A LAB MANUAL

On

Data Science and Big Data Analytics

(III-B.Tech. II–Semester)

Course Code: 24CSPC46

Submitted to

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING (DATASCIENCE)

By

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Syllabus

COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

DATA SCIENCE AND BIG DATA ANALYTICS LAB

Course	B.Tech.-VI-Sem.	L	T	P	C
Subject Code	22CDPC64	-	-	2	1

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4	PO5	PO9	PSO2
CO1	identify big data and its business Implications	3	3	3	3
CO2	demonstrate Job Execution in Hadoop Environment	3	3	3	3
CO3	develop big data Solutions using Hadoop Ecosystem	3	3	3	3
CO4	use cassandra to perform social media analytics	3	3	3	3
CO5	apply machine learning techniques using R	3	3	3	3

List of Experiments

Week	Title/Experiment
1	Write a python program linear search and Binary search.
2	Implement a simple map-reduce job that builds an inverted index on the set of input documents (Hadoop).
3	Process big data in HBase.
4	Store and retrieve data in Pig.
5	Perform Social media analysis using Cassandra.
6	Buyer event analytics using Cassandra on suitable product sales data.
7	Using Power Pivot (Excel) Perform the following on any dataset: a) Big Data Analytics b) Big Data Charting
8	Implement one of the following case study using big data analytics: a) Healthcare Data b) Web Clickstream Data c) Social Media Data d) Educational Data
9	Extract Sample document and apply following document preprocessing methods: Tokenization, POS Tagging, stop words removal, Stemming and Lemmatization.
10	Create representation of document by calculating Term Frequency and Inverse Document Frequency.
11	Use the inbuilt dataset 'titanic' (Use the Seaborn library). Write a code to check how the price of the ticket (column name: 'fare') for each passenger is distributed by plotting a histogram.
12	Use R-Project to carry out statistical analysis of big data.
13	Use R-Project for data visualization of social media data.

Experiment-1

Aim: Write a python program linear search and Binary search.

Require Software& Tools: anaconda (jpyter note book)

Procedure:

Step-1: open any python IDE write the program
Step-2: **Linear Search:**
Step-3: Iterate through each element.
Step-4: Compare with the target.
Step-5: If found, return the index, else return -1.
Step-6: run the program
Step-7: Result
Binary Search:
Step-1: Sort the array (if needed).
Step-2: Initialize low and high pointers
Step-3: Find the middle element and compare with the target
Step-4: Adjust the pointers (low or high) based on the comparison
Step-5: Repeat until the target is found or the pointers cross
Step-6: Return the index if found, else return -1
Step-7: Run the program write the result.

SOURCECODE:
Linear search

```
    l=list()
    n=int(input("Enter number of elements to be inserted into list:"))
    print("Enter",n," Values")

    for i in range(n):
    l.append(int(input()))

    s=int(input("Enter element to be searched"))

    for i in range(len(l)):
    if l[i]==s:
    print(s," is found at position", i+1)
    break
    else:
print("Element is not found")
```

Binary search:

```
l=list()

n=int(input("enter number of elememts"))

print("enter",n, "values")
```

```
for i in range(n):
l.append(int(input()))
l.sort()
s=int(input("enter element to be searched"))
low=0
high=len(l)-1
found=False
while low<=high:
mid=(low+high) // 2
if l[mid] == s:
print(s," is found at position ",mid+1)
found=True
break
elif l[mid]<s:
low=mid+1
else:
high=mid-1
if not found:
print(s," is not found in list")
```

Out put:

Linear search

```
Enter number of elements to be inserted into list: 5
Enter 5 Values
 11
 12
 30
 45
 22
Enter element to be searched 30
30  is found at position 3
```

Binary search:

```
enter number of elememts 5
enter 5 values
10
25
30
40
50
```

enter element to be searched 25
25 is found at position 2

Experiment-2

Aim: Implement a simple map-reduce job that builds an inverted index on the set of input documents (Hadoop).

Require Software& Tools: (Hadoop,java,linux,intellij)

1.open vm ware start ubunt then open terminal

2.hadoop version

```
student@student-virtual-machine:~$ hadoop version
Hadoop 3.4.0
```

3.java –version

```
student@student-virtual-machine:~$ java -version
openjdk version "1.8.0_432"
```

4.start-all.sh

```
student@student-virtual-machine:~$ start-all.sh
WARNING: Attempting to start all Apache Hadoop daemons as stude
WARNING: This is not a recommended production deployment config
WARNING: Use CTRL-C to abort.
Starting namenodes on [localhost]
Starting datanodes
Starting secondary namenodes [student-virtual-machine]
Starting resourcemanager
Starting nodemanagers
```

5.jps

```
student@student-virtual-machine:~$ jps
2115 Jps
3395 Jps
2661 SecondaryNameNode
2982 NodeManager
2488 DataNode
2858 ResourceManager
```

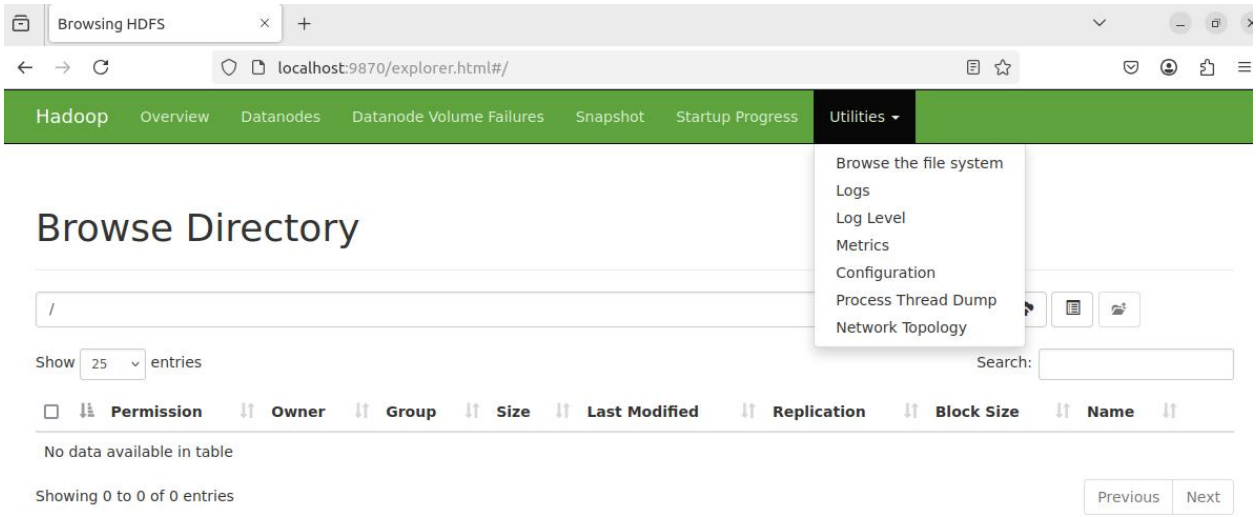
6.hadoop-3.4.0/bin/hdfs namenode –format

```
025-02-15 12:35:42,880 INFO namenode.FSNamesystem: Stopping services
 standby state
025-02-15 12:35:42,886 INFO namenode.FSImage: FSImageSaver clean chec
d=0 when meet shutdown.
025-02-15 12:35:42,886 INFO namenode.NameNode: SHUTDOWN_MSG:
************************************************************
HUTDOWN_MSG: Shutting down NameNode at student-virtual-machine/127.0.
```

7.start-all.sh

```
student@student-virtual-machine:~$ start-all.sh
WARNING: Attempting to start all Apache Hadoop daemons as stude
WARNING: This is not a recommended production deployment config
WARNING: Use CTRL-C to abort.
Starting namenodes on [localhost]
Starting datanodes
Starting secondary namenodes [student-virtual-machine]
Starting resourcemanager
Starting nodemanagers
```

8.open browser http://localhost:9870



9.open intellij idea click on new project give the name of the project

10.select maven goto advance give the group id name org.dsbda

11.remove main class

12.create dependencies in org.dsbda copy the dependencies code from the git hub

github.com/ rishikumar1992/DSBDA-LAB

13.go to maven click on the project name reload all projects

14.create the 3 java classes WC_Mapper ,Reducer,Runner copy the code from git hub

15.create jar file ---> click on maven clean enter and maven install

16.target folder will be created which contains jar file

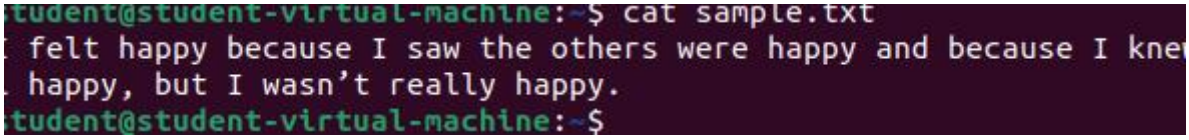
17.goto ubuntu tewrminal create the text file input2.txt

18.nano sample.txt

19.write some text with repeated words

20.cntrl+o enter cntrl+x

21.cat input.txt



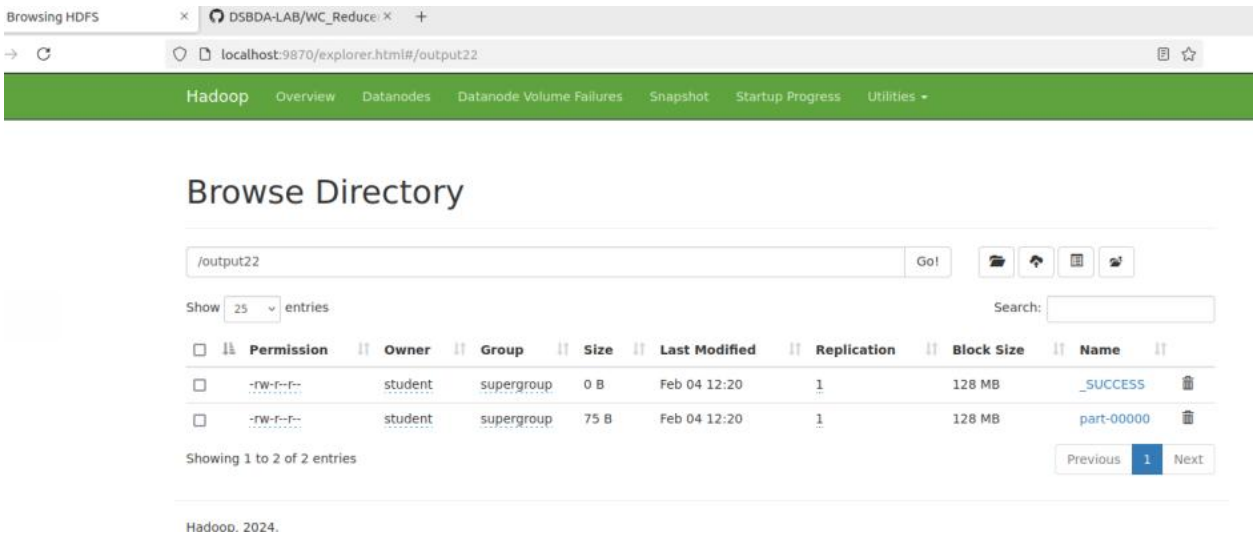
22.create the folder on the localhost hadoop fs -mkdir /input2

23.hadoop fs -put sample.txt /input2

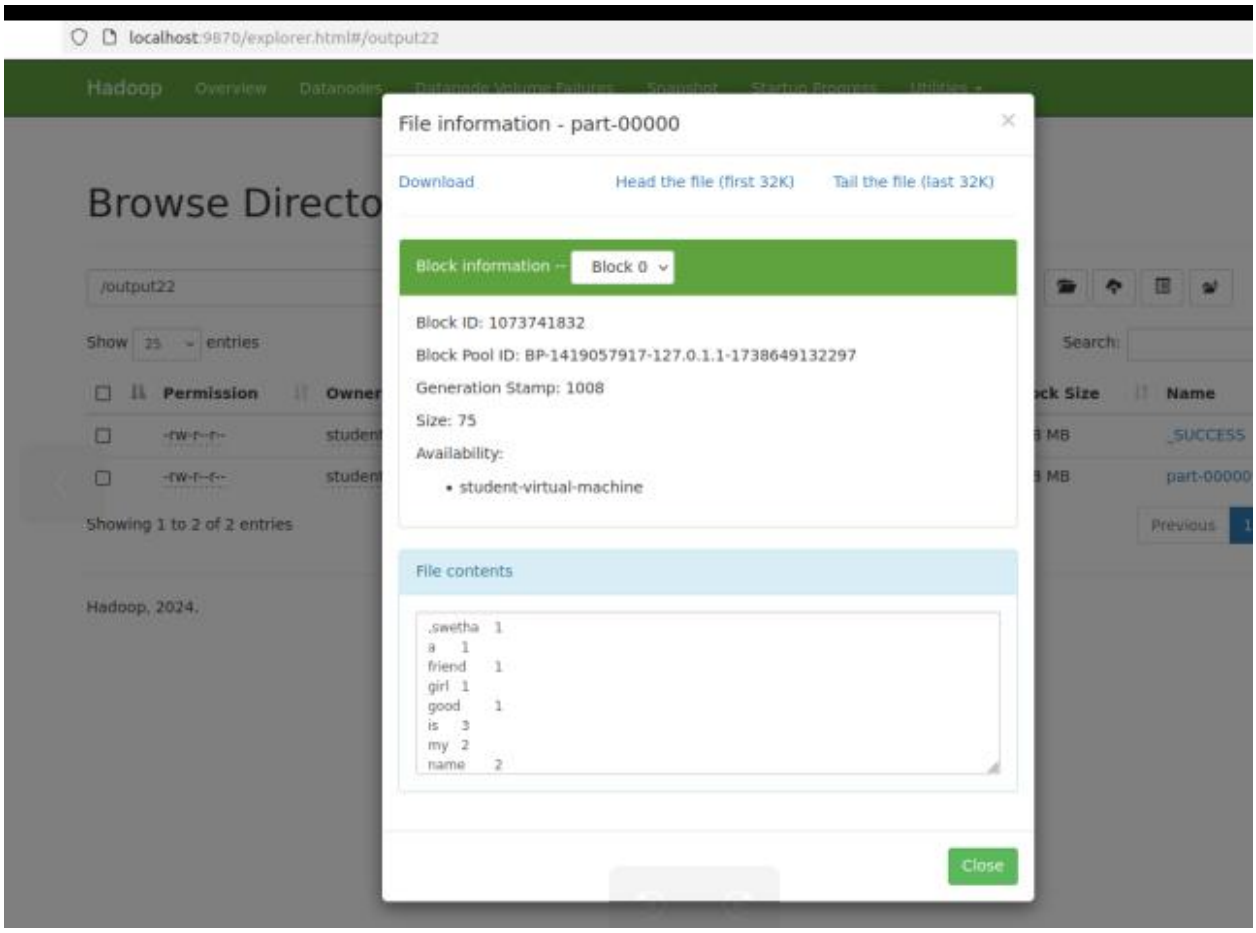
24.back to the local host check the file system

25.back to the intellij go to terminal hadoop jar target/week2-1.0-SNAPSHOT.jar org.dsbda.WC_Runner /input2/input2.txt /output2

26.back to the local host check the file system

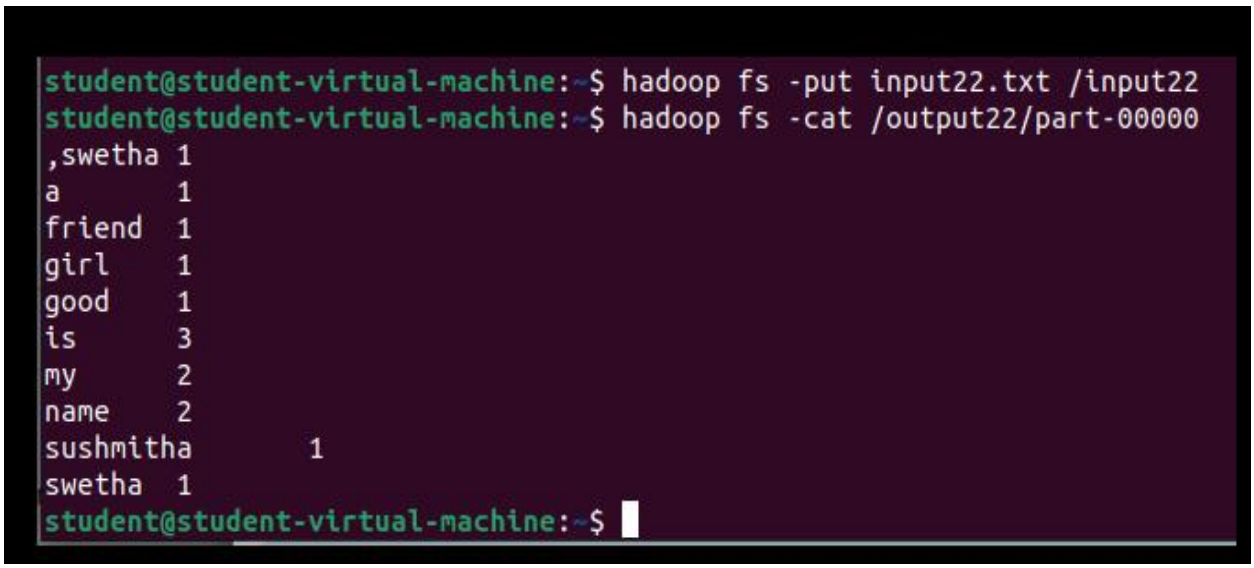


27.click on output2 file



28.back to the main terminal

29.hadoop fs -cat /output2/part-00000



Experiment-3

Aim: To create table and process the big data in Hbase.
Require Software& Tools: Hadoop in Ubuntu, VM ware work station, Hbase

Installation steps for hbase

1.download hbase from apache website(https://dlcdn.apache.org/hbase/2.6.1/hbase-2.6.1-bin.tar.gz)**St 2. Place the downloaded file into home folder**
hbase-1.1.2-bin.tar.gz in /home

3.**Unzip it by executing command $tar -xvf hbase-1.1.2-bin.tar.gz.**
It will unzip the contents, and it will create hbase-1.1.2 in the location /home

4.**Open hbase-env.sh(to open this go to home/hadoop-2.6.1/conf right click on conf open with terminal)**

5.in terminal enter the command: gedit hbase-env.sh

6.Open hbase-env.sh as above and mention JAVA_HOME path in the location.

export JAVA_HOME=/usr/lib/jvm/java-8-openjdk-amd64 (save and close the file)

7.Open ~/.bashrc file(gedit ~/.bashrc)and mention HBASE_HOME path as shown in below

export HBASE_HOME=/home/student/hbase-2.6.1

export PATH=$PATH:$HBASE_HOME/bin**(save and close the file)**

8. **Add properties in the file**
Open hbase-site.xml(gedit hbase-site.xml) and place the following properties inside the file

<property>

<name>hbase.rootdir</name>

<value>file:///home/student/hbase-2.6.1</value>

</property>
<property>

<name>hbase.zookeeper.property.dataDir</name>

<value>/home/student/hbase-2.6.1/zookeeper</value>

</property>

(save and close the file)

Here we are placing two properties

- One for HBase root directory and
- Second one for data directory correspond to ZooKeeper.

All HMaster and ZooKeeper activities point out to this hbase-site.xml.

9.close the terminal and go to home/hbase-2.6.1/bin open with terminal

10 type the following commands

a.start-hbase.sh

b.jps

c.**hbase shell**

Experiment:

1.Creating table in hbase

create 'customer','customer_info','customer_details'

output: Creating table customer with column families: [customer_info, customer_details] 0 row(s) in 0.1230 seconds

2.To list the tables in hbase: list

Output:

scss

Copy
TABLE
customer
1 row(s) in 0.0100 seconds

3.To insert values into table:

put ‘customer’,’1’,’customer_info:name’,’sita’

put ‘customer’,’1’,’customer_details:mobile’,’9999999999’

4. To display the contents of the table

get ‘customer’,’1’

```
ROW        COLUMN+CELL
1          column=customer_info:name, timestamp=1582156949875, value=sita
           column=customer_details:mobile, timestamp=1582156952061, value=9999999999
1 row(s) in 0.0160 seconds
```

5.To insert other values into table:
put ‘customer’,’1’,’customer_info:age’,’25’
put ‘customer’,’1’,’customer_details:email’,’sita@gmail.com’
6. To display the contents of the table
get ‘customer’,’1’

```
ROW        COLUMN+CELL
1          column=customer_info:name, timestamp=1582156949875, value=sita
           column=customer_info:age, timestamp=1582156980297, value=25
           column=customer_details:mobile, timestamp=1582156952061, value=9999999999
           column=customer_details:email, timestamp=1582156980823, value=sita@gmail.com
1 row(s) in 0.0150 seconds
```

7. To insert other row

put ‘customer’,’2’,’customer_info:name’,’rama’

put ‘customer’,’2’,’customer_details:mobile’,’9898999999’

put ‘customer’,’2’,’customer_info:age’,’28’

put ‘customer’,’2’,’customer_details:email’,’rama@gmail.com’

8.To update the details
put 'customer', '1', ''customer _info:name', 'John' # Update name
put 'customer', '1', ''customer _info:age', '31' # Update age
scan customer;

```
ROW        COLUMN+CELL
1          column=customer_info:name, timestamp=1582156949875, value=John
           column=customer_info:age, timestamp=1582156980297, value=31
           column=customer_details:mobile, timestamp=1582156952061, value=9999999999
           column=customer_details:email, timestamp=1582156980823, value=sita@gmail.com
2          column=customer_info:name, timestamp=1582157000000, value=rama
           column=customer_info:age, timestamp=1582157002000, value=28
           column=customer_details:mobile, timestamp=1582157003000, value=9898999999
           column=customer_details:email, timestamp=1582157004000, value=rama@gmail.com
2 row(s) in 0.0340 seconds
```

9. Delete an entire row (all columns) from the table:

deleteall 'customer', '1'

10. Delete a specific column from a row:

delete 'customer', '1', 'customer_details:mobile'

Experiment-4

Aim: Store and retrieve data in Pig.

Require Software& Tools: Hadoop in Ubuntu,apache Pig(0.17.0)

Procedure:

1. Download Apache Pig:
   First of all, download the latest version of Apache Pig from the following website
   – https://pig.apache.org/
   Open the homepage of Apache Pig website. Under the section **News,** click on the link **release page,**click on **Download a release now**

   Click on pig-0.16.0/

Click on pig-0.16.0.tar.gz

Install Apache Pig

Step 1:

Create a directory with the name Pig in the same directory where the installation directories of **Hadoop, Java,** and other software were installed.

$mkdir pig

Step 2:

Extract the downloaded tar files as shown below.

```
cd Downloads/
$ tar zxvf pig-0.16.0.tar.gz
```

Step 3:

Move the content of **pig-0.15.0.tar.gz** file to the **Pig** directory created earlier as shown below.

```
$ mv pig-0.16.0.tar.gz/* /home/Pig/
```

Configure Apache Pig

After installing Apache Pig, we have to configure it. To configure, we need to edit two files − **bashrc and pig.properties**

$pig -h properties

Open bashrc

$gedit ~/.bashrc

add this path

export PIG_HOME=/home/student/pig

export PATH=$PATH:$PIG_HOME/bin

export PIG_CLASSPATH=$HADOOP_HOME/conf

verifying installation

step1:open vm ware workstation and start ubuntu

Step2:click on home then go to the pig folder then select bin folder and right click open in terminal

Step3: check the pig version :$pig –version

```
student@student-virtual-machine:~/pig/bin$ pig -version
Apache Pig version 0.17.0 (r1797386)
compiled Jun 02 2017, 15:41:58
student@student-virtual-machine:~/pig/bin$
```

Step4:Create a text file

Step5:gedit studata.txt write the some text

Data

Krishna,1,22,cse

rani,2,21,csd

raju,3,22,aiml

sita,2,20,cse

rama,1,23,csd

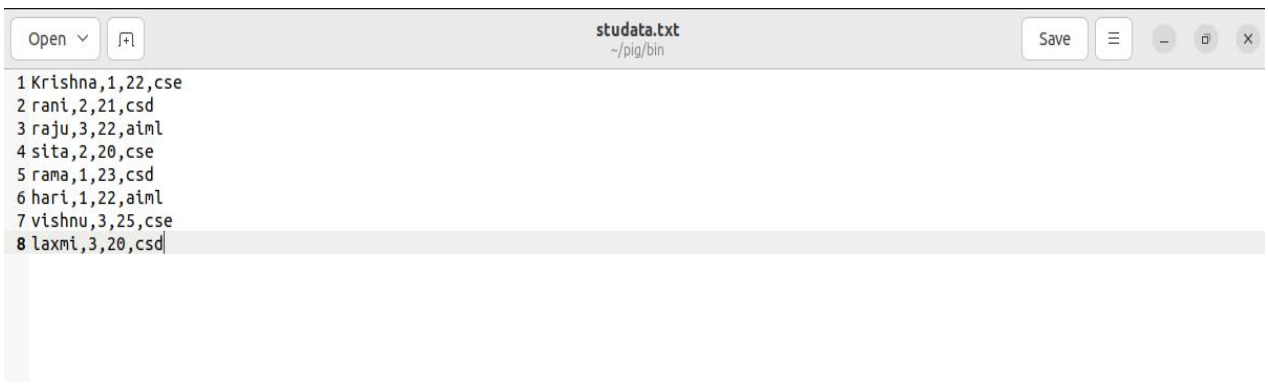
hari,1,22,aiml

vishnu,3,25,cse

laxmi,3,20,csd

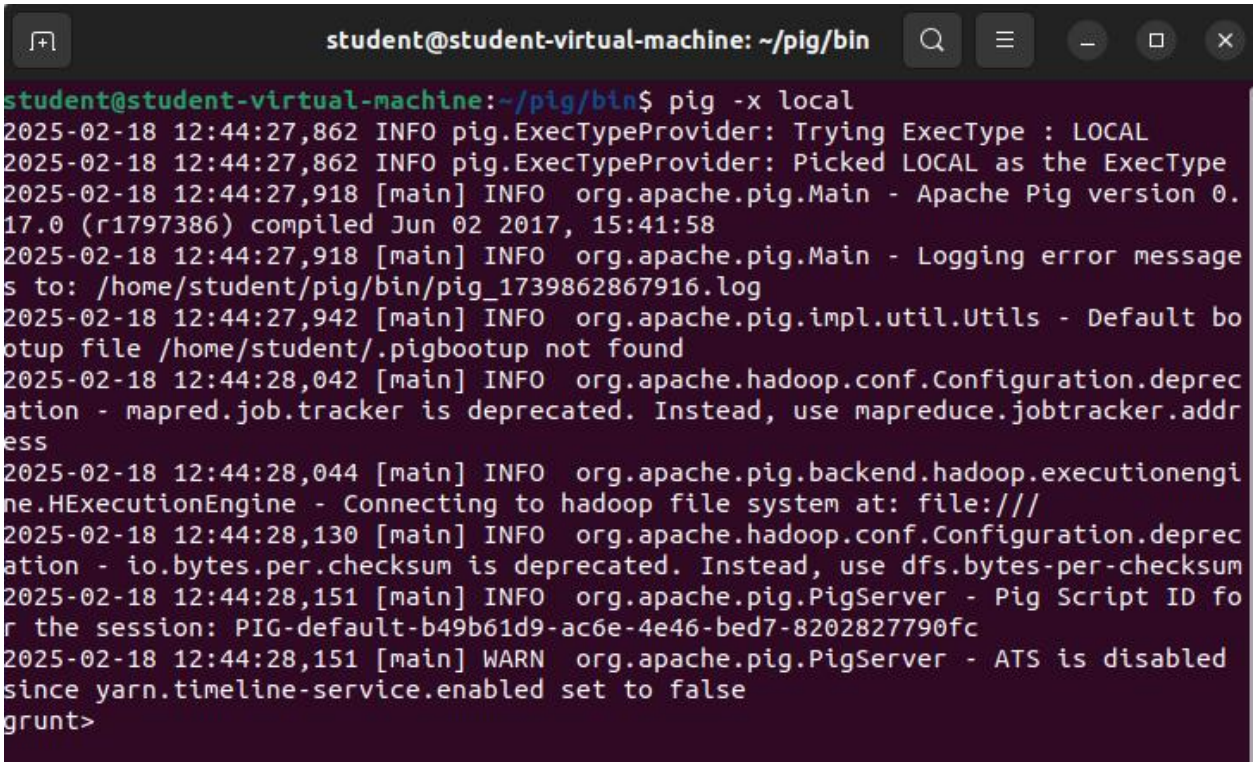
vishva,2,22,aiml

teja,4,23,cse



step6:save and close

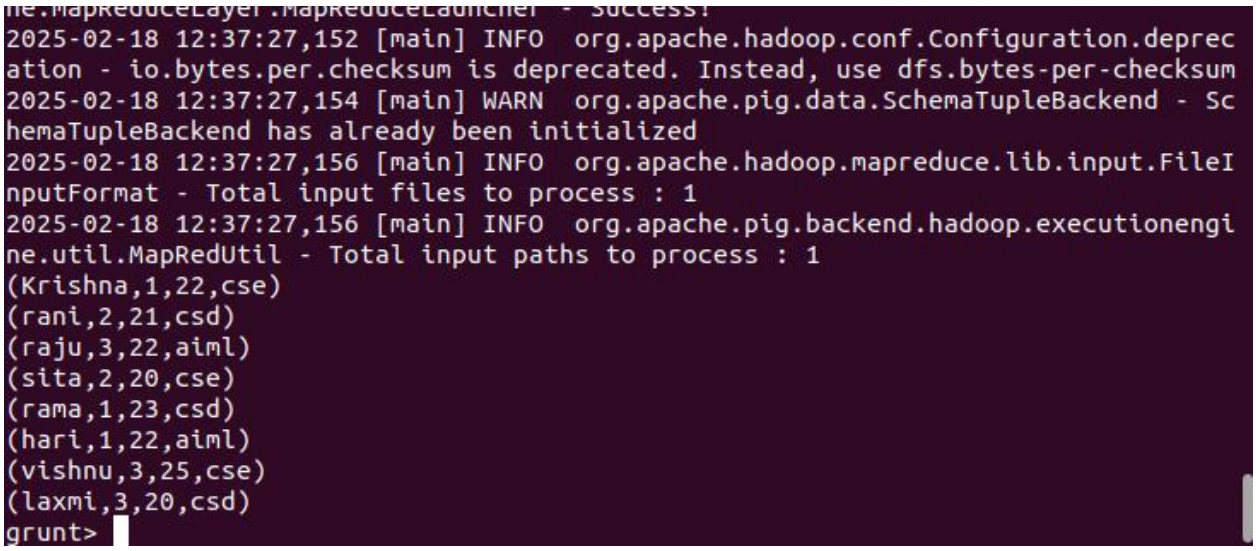
step7:start pig: pig –x local



step8:To load data from local system

mydata = LOAD '/home/student/pig/bin/studata.txt' USING PigStorage(',') AS (name:chararray, rollnumber:int, age:int, class:chararray);

step9:To dump the loaded data: dump mydata;



step10:to describe the data :describe mydata;

```
grunt> describe mydata;
mydata: {name: chararray,rollnumber: int,age: int,class: chararray}
grunt>
```

step11:Query 1: Grouping All Records Class.

(This command will group all the records by the column Class)

Step12:grunt> studentsbranch = GROUP mydata BY class;

To see the output

Step13: dump studentsbranch;

```
e.util.MapRedUtil - Total input paths to process : 1
csd,{(laxmi,3,20,csd),(rama,1,23,csd),(rani,2,21,csd)})
cse,{(vishnu,3,25,cse),(sita,2,20,cse),(Krishna,1,22,cse)})
aiml,{(hari,1,22,aiml),(raju,3,22,aiml)})
runt>
```

Step14: To store data into local system

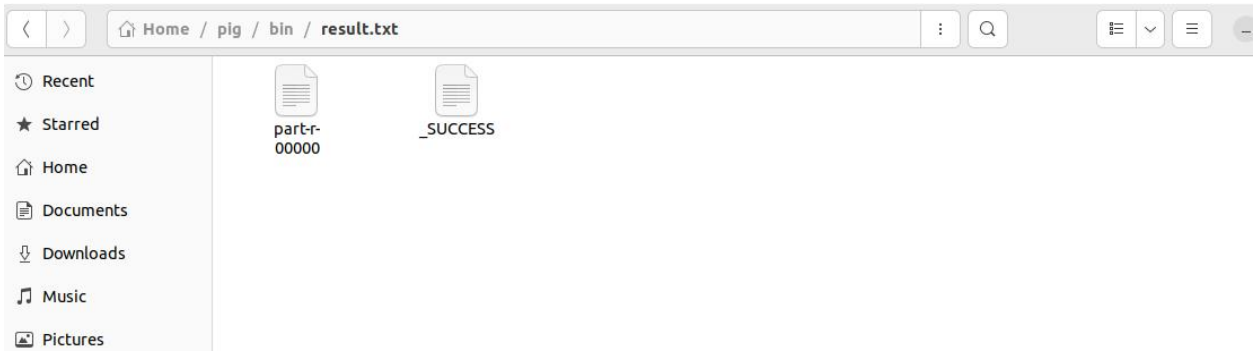
STORE studentsbranch INTO 'result.txt' USING PigStorage(',');

```
Counters:
Total records written : 3
Total bytes written : 0
Spillable Memory Manager spill count : 0
Total bags proactively spilled: 0
Total records proactively spilled: 0

Job DAG:
job_local1719705260_0006


2025-02-18 12:42:00,982 [main] WARN  org.apache.hadoop.metrics2.impl.MetricsSyst
emImpl - JobTracker metrics system already initialized!
2025-02-18 12:42:00,983 [main] WARN  org.apache.hadoop.metrics2.impl.MetricsSyst
emImpl - JobTracker metrics system already initialized!
2025-02-18 12:42:00,984 [main] WARN  org.apache.hadoop.metrics2.impl.MetricsSyst
emImpl - JobTracker metrics system already initialized!
2025-02-18 12:42:00,985 [main] INFO  org.apache.pig.backend.hadoop.executionengi
ne.mapReduceLayer.MapReduceLauncher - Success!
grunt>
```

Step15: see the output in bin folder select the output txt the open part-r-00000



Experiment-5

Aim: Perform Social media analysis using Cassandra.
Require Software& Tools: Hadoop in Ubuntu, VM ware work station,Cassandra

Procedure: below imp queries of cassandra

Step1: cqlsh> CAPTURE '/home/hadoop/CassandraProgs/Outputfile'
Step2: cqlsh:tutorialspoint> select * from emp;
Step3: cqlsh:tutorialspoint> capture off;
Step4: cqlsh:tutorialspoint> CONSISTENCY
Step5: cqlsh:tutorialspoint> COPY emp (emp_id, emp_city, emp_name, emp_phone,emp_sal)
TO ‘myfile’;
Step6: cqlsh:tutorialspoint> describe cluster;
Step7: cqlsh:tutorialspoint> describe keyspaces;
Step8: cqlsh:tutorialspoint> describe table emp;
Step9: cqlsh:tutorialspoint> describe type card_details;
Step10: cqlsh:tutorialspoint> DESCRIBE TYPES;

Step11: cqlsh:tutorialspoint> expand on;
cqlsh:tutorialspoint> select * from emp;
cqlsh:tutorialspoint> expand off;
Step12: cqlsh:tutorialspoint> source '/home/hadoop/CassandraProgs/inputfile';

SOURCECODE AND OUTPUT:

Performing social media analysis using **Apache Cassandra** involves storing and processing large volumes of social media data efficiently. Cassandra is a distributed NoSQL database that is highly scalable and fault-tolerant, which makes it ideal for storing social media data like posts, comments, likes, and user interactions. Let's go through a step-by-step example of how to perform social media analysis using Cassandra.

Step 1: Set Up Cassandra

Before we start, ensure that Apache Cassandra is installed and running on your system. You can download it from the official website or use Docker to quickly set up a Cassandra container.

docker run --name cassandra -d -p 9042:9042 cassandra:latest

This will start a Cassandra instance that listens on port 9042, the default port for CQL (Cassandra Query Language).

Step 2: Design the Data Model

For social media analysis, we need to design an appropriate data model. Social media data generally includes posts, comments, likes, and user data. In Cassandra, data modeling is key, as it is optimized for fast writes and specific query patterns.

Let’s consider a simplified example of the following social media data:

1. **User Table:** User profile details (e.g., user_id, name, email).
2. **Posts Table:** Posts by users (e.g., post_id, user_id, content, timestamp).
3. **Comments Table:** Comments on posts (e.g., comment_id, post_id, user_id, content, timestamp).
4. **Likes Table:** Likes on posts (e.g., post_id, user_id, timestamp).

Step 3: Create Keyspaces and Tables in Cassandra

Once Cassandra is set up, we can create a keyspace and the necessary tables for storing social media data.

Create Keyspace

In Cassandra, a **keyspace** is similar to a database in relational systems. We can create a keyspace with the following command in CQL (Cassandra Query Language):

CREATE KEYSPACE social_media

WITH replication = {'class': 'SimpleStrategy', 'replication_factor': 1};

his command creates a keyspace named social_media with a replication factor of 1. In production, you might want to adjust the replication factor based on fault tolerance needs.

Create Tables

Now, let's create the necessary tables to store social media data.

Create User Table:

```
CREATE TABLE social_media.users (
   user_id UUID PRIMARY KEY,
   name TEXT,
   email TEXT
);
```

Create Posts Table:

```
CREATE TABLE social_media.posts (
   post_id UUID PRIMARY KEY,
   user_id UUID,
   content TEXT,
   timestamp TIMESTAMP
);
```

Create Comments Table:

```
CREATE TABLE social_media.comments (
   comment_id UUID PRIMARY KEY,
   post_id UUID,
   user_id UUID,
   content TEXT,
   timestamp TIMESTAMP
);
```

Create Likes Table:

```
CREATE TABLE social_media.likes (
   post_id UUID,
   user_id UUID,
   timestamp TIMESTAMP,
   PRIMARY KEY (post_id, user_id)
);
```

Step 4: Insert Data

Now that the tables are created, let's insert some sample data into them.

Insert Users:

```
INSERT INTO social_media.users (user_id, name, email) VALUES (uuid(), 'Alice', 'alice@example.com');

INSERT INTO social_media.users (user_id, name, email) VALUES (uuid(), 'Bob', 'bob@example.com');
```

Insert Posts:

```
INSERT INTO social_media.posts (post_id, user_id, content, timestamp) VALUES (uuid(),
<user_id_Alice>, 'This is Alice\'s first post!', toTimestamp(now()));
```

INSERT INTO social_media.posts (post_id, user_id, content, timestamp) VALUES (uuid(), <user_id_Bob>, 'This is Bob\'s first post!', toTimestamp(now()));

Insert Comments:

INSERT INTO social_media.comments (comment_id, post_id, user_id, content, timestamp) VALUES (uuid(), <post_id_1>, <user_id_Bob>, 'Great post, Alice!', toTimestamp(now()));

INSERT INTO social_media.comments (comment_id, post_id, user_id, content, timestamp) VALUES (uuid(), <post_id_2>, <user_id_Alice>, 'Thanks for the post, Bob!', toTimestamp(now()));

Insert Likes:

INSERT INTO social_media.likes (post_id, user_id, timestamp) VALUES (<post_id_1>, <user_id_Bob>, toTimestamp(now()));

INSERT INTO social_media.likes (post_id, user_id, timestamp) VALUES (<post_id_2>, <user_id_Alice>, toTimestamp(now()));

Get Posts by User:

SELECT * FROM social_media.posts WHERE user_id = <user_id_Alice>;

This will return all posts made by Alice.

Get Comments on a Post:

SELECT * FROM social_media.comments WHERE post_id = <post_id_1>;

This will return all comments for a particular post.

Get Likes on a Post:

SELECT * FROM social_media.likes WHERE post_id = <post_id_1>;

This will return all users who liked a particular post.

Advanced Analysis

For more complex analysis, such as finding the most liked posts or analyzing the sentiment of comments, you can use additional tools alongside Cassandra.

- **Apache Spark:** You can integrate **Apache Spark** with Cassandra for large-scale data processing and advanced analytics, such as aggregations, sentiment analysis, or recommendations.
- **Machine Learning Models:** You can apply machine learning algorithms to analyze user behavior, predict trends, or classify posts/comments.

For example, to calculate the most liked posts:

```
SELECT post_id, COUNT(user_id) AS likes_count
FROM social_media.likes
GROUP BY post_id
ORDER BY likes_count DESC;
```

However, as Cassandra doesn't support complex aggregation queries like SQL databases, tools like **Apache Spark** are typically used to process the data and perform such analysis.

Visualize the Results

Once the data has been queried and processed, you can visualize the results using tools like:

- **Apache Superset**
- **Tableau**
- **Power BI**

These tools can be connected to Cassandra or Apache Spark to create dashboards for monitoring social media trends, user engagement, and more.

Experiment-6

Aim: To perform the buyer event analysis using Cassandra on sales data

Require Software& Tools: Hadoop in Ubuntu, VM ware work station, Cassandra

Procedure: **Step 1: Setting Up Apache Cassandra**

Before starting with the analysis, ensure that you have Apache Cassandra installed and running. If you don't have it installed, download and follow the installation guide.

Step 2: Data Modeling for Sales Data

Sales data typically includes information such as:

- **Sale ID** (Unique identifier for the sale)
- **Buyer ID** (Unique identifier for the buyer)
- **Item ID** (Product purchased)
- **Quantity** (Amount of the product bought)
- **Price** (Price of the product)
- **Timestamp** (When the sale occurred)

For the purpose of analysis, you might want to store the data in a way that allows you to quickly query buyer behavior.

Example Schema Design:

In Cassandra, it's important to design your tables based on the queries you intend to perform. For buyer event analysis, you might want to track the sales per buyer or analyze buyer activity over time.

Table 1: sales_by_buyer

This table will store sales data for each buyer.

```
CREATE TABLE sales_by_buyer (
    buyer_id UUID,
    sale_id UUID,
    item_id UUID,
    quantity INT,
    price DECIMAL,
    timestamp TIMESTAMP,
    PRIMARY KEY (buyer_id, timestamp, sale_id)
);
```

Explanation:

- buyer_id: Partition key, ensures that data is grouped by buyer.
- timestamp: Clustering key to store sales chronologically per buyer.
- sale_id: Uniquely identifies each sale for a buyer.

Table 2: sales_by_item

This table stores sales data per item, allowing you to track item-specific buyer events.

```
    CREATE TABLE sales_by_item (
```

```
    item_id UUID,
    sale_id UUID,
    buyer_id UUID,
    quantity INT,
    price DECIMAL,
    timestamp TIMESTAMP,
    PRIMARY KEY (item_id, timestamp, sale_id)
);
```

Step 3: Insert Sales Data into Cassandra

Once your tables are set up, you can insert sample sales data into the tables using INSERT INTO.

Sample Query to Insert Data:

```
INSERT INTO sales_by_buyer (buyer_id, sale_id, item_id, quantity, price, timestamp)
VALUES (uuid(), uuid(), uuid(), 2, 100.50, toTimestamp(now()));

INSERT INTO sales_by_item (item_id, sale_id, buyer_id, quantity, price, timestamp)
VALUES (uuid(), uuid(), uuid(), 2, 100.50, toTimestamp(now()));
```

You can repeat this process to insert multiple rows.

Step 4: Perform Analysis Queries

1. Retrieve Total Sales per Buyer

You can query the sales_by_buyer table to get the total sales for a specific buyer.

```
SELECT buyer_id, SUM(quantity * price) AS total_spent
FROM sales_by_buyer
WHERE buyer_id = <specific_buyer_id>
GROUP BY buyer_id;
```

2. Find All Purchases for a Specific Buyer

If you want to analyze the buying pattern of a specific buyer, you can retrieve all of their purchases.

```
SELECT sale_id, item_id, quantity, price, timestamp
FROM sales_by_buyer
```

WHERE buyer_id = <specific_buyer_id>;

3. Find Popular Items

To find out which items are being bought the most across all buyers, you can query the sales_by_item table.

SELECT item_id, SUM(quantity) AS total_sold

FROM sales_by_item

GROUP BY item_id

ORDER BY total_sold DESC;

4. Find Buyers Who Purchased a Specific Item

If you're interested in finding which buyers bought a specific item, you can query the sales_by_item table.

SELECT buyer_id, sale_id, quantity, price, timestamp

FROM sales_by_item

WHERE item_id = <specific_item_id>;

Step 5: Analyze Buyer Events Using Aggregations

After querying the data, you may want to perform aggregations on the results.

1. Buyer Retention Analysis

You can group buyers by their last purchase timestamp to check for repeat buyers. For example, buyers who made a purchase within the last 30 days are considered retained.

SELECT buyer_id, MAX(timestamp) AS last_purchase

FROM sales_by_buyer

GROUP BY buyer_id

HAVING MAX(timestamp) > toTimestamp(now()) - 30;

2. Frequent Buyers

Find the top N buyers who have made the most purchases:

SELECT buyer_id, COUNT(sale_id) AS purchase_count

FROM sales_by_buyer

```
GROUP BY buyer_id

ORDER BY purchase_count DESC

LIMIT 10;
```

3. Item Purchase Analysis

Analyze which buyers tend to buy specific combinations of items:

```
SELECT buyer_id, item_id, SUM(quantity) AS total_quantity

FROM sales_by_buyer

WHERE item_id IN (<item_id1>, <item_id2>)

GROUP BY buyer_id, item_id;
```

Step 6: Visualize the Data

While Cassandra is great for handling large-scale data, you may want to visualize the results using a tool like **Apache Spark** with **Cassandra Connector** or use an external tool like **Tableau** or **Grafana** for better insights.

Example Visualization:

- **Total spending by each buyer** could be visualized as a bar chart.
- **Most purchased items** could be visualized as a pie chart.
- **Buyer retention** could be visualized as a line graph over time.

Step 7: Optimization & Scaling

For large-scale data, consider:

- **Data Modeling**: Proper design of partition keys and clustering keys ensures efficient querying.
- **Indexing**: Use secondary indexes carefully as they may not be ideal for large datasets. Consider using **Materialized Views** or **Search** in Elasticsearch for more complex querying.

Step 8: Output & Results

When querying the tables as shown in the previous steps, you will get output that looks like this (the exact results depend on your inserted data):

Output Example 1: Total Sales per Buyer

```
diff                                                    Copy

buyer_id                                | total_spent
----------------------------------------/-------------
e45b9f0f-132b-45fe-a05f-cd9bb5622b5e    | 500.25
```

Output Example 2: Popular Items

```
diff                                                    Copy

item_id                                 | total_sold
----------------------------------------/-------------
b8a39d50-b5ec-4f87-bb67-21d42d75a3f5    | 150
```

Output Example 3: Frequent Buyers

```
diff                                                    Copy

buyer_id                                | purchase_count
----------------------------------------/-------------
c31d8ab9-0e2b-4e9d-b520-5451206bc3d4    | 5
```

Experiment-7

Aim: Using Power Pivot (Excel) Perform the following on any dataset:

a) Big Data Analytics b) Big Data Charting

Require Software& Tools: Ubuntu, VM ware work station, Libre office Calc

Procedure:

1. Open Ubuntu

2.start libra office calc

3. got to file -> open -> load data to libra office calc

4. Formatting date using function

5. Go to cell D -> right click and inser column before

New column will be created

Name it as “Formatted Dates”

6. Formula for converting date dd/mm/yyyy to date month year

=TEXT(C2,”d mmmm yyyy”)

7. Upon cell D -> right click and insert column after

New column will be created

Name it as “Year”

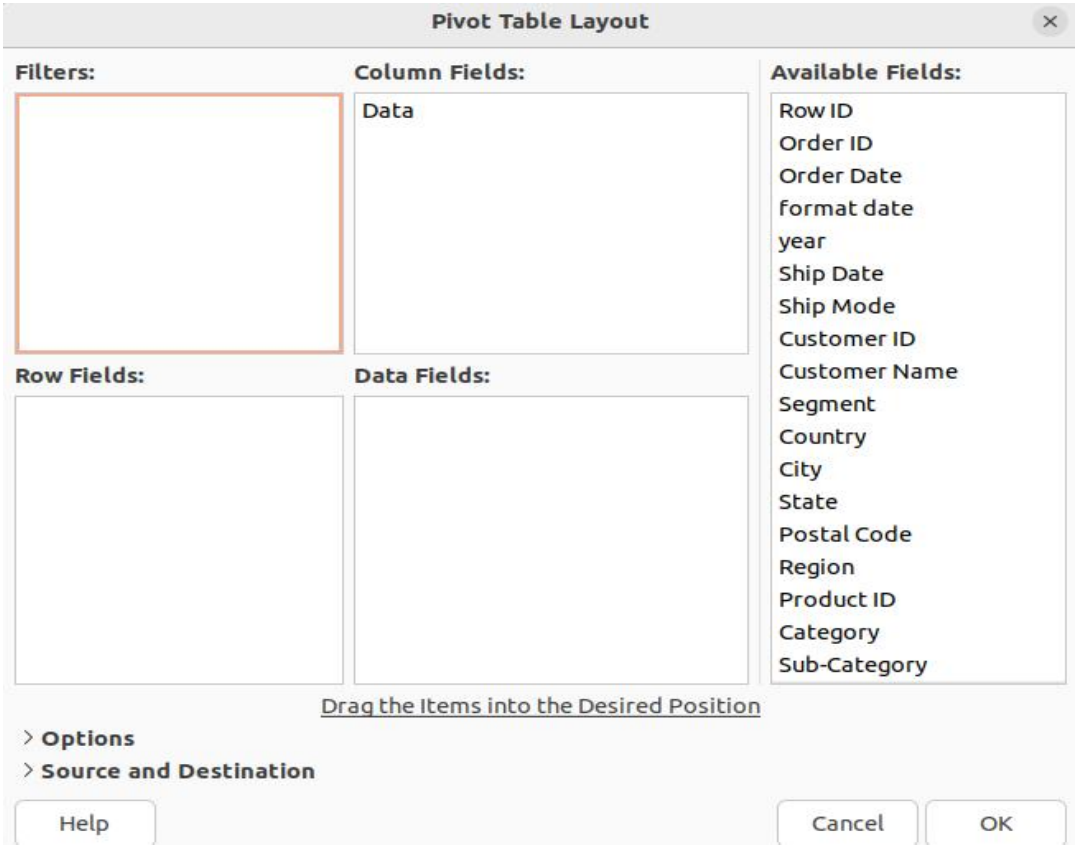
8.Select E column -> data -> sort ascending then click on extend selection an click on ok

Data Analysis:

- Which category of products with the highest sales?
- Which sub-category has the highest sales?
- Which region drives the most sales to this super store?

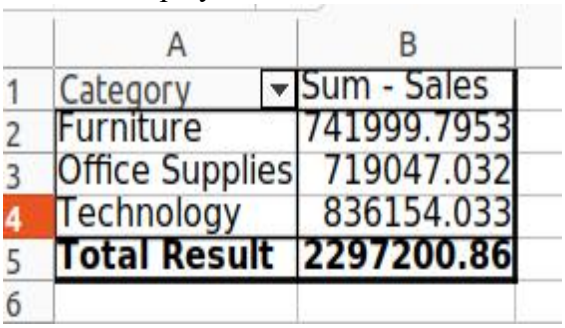
Pivot Tables and Charts:

- Which category of products with the highest sales?
    1. Select data tab and go to pivot table (insert or edit) select source current selection then click on ok



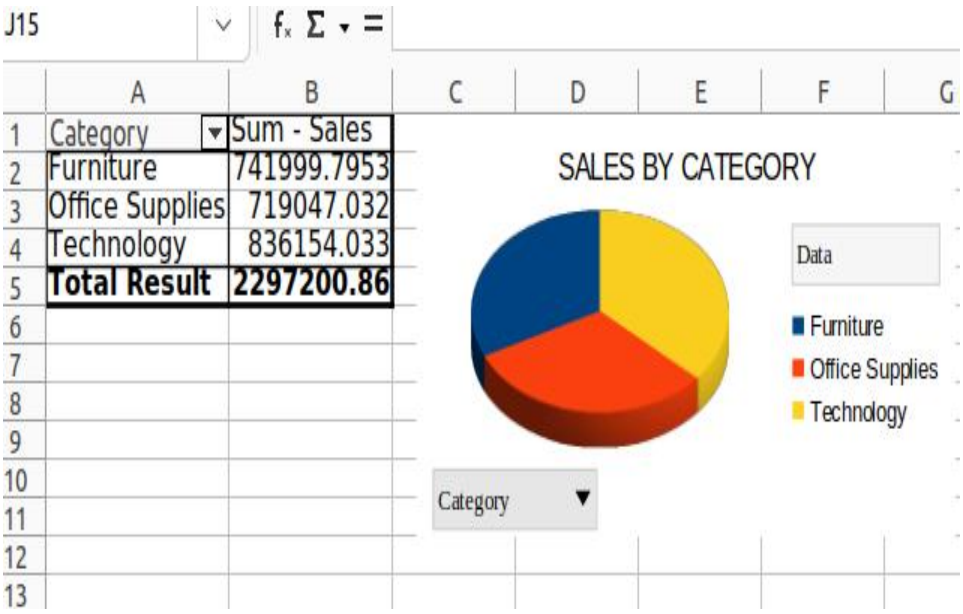
2. Drag category into row fileds and sales into data fileds then click on ok

3. It will be display like this



	A	B
1	Category	Sum - Sales
2	Furniture	741999.7953
3	Office Supplies	719047.032
4	Technology	836154.033
5	**Total Result**	**2297200.86**
6		

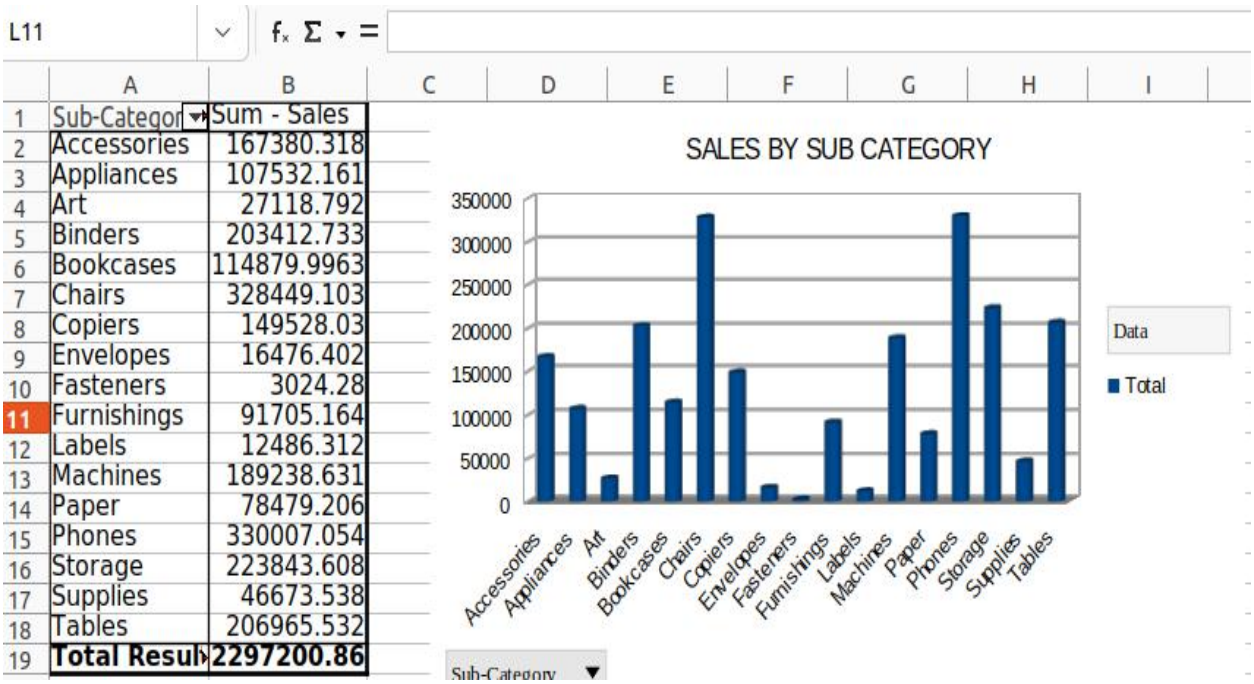
4. Go to insert >chart>pie>3D look creat tittle name “sales by catogory”



- Which sub-category has the highest sales

Drag sub-category into row fileds and sales into data fileds then click on ok

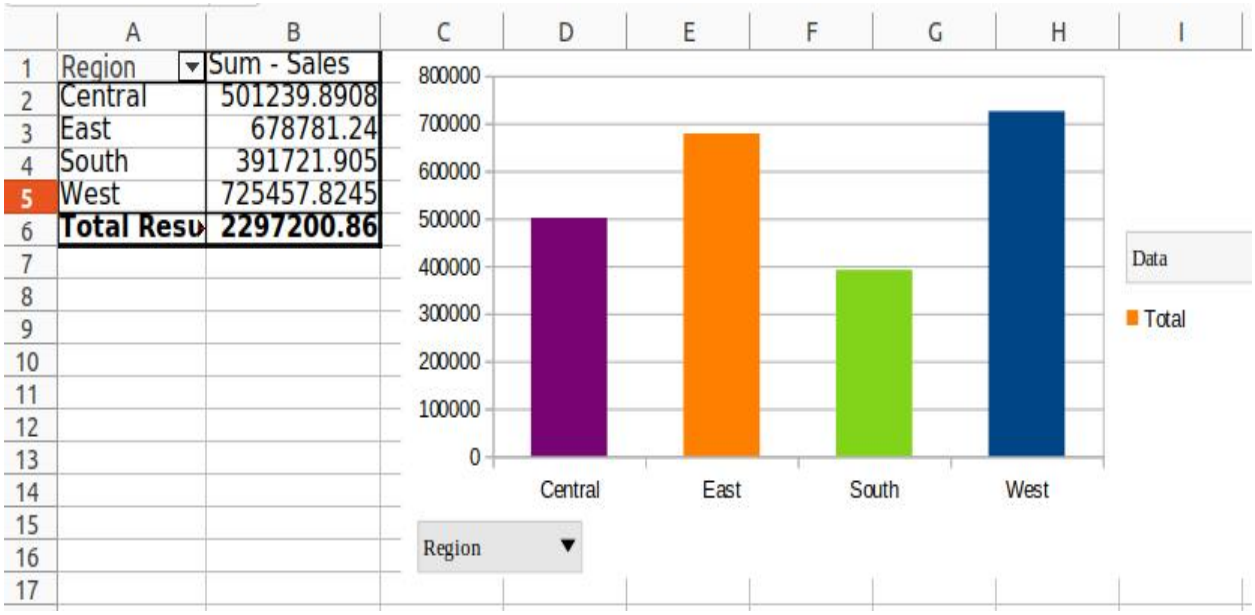
Go to insert >chart>bar chart>3D look creat tittle name “sales by sub-catogory”



Which region drives the most sales to this super store.

Drag region into row fileds and sales into data fileds then click on ok

Go to insert >chart>bar chart>3D look creat tittle name “sales by region”



:

Experiment-8

AIM: Implement one of the following case studies using big data analytics:

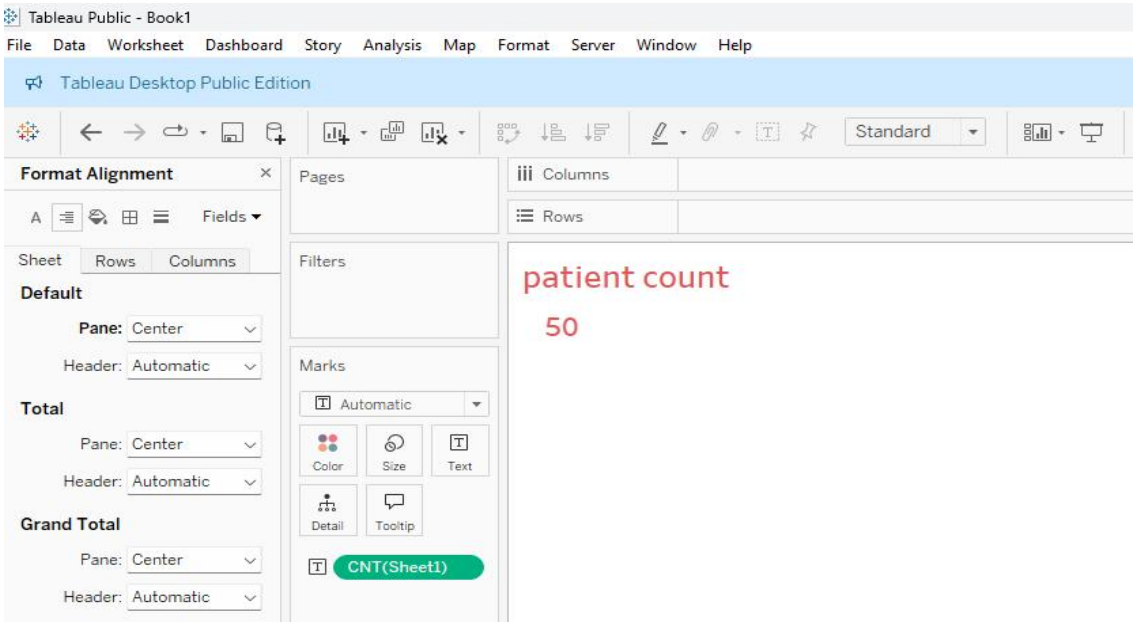
a) Healthcare Data b) Web Clickstream Data

c) Social Media Data d) Educational Data

Require Software& Tools: Tableau Public

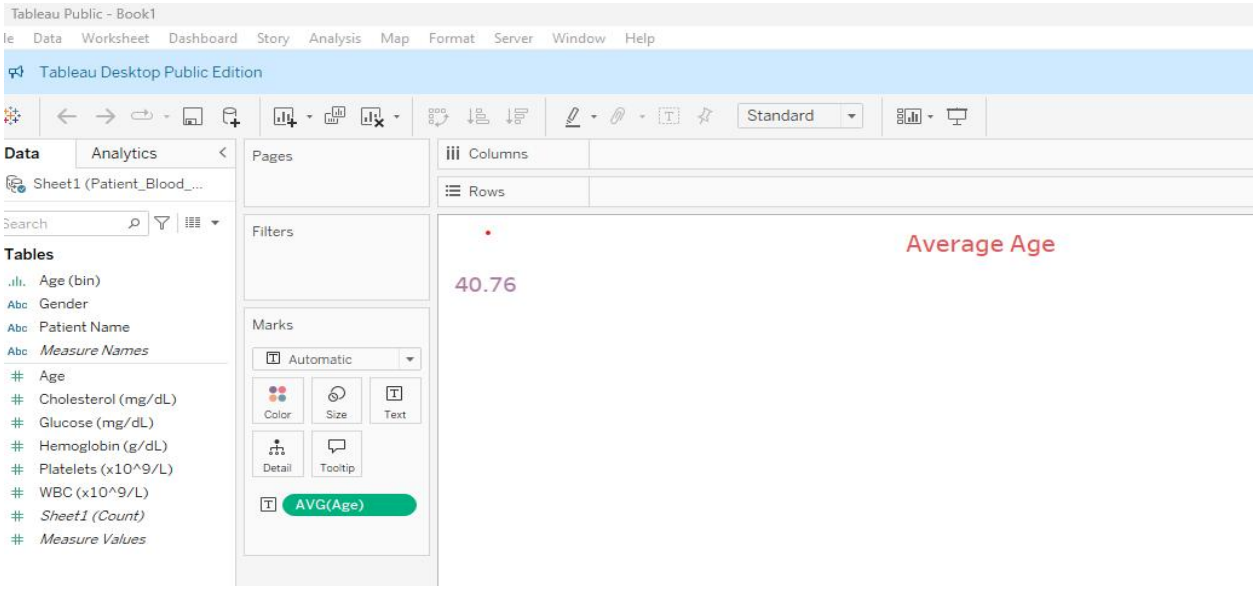
Procedure: step:-1

- Open tableau public and insert the exel sheet data (pateint_blood_test)
- Create new sheet and rename as **patient count** ,set the font style,size,color
- Drag sheet1(count) to rows then select text table
- Right click on count(50) format select worksheet -> change font color and size
  Then go to allignment -> pane-> center



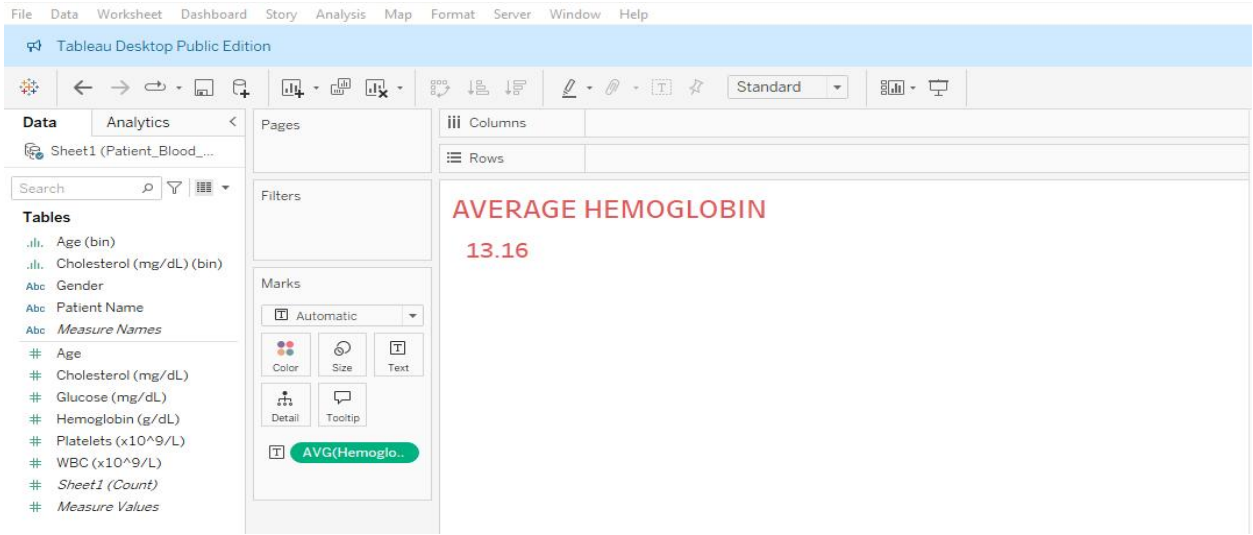
step:-2

- Duplicat **patient count and** rename **avarage age**
- Remove previous sheet count by draging left side of the screen
- Drag age to rows and convert SUM(age) to AVG(age)
- Right click on **avarage age** format select worksheet -> change font color and size
  Then go to allignment -> pane-> center



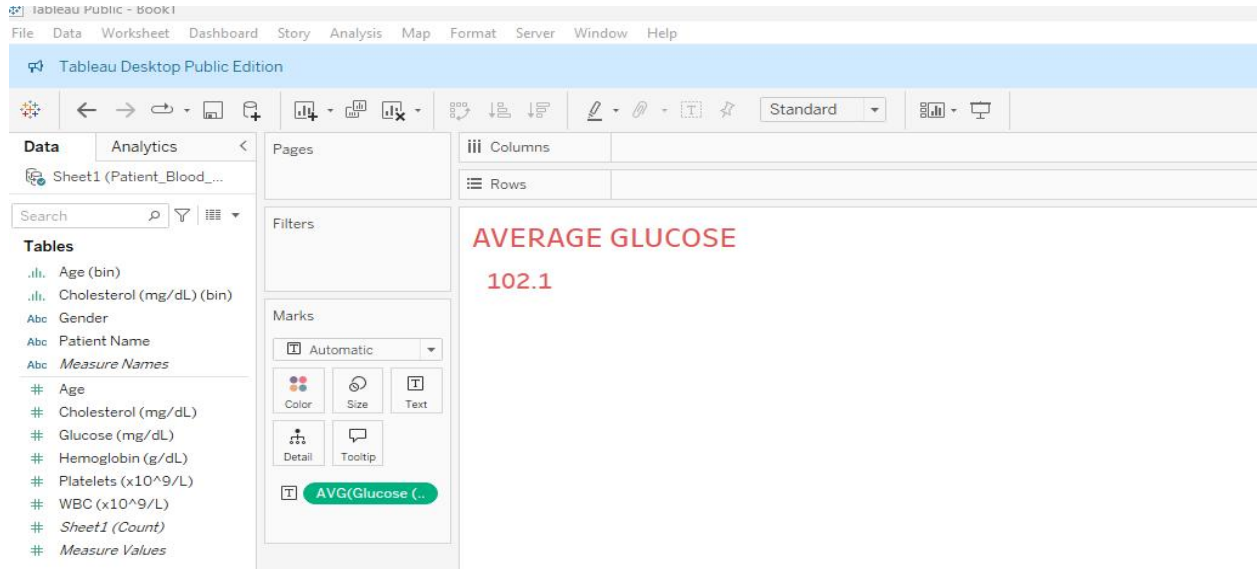
STEP 3:

- Duplicat **average age and** rename **avarage Hemoglobin**
- Remove previous sheet average age by draging left side of the screen
- Drag age to rows and convert SUM(Hemoglobin) to AVG(Hemoglobin)
- Right click on **avarage Hemoglobin** format select worksheet -> change font color and size Then go to allignment -> pane-> center



Step:-4

- Duplicate **average Hemoglobin and** rename **average Glucose**
- Remove previous sheet average Hemoglobin by draging left side of the screen
- Drag age to rows and convert SUM(Glucose) to AVG(Glucose)
- Right click on **avarage Glucose** format select worksheet -> change font color and size Then go to allignment -> pane-> center



Step:-5

- Click on dash board symbol.
- Click on objects->Text and type Patient blood test analysis dash board.
- Right Click on patient blood test analysis dash board ->size-> change maximum size to 950px
- Drag from sheets paitent count,average age, average hemoglobin,average Glucose .
- Select patient count window and right click and select fit-> fit width
- Select Average age window and right click and select fit-> fit width
- Select Average Hemoglobin window and right click and select fit-> fit width
- Select Average Glucose window and right click and select fit-> fit width

Step:6

- Select new sheet and name it as count of patient by gender
- Drag Gender to columns and Sheet1(count) to rows
- Select pie chart
- To label the pie chart drag gender to label and sheet1 (count) to label.
- Go to dash board and from sheets drag patient by gender to the down of the Patient count.

Step 7:- Select new sheet and name it as Age Distribution.

- Drag Age to columns and Sheet1(count) to rows
- And select histogram
- Left hand side table click on Age(bin)->edit-> change the bin size to 10.
- Go to dash board and from sheets drag Age distribution to the down of the Avg age.

Step 8:- Select new sheet and name it as WBC VS PATELETS

- Drag platelets to columns and WBC to rows or vice versa
- Select Scatter plots

- Go to Analysis on menu bar-->Aggregate measures
- Go to Analysis on menu bar-->trend lines-->show trend lines
- Go to dash board and from sheets drag WBC VS PATELETS to the down of the avg hemoglobin.

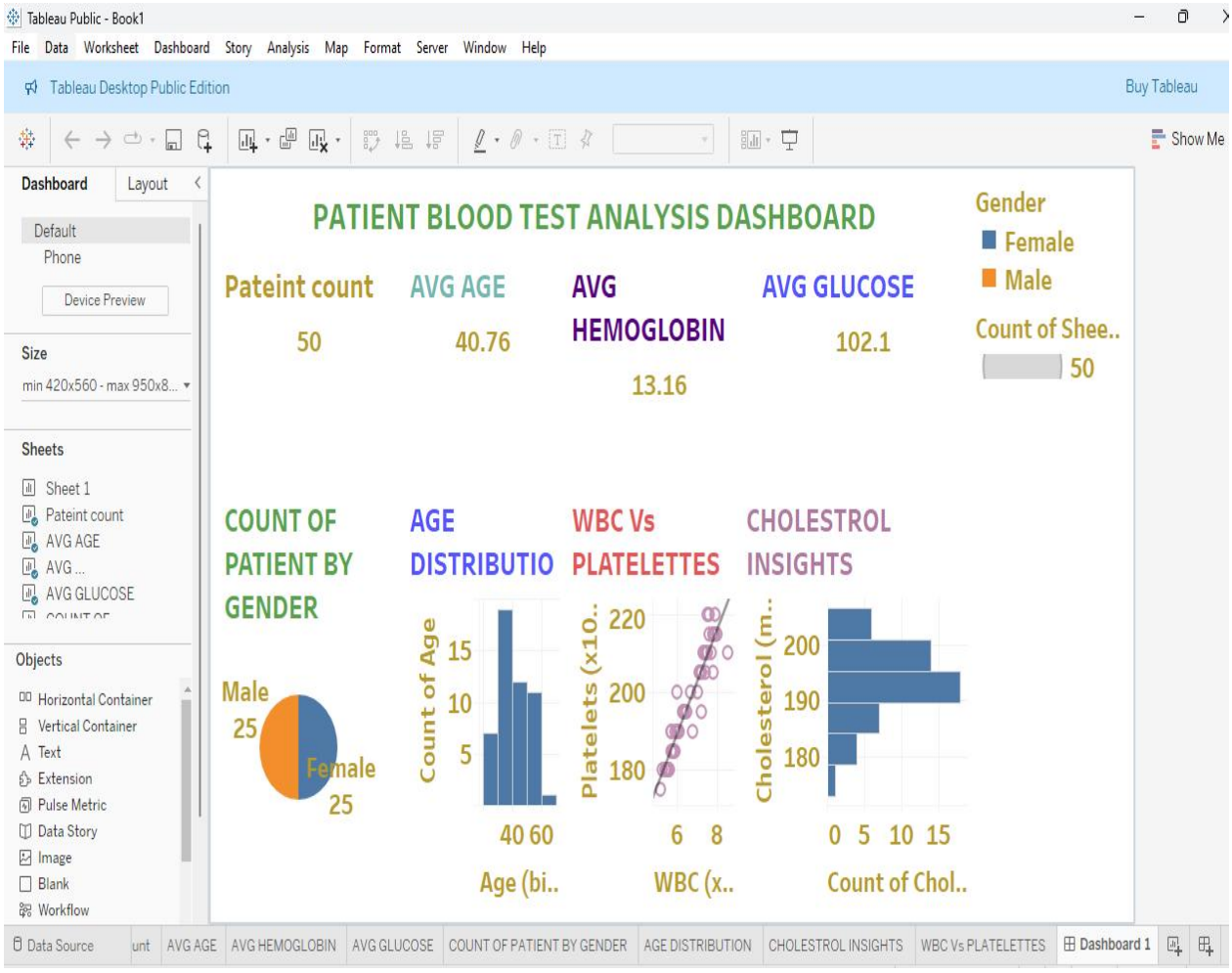
Step 9:- Select age distribution sheet and rename it as cholesterol insights

- Drag cholesterol to columns

- Select histogram and click on swap rows and column symbol 

Go to dash board and from sheets drag cholesterol insights to the down of the avg glucose.

Out put:



Experiment-9

AIM: Extract Sample document and apply following document preprocessing methods: Tokenization, POS Tagging, stop words removal, Stemming and Lemmatization.

Require Software& Tools: Hadoop in Ubuntu, VM ware work station,Power Pivot(Excel)

PROCEDURE:

To implement a Python program that reads text from a file and applies the following preprocessing techniques:

1. Tokenization
2. POS Tagging
3. Stop Words Removal
4. Stemming
5. Lemmatization

In Natural Language Processing (NLP), text preprocessing is an essential step that ensures raw data is prepared for analysis. The steps involved are:

1. Tokenization: Breaking the text into smaller meaningful units such as words or sentences.
2. POS Tagging: Identifying the part of speech (e.g., noun, verb, adjective) for each token in the text.
3. Stop Words Removal: Removing common words (e.g., *is*, *the*, *and*) that are not significant for the analysis.
4. Stemming: Reducing words to their root form (e.g., *running* → *run*).
5. Lemmatization: Converting words to their dictionary form (e.g., *better* → *good*), considering grammar and context.

Process

1. Step 1: Install and import the required libraries (nltk, python-docx).
2. Step 2: Define a function to read text from a .docx file.
3. Step 3: Apply tokenization to the text.
4. Step 4: Perform POS tagging on the tokens.
5. Step 5: Remove stop words using NLTK's predefined stop words list.
6. Step 6: Apply stemming using the Porter Stemmer algorithm.

7. Step 7: Apply lemmatization using WordNet Lemmatizer.
8. Step 8: Print the results for each preprocessing step.

Code:

```
import nltk
from nltk.tokenize import word_tokenize
from nltk import pos_tag
from nltk.stem import PorterStemmer
from nltk.corpus import stopwords
from nltk.stem import WordNetLemmatizer
```

```
x = open("testdoc.txt").read()
```

```
x
```

```
'Artificial Intelligence (AI) & Machine Learning (ML):\n\n    Involves developing systems that can perform task
s that normally require human intelligence, like speech recognition, image processing, and decision-making.\n\n
Applications: Healthcare, self-driving cars, finance, robotics.\n\nBig Data and Data Analytics:\n\n    Involves
processing large sets of data to extract useful insights and patterns.\n\n    Tools: Hadoop, Spark, Tableau, Py
thon (pandas, numpy).'
```

```
import nltk
nltk.download('punkt_tab')
```

```
[nltk_data] Downloading package punkt_tab to /root/nltk_data...
[nltk_data]   Package punkt_tab is already up-to-date!
True
```

```
#Tokenization
tokens = word_tokenize(x)
print(tokens)

'Artificial', 'Intelligence', '(', 'AI', ')', '&', 'Machine', 'Learning', '(', 'ML', ')', ':', 'Involves', 'developing',
'systems', 'that', 'can', 'perform', 'tasks', 'that', 'normally', 'require', 'human', 'intelligence', ',', 'like',
'speech', 'recognition', ',', 'image', 'processing', ',', 'and', 'decision-making', '.', 'Applications', ':',
'Healthcare', ',', 'self-driving', 'cars', ',', 'finance', ',', 'robotics', '.', 'Big', 'Data', 'and', 'Data', 'Analytics',
':', 'Involves', 'processing', 'large', 'sets', 'of', 'data', 'to', 'extract', 'useful', 'insights', 'and', 'patterns', '.',
'Tools', ':', 'Hadoop', ',', 'Spark', ',', 'Tableau', ',', 'Python', '(', 'pandas', ',', 'numpy', ')', '.']

import nltk
nltk.download('averaged_perceptron_tagger_eng')
[nltk_data] Downloading package averaged_perceptron_tagger_eng to
[nltk_data]     /root/nltk_data...
[nltk_data]   Package averaged_perceptron_tagger_eng is already up-to-
[nltk_data]       date!
True
#POS Tagging
postags = pos_tag(tokens)
print(postags)
```

25. [('Artificial', 'JJ'), ('Intelligence', 'NNP'), ('(', '('), ('AI', 'NNP'), (')', ')'), ('&', 'CC'), ('Machine', 'NNP'), ('Learning', 'NNP'), ('(', '('), ('ML', 'NNP'), (')', ')'), (':', ':'), ('Involves', 'VBZ'), ('developing', 'VBG'), ('systems', 'NNS'), ('that', 'WDT'), ('can', 'MD'), ('perform', 'VB'), ('tasks', 'NNS'), ('that', 'WDT'), ('normally', 'RB'), ('require', 'VBP'), ('human', 'JJ'), ('intelligence', 'NN'), (',', ','), ('like', 'IN'), ('speech', 'NN'), ('recognition', 'NN'), (',', ','), ('image', 'NN'), ('processing', 'NN'), (',', ','), ('and', 'CC'), ('decision-making', 'NN'), ('.', '.'), ('Applications', 'NNS'), (':', ':'), ('Healthcare', 'NNP'), (',', ','), ('self-driving', 'JJ'), ('cars', 'NNS'), (',', ','), ('finance', 'NN'), (',', ','), ('robotics', 'NNS'), ('.', '.'), ('Big', 'NNP'), ('Data', 'NNP'), ('and', 'CC'), ('Data', 'NNP'), ('Analytics', 'NNS'), (':', ':'), ('Involves', 'VBZ'), ('processing', 'VBG'), ('large', 'JJ'), ('sets', 'NNS'), ('of', 'IN'), ('data', 'NNS'), ('to', 'TO'), ('extract', 'VB'), ('useful', 'JJ'), ('insights', 'NNS'), ('and', 'CC'), ('patterns', 'NNS'), ('.', '.'), ('Tools', 'NNS'), (':', ':'), ('Hadoop', 'NNP'), (',', ','), ('Spark', 'NNP'), (',', ','), ('Tableau', 'NNP'), (',', ','), ('Python', 'NNP'), ('(', '('), ('pandas', 'NN'), (',', ','), ('numpy', 'RB'), (')', ')'), ('.', '.')]
26. #Removing stop words
27. stop_words = set(stopwords.words('english'))
28. print(stop_words)
29.
30. {'when', 'your', "doesn't", 'at', 'mustn', 'until', 'these', 'own', "that'll", 'for', 'isn', 'what', 'nor', 'how', 'did', 's', "you're", 'yourselves', 'wouldn', 'same', 'those', 'below', 'about', "they're", 'but', 'only', 'was', "needn't", 'will', 'so', 'weren', 'by', 'to', 'been', 'on', 'further', 'her', 'against', "shouldn't", 't', 'while', 'after', 'do', 'didn', 'again', 'being', 'ma', "you've", 'can', 'i', 'such', 'o', 'who', "they'll", 'his', 'does', 've', 'here', 'theirs', "don't", 'very', 'other', "wasn't", "we've", 'haven', "shan't", "haven't", "i'd", "hasn't", 'doesn', 'out', 'yours', 'because', 'that', "isn'
31. li = []
32. for words in tokens:
33.   if words not in stop_words:
34.   li.append(words)
35. print(li)
36.
37. 'Artificial', 'Intelligence', '(', 'AI', ')', '&', 'Machine', 'Learning', '(', 'ML', ')', ':', 'Involves', 'developing', 'systems', 'perform', 'tasks', 'normally', 'require', 'human', 'intelligence', ',', 'like', 'speech', 'recognition', ',', 'image', 'processing', ',', 'decision-making', '.', 'Applications', ':', 'Healthcare', ',', 'self-driving', 'cars', ',', 'finance', ',', 'robotics', '.', 'Big', 'Data', 'Data', 'Analytics', ':', 'Involves', 'processing', 'large', 'sets', 'data', 'extract', 'useful', 'insights', 'patterns', '.', 'Tools', ':', 'Hadoop', ',', 'Spark', ',', 'Tableau', ',', 'Python', '(', 'pandas', ',', 'numpy', ')', '.']

38. 0s

39. #Stemming
40. ps = PorterStemmer()
41. stemlist = []
42. for words in li:
43.   stemlist.append([words, ps.stem(words)])
44. print(stemlist)
45. ['Artificial', 'artifici'], ['Intelligence', 'intellig'], ['(', '('], ['AI', 'ai'], [')', ')'], ['&', '&'], ['Machine', 'machin'], ['Learning', 'learn'], ['(', '('], ['ML', 'ml'], [')', ')'], [':', ':'], ['Involves', 'involv'], ['developing', 'develop'], ['systems', 'system'], ['perform', 'perform'], ['tasks', 'task'], ['normally', 'normal'], ['require', 'requir'], ['human', 'human'], ['intelligence', 'intellig'], [',', ','], ['like', 'like'], ['speech', 'speech'], ['recognition', 'recognit'], [',', ','], ['image', 'imag'], ['processing', 'process'], [',', ','], ['decision-making',

'decision-mak'], ['.', '.'], ['Applications', 'applic'], [':', ':'], ['Healthcare', 'healthcar'], [',', ','], ['self-driving', 'self-driv'], ['cars', 'car'], [',', ','], ['finance

```
#Lemmatization
wl = WordNetLemmatizer()
lemilist = []
for words in li:
    lemilist.append([words, wl.lemmatize(words)])
print(lemilist)
```

['Artificial', 'Artificial'], ['Intelligence', 'Intelligence'], ['(', '('], ['AI', 'AI'], [')', ')'], ['&', '&'], ['Machine', 'Machine'], ['Learning', 'Learning'], ['(', '('], ['ML', 'ML'], [')', ')'], [':', ':'], ['Involves', 'Involves'], ['developing', 'developing'], ['systems', 'system'], ['perform', 'perform'], ['tasks', 'task'], ['normally', 'normally'], ['require', 'require'], ['human', 'human'], ['intelligence', 'intelligence'], [',', ','], ['like', 'like'], ['speech', 'speech'], ['recognition', 'recognition'], [',', ','], ['image', 'image'], ['processing', 'processing'], [',', ','], ['decision-making', 'decision-making'], ['.', '.'], ['Applications', 'Applications'], [':', ':'], ['Healthcare', 'Healthcare'], [',', ','], ['self-driving', 'self-driving'], ['cars', 'car'], [',', ','], ['finance', 'finance'], [',', ','], ['robotics', 'robotics'], ['.', '.'], ['Big', 'Big'], ['Data', 'Data'], ['Data', 'Data'], ['Analytics', 'Analytics'], [':', ':'], ['Involves', 'Involves'], ['processing', 'processing'], ['large', 'large'], ['sets', 'set'], ['data', 'data'], ['extract', 'extract'], ['useful', 'useful'], ['insights', 'insight'], ['patterns', 'pattern'], ['.', '.'], ['Tools', 'Tools'], [':', ':'], ['Hadoop', 'Hadoop'], [',', ','], ['Spark', 'Spark'], [',', ','], ['Tableau', 'Tableau'], [',', ','], ['Python', 'Python'], ['(', '('], ['pandas', 'panda'], [',', ','], ['numpy', 'numpy'], [')', ')'], ['.', '.']]

Experiment-10

AIM: Create representation of document by calculating Term Frequency and Inverse Document Frequency.

Require Software& Tools: Hadoop in Ubuntu, VM ware work station,Power Pivot(Excel)

PROCEDURE:

[10 .Create representation of document by calculating Term Frequency and Inverse Document Frequency.

Term Frequency-Inverse Document Frequency (TF-IDF) is a statistical measure used to evaluate the importance of a word in a document relative to a collection (or corpus) of documents. The formula for calculating TF-IDF is:

1. **Term Frequency (TF):**

$$TF(t,d) = \frac{f_t}{N}$$

where:

- f_t is the number of times term t appears in document d.
- N is the total number of terms in document d.

2. **Inverse Document Frequency (IDF):**

$$IDF(t) = \log\left(\frac{D}{df_t}\right)$$

where:

- D is the total number of documents.
- df_t is the number of documents containing term t.

3. **TF-IDF Score:**

$$TF\text{-}IDF(t,d) = TF(t,d) \times IDF(t)$$

```
from sklearn.feature_extraction.text import TfidfVectorizer

def compute_tfidf_from_file(file_path):
    # Open and read the file
    with open(file_path, 'r') as file:
        documents = file.readlines()

    # Create TF-IDF vectorizer and compute TF-IDF matrix
    vectorizer = TfidfVectorizer()
    tfidf_matrix = vectorizer.fit_transform(documents)
    feature_names = vectorizer.get_feature_names_out()

    # Print out the TF-IDF score for each word in each document
    for i, doc in enumerate(documents):
        print(f"Document {i + 1} TF-IDF scores:")
        for word, score in zip(feature_names, tfidf_matrix[i].toarray()[0]):
            if score > 0:  # Only print words with a non-zero score
```

```
            print(f"  {word}: {score:.4f}")
        print("\n")

# Example usage
file_path = "doc.txt"  # Replace this with the path to your text file
compute_tfidf_from_file(file_path)
```

Full Code:

python Copy

```python
from sklearn.feature_extraction.text import TfidfVectorizer

def compute_tfidf_from_file(file_path):
    # Open and read the file
    with open(file_path, 'r') as file:
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        for word, score in zip(feature_names, tfidf_matrix[i].toarray()[0]):
            if score > 0:  # Only print words with a non-zero score
                print(f"  {word}: {score:.4f}")
        print("\n")

# Example usage
file_path = "doc.txt"  # Replace this with the path to your text file
compute_tfidf_from_file(file_path)
```

1. **Importing the necessary library**:

```python
from sklearn.feature_extraction.text import TfidfVectorizer
```

- This line imports the **TfidfVectorizer** class from the `sklearn.feature_extraction.text` module. This class is used to convert a collection of text documents into a matrix of TF-IDF features. The **TF-IDF** stands for **Term Frequency-Inverse Document Frequency**, a statistical measure used to evaluate how important a word is in a collection of documents.

2. **Defining the `compute_tfidf_from_file` function**:

```python
def compute_tfidf_from_file(file_path):
```

- This line defines a function called `compute_tfidf_from_file` that takes a single argument, `file_path`, which is the location of the text file you want to analyze.

3. **Opening and reading the file**:

```python
    with open(file_path, 'r') as file:
        documents = file.readlines()
```

- `open(file_path, 'r')`: Opens the text file located at `file_path` in read mode (`'r'`).
- `with open(...) as file`: This ensures that the file is properly closed after reading, even if an error occurs during processing.
- `file.readlines()`: Reads all lines of the file and stores them in a list called `documents`. Each line in the file will be treated as a separate document.

4. **Creating a TF-IDF vectorizer**:

```python
    vectorizer = TfidfVectorizer()
```

- This line creates an instance of `TfidfVectorizer` called `vectorizer`. This vectorizer will be used to convert the collection of text documents into a matrix of TF-IDF features.

5. **Computing the TF-IDF matrix**:

```
python                                                    Copy
    tfidf_matrix = vectorizer.fit_transform(documents)
```

- `vectorizer.fit_transform(documents)` : This line does two things:
  1. `fit` : It learns the vocabulary of the documents and the term frequency-inverse document frequency (TF-IDF) values for each word.
  2. `transform` : It converts the documents into a matrix where each row represents a document, and each column represents a term (word). The values in the matrix are the TF-IDF scores for each word in the corresponding document.
- The result, `tfidf_matrix` , is a sparse matrix that stores the TF-IDF values for each word in each document.

6. **Getting the list of feature names (words)**:

```
python                                                    Copy
    feature_names = vectorizer.get_feature_names_out()
```

- `vectorizer.get_feature_names_out()` : This method returns the list of words (features) that the vectorizer has learned from the documents. These are the terms (words) that appear in the documents and are used to calculate the TF-IDF scores.

7. **Looping through each document**:

```python
for i, doc in enumerate(documents):
    print(f"Document {i + 1} TF-IDF scores:")
```

- `enumerate(documents)` : This function loops through the list of documents (`documents`) and provides both the index (`i`) and the actual document (`doc`) in each iteration.
- `print(f"Document {i + 1} TF-IDF scores:")` : Prints the title for each document, showing its index. The `i + 1` ensures that the documents are numbered starting from 1 (not 0).

8. **Looping through words and their TF-IDF scores**:

```python
for word, score in zip(feature_names, tfidf_matrix[i].toarray()[0]):
    if score > 0:  # Only print words with a non-zero score
        print(f"  {word}: {score:.4f}")
```

- `zip(feature_names, tfidf_matrix[i].toarray()[0])` :
  - `feature_names` is a list of all the words (features) that the vectorizer learned.
  - `tfidf_matrix[i]` : This is the row for document `i` in the TF-IDF matrix. `toarray()` converts the sparse matrix to a dense array.
  - The `[0]` extracts the first row of the matrix (corresponding to the TF-IDF scores for document `i`).
  - `zip(feature_names, ...)` pairs each word with its corresponding TF-IDF score for the document.
- `if score > 0:` : This line ensures that only words with a non-zero TF-IDF score are printed. Words with a score of `0` are either not present in the document or have no significance based on the TF-IDF calculation.
- `print(f"  {word}: {score:.4f}")` : For each word with a non-zero score, this prints the word and its TF-IDF score. The score is rounded to four decimal places for readability.

9. **Adding spacing between documents**:

```python
print("\n")
```

- This line prints a newline after displaying the TF-IDF scores for each document, making the output easier to read.

10. **Example usage**:

```python
file_path = "doc.txt"  # Replace this with the path to your text file
compute_tfidf_from_file(file_path)
```

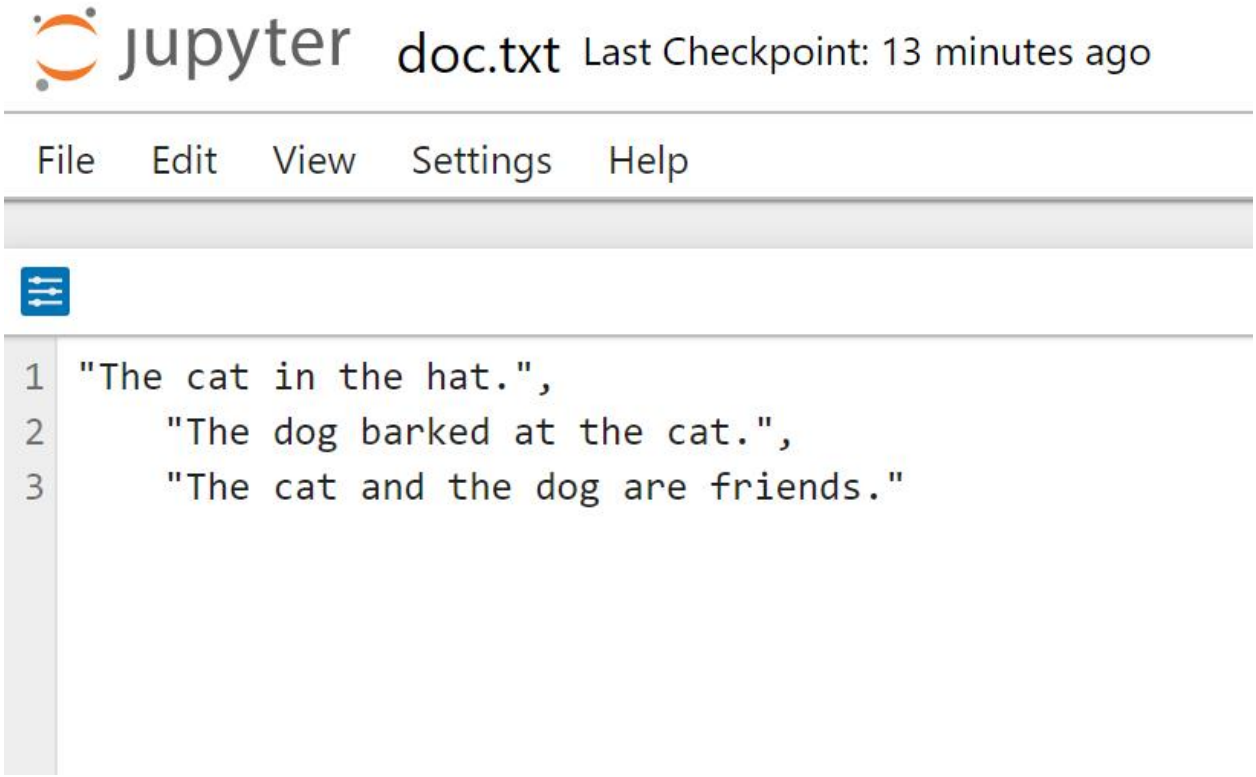
- `file_path = "doc.txt"` : This specifies the path to the text file you want to analyze. Replace `"doc.txt"` with the actual path of your file.
- `compute_tfidf_from_file(file_path)` : This calls the `compute_tfidf_from_file` function, passing the file path as an argument to compute the TF-IDF scores.

Summary of What the Code Does:

- **Reads a text file**: Each line in the file is treated as a separate document.
- **Computes the TF-IDF scores**: It uses `TfidfVectorizer` to calculate the TF-IDF scores for each word in each document.
- **Displays the results**: It prints the TF-IDF scores for each word that appears in each document, with non-zero scores.

This is a basic implementation of computing TF-IDF scores from a file containing multiple documents, and it's especially useful for text analysis or feature extraction in machine learning tasks.

input



Output:

```
Document 1 TF-IDF scores:
  cat: 0.3052
  hat: 0.5168
  in: 0.5168
  the: 0.6105


Document 2 TF-IDF scores:
  at: 0.4810
  barked: 0.4810
  cat: 0.2841
  dog: 0.3658
  the: 0.5682


Document 3 TF-IDF scores:
  and: 0.4335
  are: 0.4335
  cat: 0.2560
  dog: 0.3297
```

Experiment-11

AIM: Use the inbuilt dataset 'titanic' (Use the Seaborn library). Write a code to check how the price of the ticket (column name: 'fare') for each passenger is distributed by plotting a histogram

To visualize the distribution of ticket fares for passengers aboard the Titanic using a histogram.

Require Software& Tools: Anaconda(jupyternotebook)

PROCEDURE:

1. Import necessary libraries:
    - Import seaborn (for loading the Titanic dataset and plotting) and matplotlib.pyplot (for customizing the plot and displaying it).
2. Load the Titanic dataset:
    - Seaborn provides an inbuilt Titanic dataset, which contains information about passengers such as age, class, fare, and survival status. We'll use this dataset to explore the fare distribution.
3. Preview the data:
    - Use the head() function to check the first few rows of the dataset. This helps ensure that the data is loaded correctly and gives an overview of the available columns.
4. Plotting the histogram:
    - We will use Seaborn's histplot() function to plot the distribution of the "fare" column. This function will create a histogram and optionally include a Kernel Density Estimate (KDE) curve to visualize the data distribution.
5. Customize the plot:
    - Add a title, x-axis label, and y-axis label to make the plot informative.
6. Display the plot:
    - Use plt.show() to display the generated histogram.

7. Import necessary libraries:
    - Import seaborn (for loading the Titanic dataset and plotting) and matplotlib.pyplot (for customizing the plot and displaying it).

8. Load the Titanic dataset:
    - Seaborn provides an inbuilt Titanic dataset, which contains information about passengers such as age, class, fare, and survival status. We'll use this dataset to explore the fare distribution.
9. Preview the data:
    - Use the head() function to check the first few rows of the dataset. This helps ensure that the data is loaded correctly and gives an overview of the available columns.
10. Plotting the histogram:
    - We will use Seaborn's histplot() function to plot the distribution of the "fare" column. This function will create a histogram and optionally include a Kernel Density Estimate (KDE) curve to visualize the data distribution.
11. Customize the plot:
    - Add a title, x-axis label, and y-axis label to make the plot informative.
12. Display the plot:
    - Use plt.show() to display the generated histogram.

SOURCE CODE AND OUTPUT:

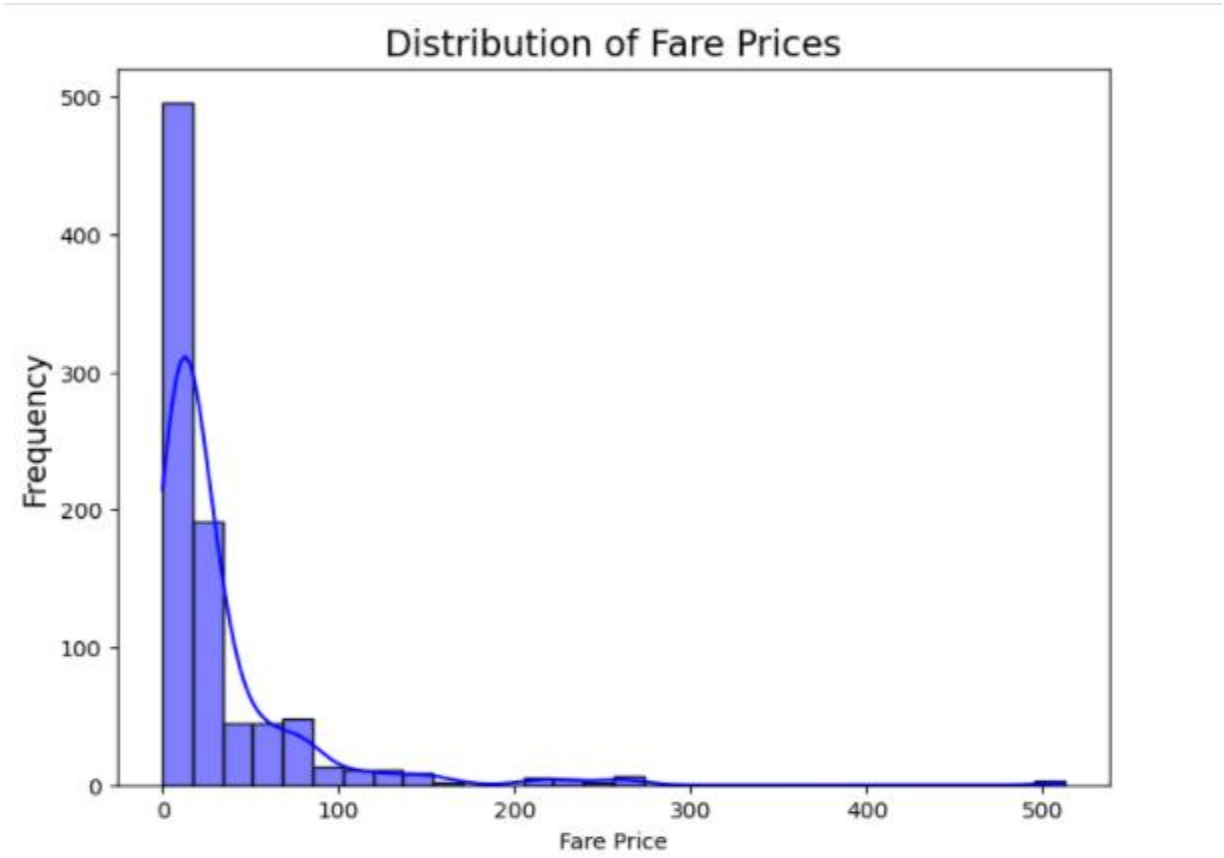
```
import seaborn as sns
import matplotlib.pyplot as plt
```

```
titanic=sns.load_dataset('titanic')
print(titanic.head())
```

	survived	pclass	sex	age	sibsp	parch	fare	embarked	class
0	0	3	male	22.0	1	0	7.2500	S	Third
1	1	1	female	38.0	1	0	71.2833	C	First
2	1	3	female	26.0	0	0	7.9250	S	Third
3	1	1	female	35.0	1	0	53.1000	S	First
4	0	3	male	35.0	0	0	8.0500	S	Third

	who	adult_male	deck	embark_town	alive	alone
0	man	True	NaN	Southampton	no	False
1	woman	False	C	Cherbourg	yes	False
2	woman	False	NaN	Southampton	yes	True
3	woman	False	C	Southampton	yes	False
4	man	True	NaN	Southampton	no	True

```
plt.figure(figsize=(8,6))
sns.histplot(titanic['fare'],kde=True,bins=30,color='blue')
plt.title('Distribution of Fare Prices',fontsize=16)
plt.xlabel("Fare Price",fontsize=10)
plt.ylabel('Frequency',fontsize=14)
plt.show()
```



EXPERIMENT-12:

Aim: Use R-Project to carry out statistical analysis of big data

PROCEDURE:

Installation of R and Rstudio

Step 1: sudo apt-get update

sudo apt-get install r-base

Step 2: Installation of R studio

Step 3: step 1 download R studio for Ubuntu

Step 4: step2:sudo dpkg -i rstudio-2022.07.2-576-amd64 . deb

Step 5: step 3 :sudo apt install –f

Step 6: Open rstudio

Step 7: procedure:-->install.packages("gapminder")-->library(gapminder)

Step 8: >data(gapminder)

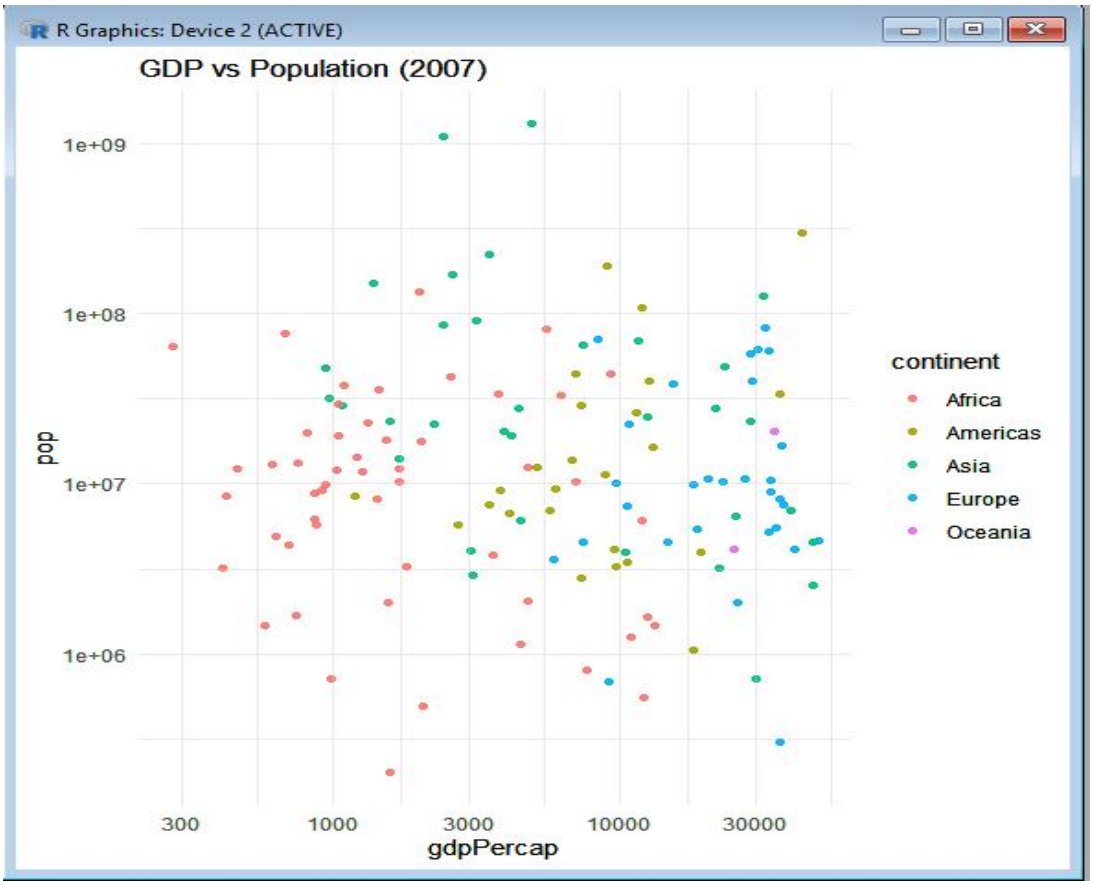
Step 9:boxplot(lifeExp)

Source Code:

```
# Install necessary packages
install.packages(c("dplyr", "ggplot2", "gapminder"))
library(dplyr)
library(ggplot2)
library(gapminder)

#Load the Gapminder Dataset
data(gapminder)
head(gapminder)  # View the first few rows

# Exploring the Data
summary(gapminder)

# Filter for the year 2007 (the most recent in the dataset)
gapminder_2007 <- filter(gapminder, year == 2007)

# View the data for 2007
head(gapminder_2007)

#Statistical Analysis
#Average Life Expectancy by Continent

life_expectancy_by_continent <- gapminder %>%
  group_by(continent) %>%
  summarize(avg_lifeExp = mean(lifeExp, na.rm = TRUE))

print(life_expectancy_by_continent)
# GDP and Life Expectancy Correlation
cor(gapminder$gdpPercap, gapminder$lifeExp, use = "complete.obs")
#Linear Regression (Life Expectancy ~ GDP)
model <- lm(lifeExp ~ gdpPercap, data = gapminder)
summary(model)
#Visualization

#GDP vs. Life Expectancy
ggplot(gapminder, aes(x = gdpPercap, y = lifeExp)) +
  geom_point(aes(color = continent), alpha = 0.7) +
```

```
  scale_x_log10() +
  labs(title = "GDP vs Life Expectancy") +
  theme_minimal()

#Life Expectancy Over Time (by Continent)
ggplot(gapminder, aes(x = year, y = lifeExp, color = continent)) +
  geom_line() +
  labs(title = "Life Expectancy Over Time") +
  theme_minimal()
#GDP vs. Population (2007)
gapminder_2007 <- filter(gapminder, year == 2007)
ggplot(gapminder_2007, aes(x = gdpPercap, y = pop)) +
  geom_point(aes(color = continent), alpha = 0.7) +
  scale_x_log10() + scale_y_log10() +
  labs(title = "GDP vs Population (2007)") +
  theme_minimal()
```

Ouput:



EXPERIMENT-13:

Aim: Use R-Project for data visualization of social media data.

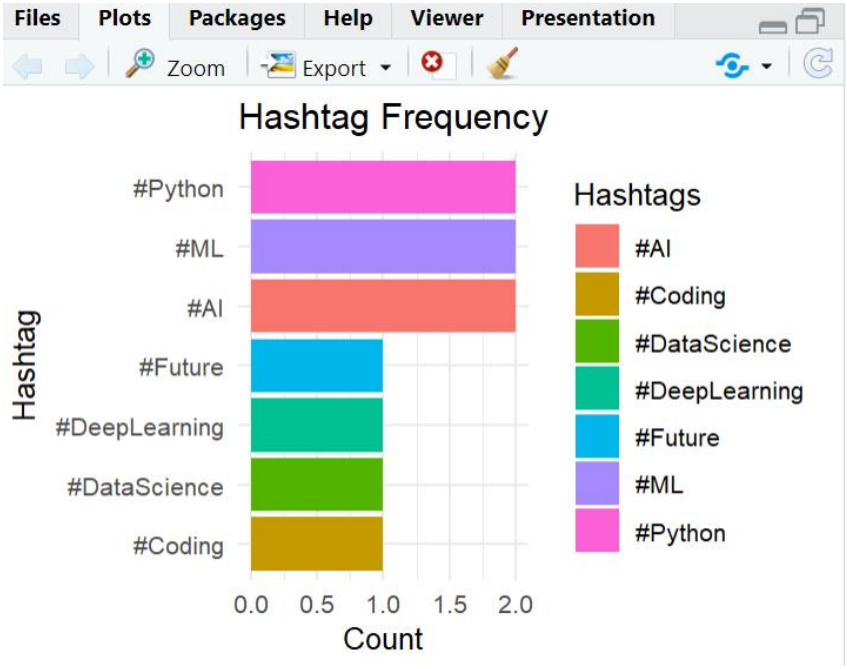
Require Software& Tools: R studio

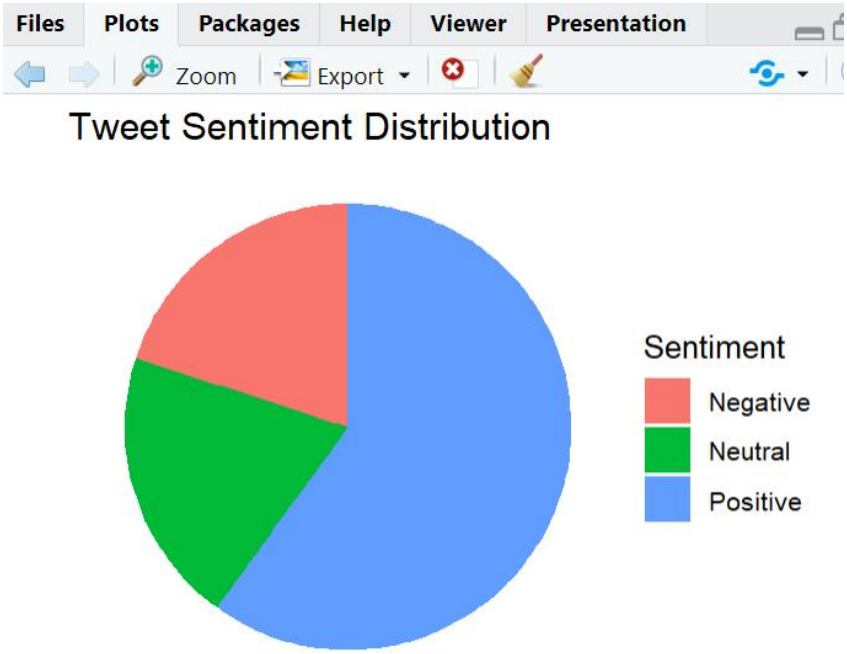
PROCEDURE:

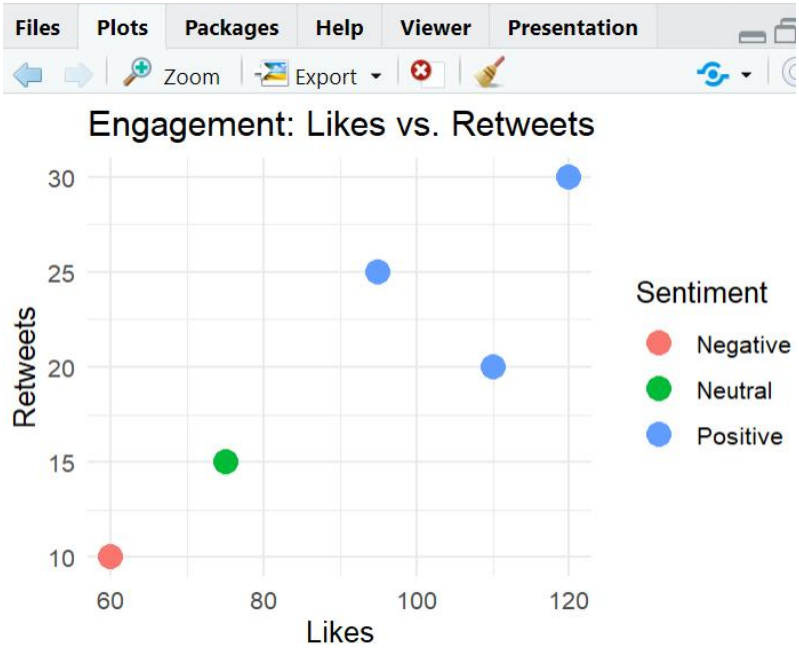
```
# Load required libraries
install.packages("tidyr")
```

```
library(ggplot2)
library(dplyr)
library(tidyr)
library(stringr)

# Step 1: Read data from the text file
data <- read.csv("socialmedia.txt", stringsAsFactors = FALSE)

# Step 2: Split hash tags into individual rows
hashtag_data <- data %>%
  separate_rows(Hashtags, sep = ",") %>%
  mutate(Hashtags = str_trim(Hashtags))

# Step 3: Hash tag Frequency Bar Chart
hashtag_freq <- hashtag_data %>%
  group_by(Hashtags) %>%
  summarise(Frequency = n())

ggplot(hashtag_freq, aes(x = reorder(Hashtags, Frequency), y = Frequency, fill = Hashtags)) +
  geom_bar(stat = "identity") +
  coord_flip() +
  labs(title = "Hashtag Frequency", x = "Hashtag", y = "Count") +
  theme_minimal()

# Step 4: Sentiment Pie Chart
sentiment_freq <- data %>%
  count(Sentiment)

ggplot(sentiment_freq, aes(x = "", y = n, fill = Sentiment)) +
  geom_col(width = 1) +
  coord_polar(theta = "y") +
  labs(title = "Tweet Sentiment Distribution") +
  theme_void()

# Step 5: Scatter Plot of Likes vs. Retweets
ggplot(data, aes(x = Likes, y = Retweets, color = Sentiment)) +
  geom_point(size = 4) +
  labs(title = "Engagement: Likes vs. Retweets", x = "Likes", y = "Retweets") +
  theme_minimal()
```

Output:


Files
Plots
Packages
Help
Viewer
Presentation
Zoom
Export
Hashtag Frequency
#Python
#ML
#AI
#Future
#DeepLearning
#DataScience
#Coding
Hashtag
0.0
0.5
1.0
1.5
2.0
Count
Hashtags
#AI
#Coding
#DataScience
#DeepLearning
#Future
#ML
#Python


Files
Plots
Packages
Help
Viewer
Presentation
Zoom
Export
Tweet Sentiment Distribution
Sentiment
Negative
Neutral
Positive


Files
Plots
Packages
Help
Viewer
Presentation
Zoom
Export
Engagement: Likes vs. Retweets
Retweets
30
25
20
15
10
60
80
100
120
Likes
Sentiment
Negative
Neutral
Positive