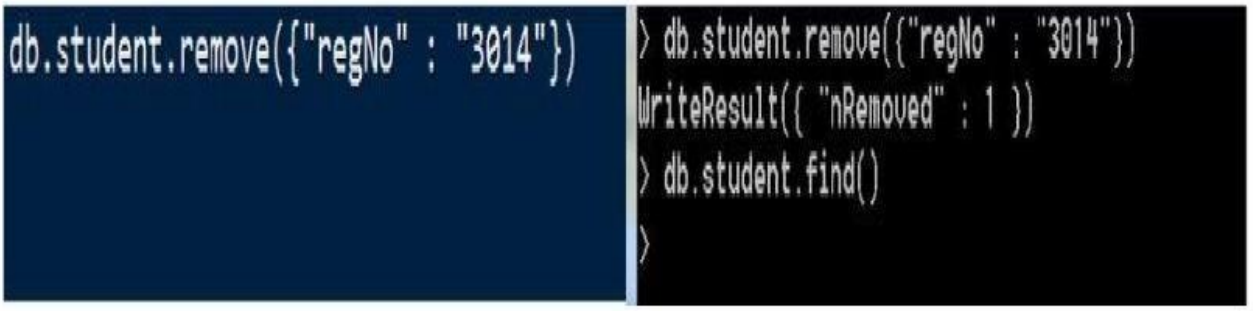
Updating a document in a collection (Update) In order to update specific field values of a collection in MongoDB, run the below query. db.collection_name.update()

➢ update() method specified above will take the fieldname and the new value as argument to update a document.

➢ Let us update the attribute name of the collection student for the document with regNo 3014.
db.student.update({
"regNo": "3014"
},
$set:
{
"name": "Viraj"
})
Removing an entry from the collection (Delete)
➢ Let us now look into the deleting an entry from a collection. In order to delete an entry from a collection, run the command as shown below : db.collection_name.remove({"fieldname":"value"})

➢ For Example : db.student.remove({"regNo":"3014"})

Note that after running the remove() method, the entry has been deleted from the student collection



Working with Arrays in MongoDB

1. Introduction

In a MongoDB database, data is stored in collections and a collection has documents. A document has fields and values, like in a JSON. The field types include scalar types (string, number, date, etc.) and composite types (arrays and objects). In this article we will look at an example of using the array field type.

The example is an application where users create blog posts and write comments for the posts. The relationship between the posts and comments is One-to-Many; i.e., a post can have many comments. We will consider a collection of blog posts with their comments. That is a post document will also store the related comments. In MongoDB's document model, a 1:N relationship data can be stored within a collection; this is a de-normalized form of data. The related data is stored together and can be accessed (and updated) together. The comments are stored as an array; an array of comment objects.

A sample document of the blog posts with comments:

```
{
	"_id" : ObjectId("5ec55af811ac5e2e2aafb2b9"),
	"name" : "Working with Arrays",
	"user" : "Database Rebel",
	"desc" : "Maintaining an array of objects in a document",
	"content" : "some content ...",
	"created" : ISODate("2020-05-20T16:28:55.468Z"),
	"updated" : ISODate("2020-05-20T16:28:55.468Z"),
	"tags" : [ "mongodb", "arrays" ],
	"comments" : [
		{
			"user" : "DB Learner",
			"content" : "Nice post.",
			"updated" : ISODate("2020-05-20T16:35:57.461Z")

			}
	  ]


}
```

In an application, a blog post is created, comments are added, queried, modified or deleted by users. In the example, we will write code to create a blog post document, and do some CRUD operations with comments for the post.

2. Create and Query a Document

Let's create a blog post document. We will use a database called as blogs and a collection called as posts. The code is written in mongoshell (an interactive JavaScript interface to MongoDB). Mongo shell is started from the command line and is connected to the MongoDB server. From the shell:

```
use blogs
NEW_POST =
  {
    name: "Working with Arrays",
    user: "Database Rebel",
    desc: "Maintaining an array of objects in a document",
    content: "some content...",
    created: ISODate(),
    updated: ISODate(),
    tags: [ "mongodb", "arrays" ]
}
db.posts.insertOne(NEW_POST)
```

Returns a result { "acknowledged" : true, "insertedId" : ObjectId("5ec55af811ac5e2e2aafb2b9") } indicating that a new document is created. This is a common acknowledgement when you perform a write operation. When a document is inserted into a collection for the first time, the collection gets created (if it doesn't exist already). The insertOne method inserts a document into the collection.

Now, let's query the collection :

```
db.posts.findOne()
{
        "_id" : ObjectId("5ec55af811ac5e2e2aafb2b9"),
        "name" : "Working with Arrays",
        "user" : "Database Rebel",
        "desc" : "Maintaining an array of objects in a document",
        "content" : "some content...",
        "created" : ISODate("2020-05-20T16:28:55.468Z"),
        "updated" : ISODate("2020-05-20T16:28:55.468Z"),
        "tags" : [
                "mongodb",
                "arrays"
        ]
}
```

The findOne method retrieves one matching document from the collection. Note the scalar fields name (string type) and created (date type), and the array field tags. In the newly inserted document there are no comments, yet.

3. Add an Array Element

Let's add a comment for this post, by a user "DB Learner":

```
NEW_COMMENT = {
  user: "DB Learner",
  text: "Nice post, can I know more about the arrays in MongoDB?",

  updated: ISODate()
}
db.posts.updateOne(
  { _id : ObjectId("5ec55af811ac5e2e2aafb2b9") },
  { $push: { comments: NEW_COMMENT } }
```

)
Returns: { "acknowledged" : true, "matchedCount" : 1, "modifiedCount" : 1 }
The updateOne method updates a document's fields based upon the specified condition. $push is an array update operator which adds an element to an array. If the array doesn't exist, it creates an array field and then adds the element.

Let's query the collection and confirm the new comment visually, using the findOne method:

```
{
	"_id" : ObjectId("5ec55af811ac5e2e2aafb2b9"),
	"name" : "Working with Arrays",
	...
	"comments" : [
		{
			"user" : "DB Learner",
			"text" : "Nice post, can I know more about the arrays in MongoDB?",
			"updated" : ISODate("2020-05-20T16:35:57.461Z")
		}
	]
}
```

Note the comments array field has comment objects as elements. Let's add one more comment using the same $push update operator. This new comment (by user "Database Rebel") is appended to the comments array:

```
"comments" : [
	{
	   "user" : "DB Learner",
	   "text" : "Nice post, can I know more about the arrays in MongoDB?",
	   "updated" : ISODate("2020-05-20T16:35:57.461Z")
	},
	{
	   "user" : "Database Rebel",
	   "text" : "Thank you, please look for updates",
	   "updated" : ISODate("2020-05-20T16:48:25.506Z")
	}
]
```

4. Update an Array Element

Let's update the comment posted by "Database Rebel" with modified text field :
NEW_CONTENT = "Thank you, please look for updates - updated the post".

```
db.posts.updateOne(
  { _id : ObjectId("5ec55af811ac5e2e2aafb2b9"), "comments.user": "Database Rebel" },
  { $set: { "comments.$.text": NEW_CONTENT } }
)
```

The $set update operator is used to change a field's value. The positional $ operator identifies an element in an array to update without explicitly specifying the position of the element in the array. The first matching element is updated. The updated comment object:

```
"comments" : [
```

```
        {
            "user" : "Database Rebel",
            "text" : "Thank you, please look for updates - updated",
            "updated" : ISODate("2020-05-20T16:48:25.506Z")
        }
]
```

5. Delete an Array Element

The user changed his mind and wanted to delete the comment, and then add a new one.

```
db.posts.updateOne(
  { _id" : ObjectId("5ec55af811ac5e2e2aafb2b9") },
  { $pull: { comments: { user: "Database Rebel" } } }
)
```

The $pull update operator removes elements from an array which match the specified condition - in this case { comments: { user: "Database Rebel" } }.
A new comment is added to the array after the above delete operation, with the following text: "Thank you for your comment. I have updated the post with CRUD operations on an array field".

6. Add a New Field to all Objects in the Array

Let's add a new field likes for all the comments in the array.

```
db.posts.updateOne(
  { "_id : ObjectId("5ec55af811ac5e2e2aafb2b9") },
  { $set: { "comments.$[].likes": 0 } }
)
```

The all positional operator $[] specifies that the update operator $set should modify all elements in the specified array field. After the update, all comment objects have the likes field, for example:

```
{
    "user" : "DB Learner",
    "text" : "Nice post, can I know more about the arrays in MongoDB?",
    "updated" : ISODate("2020-05-20T16:35:57.461Z"),
    "likes" : 0
}
```

7. Update a Specific Array Element Based on a Condition

First, let's add another new comment using the $push update operator:

```
NEW_COMMENT = {
  user: "DB Learner",
  text: "Thanks for the updates!",
  updated: ISODate()
}
```

Note the likes field is missing in the input document. We will update this particular comment in the comments array with the condition that the likes field is missing.

```
db.posts.updateOne(
  { "_id" : ObjectId("5ec55af811ac5e2e2aafb2b9") },
  { $inc: { "comments.$[ele].likes": 1 } },
  { arrayFilters: [ { "ele.user": "DB Learner",  "ele.likes": { $exists: false } } ] }
)
```

The likes field is updated using the $inc update operator (this increments a field's value, or if not exists adds the field and then increments). The filtered positional operator $[<identifier>] identifies the array elements that match the arrayFilters conditions for an update operation.

RESULT:

-

AIM:

To create function operations for sort, limit, skip and aggregate.

ALGORITHM:

1. Start the program.
2. Import the required library and connect to the database/collection.
3. Insert sample data into the collection for testing.
4. Create a function for **Sort** operation to arrange records in ascending or descending order.
5. Create a function for **Limit** operation to display only a specified number of records.
6. Create a function for **Skip** operation to ignore a specified number of records from the beginning

PROGRAM:

1.COUNT

How do you get the number of Debit and Credit transactions? One way to do it is by using count() function as below

```
> db.transactions.count({cr_dr : "D"});
```

or

```
> db.transactions.find({cr_dr : "D"}).length();
```

But what if you do not know the possible values of cr_dr upfront. Here Aggregation framework comes to play. See the below Aggregate query.

```
> db.transactions.aggregate(
    [
       {
          $group : {
             _id : '$cr_dr', // group by type of transaction
              // Add 1 for each document to the count for this type of transaction
             count : {$sum : 1}
          }
       }
    ]
 );
```

And the result is

```
{
   "_id" : "C",
   "count" : 3
}
{
   "_id" : "D",
   "count" : 5
```

}

2. SORT

Definition
$sort
Sorts all input documents and returns them to the pipeline in sorted order.

The
$sort

stage has the following prototype form:

{ $sort: { <field1>: <sort order>, <field2>: <sort order> ... } }

$sort
takes a document that specifies the field(s) to sort by and the respective sort order. <sort order> can have one of the following values:

Value
Description
1
Sort ascending.
-1
Sort descending.
{ $meta: "textScore" }
Sort by the computed textScore metadata in descending order. See
Text Score Metadata Sort
for an example.
If sorting on multiple fields, sort order is evaluated from left to right. For example, in the form above, documents are first sorted by <field1>. Then documents with the same <field1> values are further sorted by <field2>
Behavior
Limits
You can sort on a maximum of 32 keys.

Sort Consistency
MongoDB does not store documents in a collection in a particular order. When sorting on a field which contains duplicate values, documents containing those values may be returned in any order.
.

If consistent sort order is desired, include at least one field in your sort that contains unique values. The easiest way to guarantee this is to include the _id field in your sort query.

Consider the following restaurant collection:

```
db.restaurants.insertMany( [
  { "_id" : 1, "name" : "Central Park Cafe", "borough" : "Manhattan"},
  { "_id" : 2, "name" : "Rock A Feller Bar and Grill", "borough" :
"Queens"},
  { "_id" : 3, "name" : "Empire State Pub", "borough" : "Brooklyn"},
  { "_id" : 4, "name" : "Stan's Pizzaria", "borough" : "Manhattan"},
  { "_id" : 5, "name" : "Jane's Deli", "borough" : "Brooklyn"},
] )
```

The following command uses the
$sort
stage to sort on the borough field:

```
db.restaurants.aggregate(
  [
    { $sort : { borough : 1 } }
  ]
)
```

In this example, sort order may be inconsistent, since the borough field contains duplicate values for both Manhattan and Brooklyn. Documents are returned in alphabetical order by borough, but the order of those documents with duplicate values for borough might not the be the same across multiple executions of the same sort. For example, here are the results from two different executions of the above command:

```
{ "_id" : 3, "name" : "Empire State Pub", "borough" : "Brooklyn" }
{ "_id" : 5, "name" : "Jane's Deli", "borough" : "Brooklyn" }
{ "_id" : 1, "name" : "Central Park Cafe", "borough" : "Manhattan" }
{ "_id" : 4, "name" : "Stan's Pizzaria", "borough" : "Manhattan" }
{ "_id" : 2, "name" : "Rock A Feller Bar and Grill", "borough" : "Queens"
}
{ "_id" : 5, "name" : "Jane's Deli", "borough" : "Brooklyn" }
{ "_id" : 3, "name" : "Empire State Pub", "borough" : "Brooklyn" }
{ "_id" : 4, "name" : "Stan's Pizzaria", "borough" : "Manhattan" }
```

-

```
{ "_id" : 1, "name" : "Central Park Cafe", "borough" : "Manhattan" }
{ "_id" : 2, "name" : "Rock A Feller Bar and Grill", "borough" : "Queens"
}
```

While the values for borough are still sorted in alphabetical order, the order of the documents containing duplicate values for borough (i.e. Manhattan and Brooklyn) is not the same.

To achieve a consistent sort, add a field which contains exclusively unique values to the sort. The following command uses the $sort stage to sort on both the borough field and the _id field:

```
db.restaurants.aggregate(
  [
    { $sort : { borough : 1, _id: 1 } }
  ]
)
```

Since the _id field is always guaranteed to contain exclusively unique values, the returned sort order will always be the same across multiple executions of the same sort.

Examples

Ascending/Descending Sort

For the field or fields to sort by, set the sort order to 1 or -1 to specify an ascending or descending sort respectively, as in the following example:

```
db.users.aggregate(
  [
    { $sort : { age : -1, posts: 1 } }
  ]
)
```

This operation sorts the documents in the users collection, in descending order according by the age field and then in ascending order according to the value in the posts field.

Since the _id field is always guaranteed to contain exclusively unique values, the returned sort order will always be the same across multiple executions of the same sort.

Examples

Ascending/Descending Sort

-

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{ "_id" : 3, "name" : "Empire State Pub", "borough" : "Brooklyn"},
{ "_id" : 4, "name" : "Stan's Pizzaria", "borough" : "Manhattan"},
{ "_id" : 5, "name" : "Jane's Deli", "borough" : "Brooklyn"},
] )
```

The following command uses the $sort stage to sort on the borough field:

```
db.restaurants.aggregate(
[
{ $sort : { borough : 1 } }
]
)
```

In this example, sort order may be inconsistent, since the borough field contains duplicate values for both Manhattan and Brooklyn. Documents are returned in alphabetical order by borough, but the order of those documents with duplicate values for borough might not the be the same across multiple executions of the same sort. For example, here are the results from two different executions of the above command:

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{ "_id" : 4, "name" : "Stan's Pizzaria", "borough" : "Manhattan" }
{ "_id" : 2, "name" : "Rock A Feller Bar and Grill", "borough" : "Queens" }
```

```
{ "_id" : 5, "name" : "Jane's Deli", "borough" : "Brooklyn" }
{ "_id" : 3, "name" : "Empire State Pub", "borough" : "Brooklyn" }
{ "_id" : 4, "name" : "Stan's Pizzaria", "borough" : "Manhattan" }
{ "_id" : 1, "name" : "Central Park Cafe", "borough" : "Manhattan" }
{ "_id" : 2, "name" : "Rock A Feller Bar and Grill", "borough" : "Queens" }
```

While the values for borough are still sorted in alphabetical order, the order of the documents containing duplicate values for borough (i.e. Manhattan and Brooklyn) is not the same.

To achieve a *consistent sort*, add a field which contains exclusively unique values to the sort. The following command uses the $sort stage to sort on both the borough field and the _id field:

```
db.restaurants.aggregate(
[
{ $sort : { borough : 1, _id: 1 } }
]
)
```

Since the _id field is always guaranteed to contain exclusively unique values, the returned sort order will always be the same across multiple executions of the same sort.

Examples

Ascending/Descending

Sort

For the field or fields to sort by, set the sort order to 1 or -1 to specify an ascending or descending sort respectively, as in the following example:

```
db.users.aggregate(
[
{ $sort : { age : -1, posts: 1 } }
]
)
```

-

3. SKIP

$skip

Skips over the specified number of documents that pass into the stage and passes the remaining documents to the next stage in the pipeline.

The
$skip
stage has the following prototype form:

{ $skip: <positive 64-bit integer> }

RESULT:

AIM:

To count a given number using map reduce functions

ALGORITHM:

1. Start the program.
2. Define the input data containing numbers.
3. Create a **Map function** to read each number and emit the number with value **1**.
4. Shuffle and group the mapped values based on the key (number).
5. Create a **Reduce function** to sum the values of each key.
6. The Reduce function calculates the total count of each number

PROGRAM:

Hadoop Streaming API for helping us passing data between our Map and Reduce code via STDIN (standard input) and STDOUT (standard output).
Note : Change the file has execution permission (chmod +x /home/hduser/mapper.py)

Change the file has execution permission (chmod +x /home/hduser/reducer.py

Mapper program

mapper.py

```
import sys
# input comes from STDIN (standard input)
for line in sys.stdin:
      line = line.strip() # remove leading and trailing whitespace
   words = line.split()# split the line into words
   # increase counters
   for word in words:
      # write the results to STDOUT (standard output);
      # what we output here will be the input for the
      # Reduce step, i.e. the input for reducer.py
      # tab-delimited; the trivial word count is 1
      print '%s\t%s' % (word, 1)
Reducer program
"""reducer.py"""
from operator import itemgetter
import sys
current_word = None
current_count = 0
word = None
```

```
# input comes from STDIN
for line in sys.stdin:
   line = line.strip()  # remove leading and trailing whitespace
   # parse the input we got from mapper.py
   word, count = line.split('\t', 1)
   # convert count (currently a string) to int
   try:
      count = int(count)
   except ValueError:
      # count was not a number, so silently
      # ignore/discard this line
      continue

   # this IF-switch only works because Hadoop sorts map output
   # by key (here: word) before it is passed to the reducer
   if current_word == word:
      current_count += count
   else:

      if current_word:
         # write result to STDOUT
         print '%s\t%s' % (current_word, current_count)
      current_count = count
      current_word = word

# do not forget to output the last word if needed!
if current_word == word:
   print '%s\t%s' % (current_word, current_count)
```

Test the code (cat data | map | sort | reduce)

```
hduser@ubuntu:~$ echo "foo foo quux labs foo bar quux" | /home/hduser/mapper.py
foo     1
foo     1
quux    1
labs    1
foo     1
bar     1
quux    1

hduser@ubuntu:~$ echo "foo foo quux labs foo bar quux" | /home/hduser/mapper.py | sort -k1,1 |
/home/hduser/reducer.py
bar     1
foo     3
labs    1
quux    2

hduser@ubuntu:~$ cat /tmp/gutenberg/20417-8.txt | /home/hduser/mapper.py
 The     1
 Project 1
 Gutenberg       1
 EBook   1
 of      1
```

RESULT:

AIM:

To create process dataset using map reduce functions**.**

ALGORITHM:

1. Start the program.
2. Load or read the input dataset.
3. Split the dataset into smaller data blocks.
4. Create a **Map function** to process each data block and produce key–value pairs.
5. Perform **Shuffle and Sort** to group similar keys together.
6. Create a **Reduce function** to process grouped keys and combine their values.

PROGRAM:

The python program reads the data from a dataset (stored in the file data.csv- wine quality).
The data mapped is stored in shuffled.pkl using mapper.py.
The contents of shuffled.pkl are reduced using reducer.py

Mapper Program

```
import pandas as pd
import pickle

data = pd.read_csv('data.csv')

#Slicing Data
slice1 = data.iloc[0:399,:]
slice2 = data.iloc[400:800,:]
slice3 = data.iloc[801:1200,:]
slice4 = data.iloc[1201:,:]

def mapper(data):
    mapped = []

for index,row in data.iterrows():
        mapped.append((row['quality'],row['volatile  acidity']))
    return mapped

map1 = mapper(slice1)
map2 = mapper(slice2)
map3 = mapper(slice3)
map4 = mapper(slice4)
```

```
shuffled = {
   3.0: [],
   4.0: [],
   5.0: [],
   6.0: [],
   7.0: [],
   8.0: [],
}
for i in [map1,map2,map3,map4]:
   for j in i:
         shuffled[j[0]].append(j[1])

   file= open('shuffled.pkl','ab')
   pickle.dump(shuffled,file)
   file.close()

   print("Data has been mapped. Now, run     reducer.py
   shuffled.pkl file.")
```

Reducer Program

```
import
pickle
         file= open('shuffled.pkl','rb')
         shuffled = pickle.load(file)
         def reduce(shuffled_dict):
            reduced = {}

            for i in shuffled_dict:

               reduced[i] = sum(shuffled_dict[i])/len(sh

            return reduced
         final = reduce(shuffled)
          print("Average volatile acidity in different cla
         for i in final:
               print(i,':',final[i])
```

RESULT:

AIM:

To create a clustering using SPARK.

ALGORITHM:

1. Start the program and import Spark libraries.
2. Create a **Spark Session**.
3. Load the dataset into a Spark DataFrame.
4. Convert the selected features into a **feature vector**.
5. Apply the **K-Means clustering algorithm** to train the model.
6. Predict and display the cluster results, then stop the program.

PROGRAM:

```
# Loads data.
dataset = spark.read.format("libsvm").load("data/mllib/sample_kmeans_data.txt")

# Trains a k-means model.
kmeans = KMeans().setK(2).setSeed(1)
model = kmeans.fit(dataset)

# Evaluate clustering by computing Within Set Sum of Squared Errors.
wssse = model.computeCost(dataset)
print("Within Set Sum of Squared Errors = " + str(wssse))

# Shows the result.
centers = model.clusterCenters()
print("Cluster Centers: ")
for center in centers:
print(center)
```

RESULT:

AIM:

To design a application to stores data in mongdb using hadoop.

ALGORITHM:

1. Start the program and import required Hadoop and MongoDB libraries.
2. Configure the Hadoop environment and connect to MongoDB database.
3. Load the input data from Hadoop HDFS.
4. Process the data using a MapReduce job.
5. Store the processed data into MongoDB collection.
6. Display the stored data and stop the program.

PROGRAM:

R Shiny Tutorial: How to Make Interactive Web Applications in R

Introduction

In this modern technological era, various apps are available for all of us –from tracking our fitness level, sleep to giving us the latest information about the stock markets. Apps like Robinhood, Google Fit and Workit seem so amazingly useful because they use real-time data and statistics. As R is a frontrunner in the field of statistical computing and programming, developers need a system to use its power to build apps.

This is where R Shiny comes to save the day. In this, R Shiny tutorial, you will come to know the basics.

What is R Shiny?

Shiny is an R package that was developed for building interactive web applications in R. Using this, you can create web applications utilizing native HTML and CSS code along with R Shiny code. You can build standalone web apps on a website that will make data visualization easy. These applications made through R Shiny can seamlessly display R objects such as tables and plots.

Let us look at some of the features of R Shiny:

- Build web applications with fewer lines of code, without JavaScript.
- These applications are live and are accessible to users like spreadsheets. The outputs may alter in real-time if the users change the input.
- Developers with little knowledge of web tools can also build apps using R Shiny.
- You get in-built widgets to display tables, outputs of R objects and plots.
- You can add live visualizations and reports to the web application using this package.
- The user interfaces can be coded in R or can be prepared using HTML, CSS or JavaScript.
- The default user interface is built using Bootstrap.
- It comes with a WebSocket package that enables fast communication between the web server and R.

Components of an R Shiny app

A Shiny app has two primary components – a user interface object and a server function. These are the arguments passed on to the shinyApp method. This method creates an application object using the arguments.

Let us understand the basic parts of an R Shiny app in detail:

User interface function
This function defines the appearance of the web application. It makes the application interactive by obtaining input from the user and displaying it on the screen. HTML and CSS tags can be used for making the application look better. So, while building the ui.R file you create an HTML file with R functions.

If you type fluidPage() in the R console, you will see that the method returns a tag .

The different input functions are:

- selectInput() – This method is used for creating a dropdown HTML that has various choices to select.
- numericInput() – This method creates an input area for writing text or numbers.
- radioButtons() – This provides radio buttons for the user to select an input.

Layout methods
The various layout features available in Bootstrap are implemented by R Shiny. The components are:

Panels
These are methods that group elements together into a single panel. These include:

- absolutePanel()
- inputPanel()
- conditionalPanel()
- headerPanel()
- fixedPanel()

Layout functions
These organize the panels for a particular layout. These include:

- fluidRow()
- verticalLayout()
- flowLayout()
- splitLayout()
- sidebarLayout()

Output methods
These methods are used for displaying R output components images, tables and plots. They are:

- tableOutput() – This method is used for displaying an R table
- plotOutput() – This method is used for displaying an R plot object

Server function

After you have created the appearance of the application and the ways to take input values from the user, it is time to set up the server. The server functions help you to write the server-side code for the Shiny app. You can create functions that map the user inputs to the corresponding outputs. This function is called by the web browser when the application is loaded.

It takes an input and output parameter, and return values are ignored. An optional session parameter is also taken by this method.

R Shiny tutorial: How to get started with R Shiny?

Steps to start working with the R Shiny package are as follows:

- Go to the R console and type in the command – install.packages(―shiny‖)
- The package comes with 11 built-in application examples for you to understand how Shiny works

You can start with the Hello Shiny example to understand the basic structure. Type this code to run Hello Shiny:

library(shiny)
runExample("01_hello")

The steps to create a new Shiny app are:

- Open RStudio and go to the File option
- Select New Project in a directory and click on the ―Shiny Web‖ Application
- You will get a histogram and a slider to test the changes in output with respect to the input
- You will get two scripts ui.R and server.R for coding and customizing the application

Tips for Shiny app development

- Test the app in the browser to see how it looks before sending it for production
- Run the entire script while debugging the app
- Be careful about common error such as commas

RESULT: