# VISVESVARAYA TECHNOLOGICAL UNIVERSITY

**"JnanaSangama", Belgaum -590014, Karnataka.**

**LAB REPORT**
**on**

# Big Data Analytics

***Submitted by***

**Mohammed Shuraih Shaikh(1BM22CS157)**

***in partial fulfillment for the award of the degree of***
**BACHELOR OF ENGINEERING**
***in***
**COMPUTER SCIENCE AND ENGINEERING**

**B.M.S. COLLEGE OF ENGINEERING**
**(Autonomous Institution under VTU)**
**BENGALURU-560019**
**Feb-2024 to July-2024**

# B. M. S. College of Engineering,

**Bull Temple Road, Bangalore 560019**

(Affiliated To Visvesvaraya Technological University, Belgaum)

## Department of Computer Science and Engineering

## CERTIFICATE

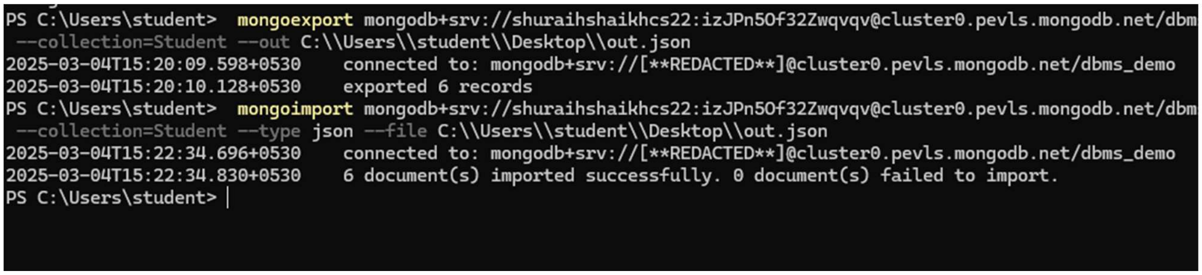
This is to certify that the Lab work entitled "LAB COURSE **Big Data Analytics**" carried out by **Mohammed Shuraih Shaikh(1BM22CS157),** who is a bonafide student of **B. M. S. College of Engineering.** It is in partial fulfillment for the award of **Bachelor of Engineering in Computer Science and Engineering** of the Visvesvaraya Technological University, Belgaum during the year 2024. The Lab report has been approved as it satisfies the academic requirements in respect of a **Big Data Analytics - (23CS6PCBDA)** work prescribed for the said degree.

| | |
|---|---|
| **Amruta B** | **Dr. Kavitha Sooda** |
| Assistant Professor | Professor and Head |
| Department of CSE | Department of CSE |
| BMSCE, Bengaluru | BMSCE, Bengaluru |

# Index Sheet

github link: https://github.com/shuraih776/6thSem-BDA-Lab_1BM22CS157

# Lab 1 MongoDB Part - 1



```
PS C:\Users\student>  mongoexport mongodb+srv://shuraihshaikhcs22:izJPn5Of32Zwqvqv@cluster0.pevls.mongodb.net/dbm
 --collection=Student --out C:\\Users\\student\\Desktop\\out.json
2025-03-04T15:20:09.598+0530    connected to: mongodb+srv://[**REDACTED**]@cluster0.pevls.mongodb.net/dbms_demo
2025-03-04T15:20:10.128+0530    exported 6 records
PS C:\Users\student>  mongoimport mongodb+srv://shuraihshaikhcs22:izJPn5Of32Zwqvqv@cluster0.pevls.mongodb.net/dbm
 --collection=Student --type json --file C:\\Users\\student\\Desktop\\out.json
2025-03-04T15:22:34.696+0530    connected to: mongodb+srv://[**REDACTED**]@cluster0.pevls.mongodb.net/dbms_demo
2025-03-04T15:22:34.830+0530    6 document(s) imported successfully. 0 document(s) failed to import.
PS C:\Users\student> |
```

I. **CREATE DATABASE IN MONGODB. use myDB;**

Confirm the existence of your database

**db;**

To list all databases

**show dbs;**

II. **CRUD (CREATE, READ, UPDATE, DELETE) OPERATIONS**

1. To create a collection by the name “Student”. Let us take a look at the collection list prior to the creation of the new collection “Student”.

   **db.createCollection(“Student”);**

2. To drop a collection by the name “Student”.

   **db.Student.drop();**

3. Create a collection by the name “Students” and store the following data in it.

   **db.Student.insert({_id:1,StudName:"MichelleJacintha",Grade:"VII",Hobbies:"InternetSurfing"});**

4. Insert the document for “AryanDavid” in to the Students collection only if it does not already exist in the collection.

   **db.Student.update({_id:3,StudName:"AryanDavid",Grade:"VII"},{$set:{Hobbies:"Skating"}},{upsert:true});**

5. FIND METHOD

A. To search for documents from the “Students” collection based on certain search criteria. **db.Student.find({StudName:"Aryan David"});**

B. To display only the StudName and Grade from all the documents of the Students collection. The identifier_id should be suppressed and NOT displayed. **db.Student.find({},{StudName:1,Grade:1,_id:0});**

C. To find those documents where the Grade is set to ‘VII’ **db.Student.find({Grade:{$eq:'VII'}}).pretty();**

D. To find those documents from the Students collection where the Hobbies is set to either ‘Chess’ or is set to ‘Skating’. **db.Student.find({Hobbies :{ $in: ['Chess','Skating']}}).pretty ();**

E. To find documents from the Students collection where the StudName begins with “M”.

```
db.Student.find({StudName:/^M/}).pretty();
```

F. To find documents from the Students collection where the StudNamehas an “e” in any position.

```
db.Student.find({StudName:/e/}).pretty();
```

G. To find the number of documents in the Students collection.

```
db.Student.count();
```

H. To sort the documents from the Students collection in the descending order of StudName.

```
db.Student.find().sort({StudName:-1}).pretty();
```

III. **Import data from a CSV file**

Given a CSV file “sample.txt” in the D:drive, import the file into the MongoDB collection, “SampleJSON”. The collection is in the database “test”.

```
mongoimport --db Student --collection airlines --type csv –headerline --file /home/hduser/Desktop/airline.csv
```

IV. **Export data to a CSV file**

This command used at the command prompt exports MongoDB JSON documents from “Customers” collection in the “test” database into a CSV file “Output.txt” in the D:drive.

```
mongoexport --host localhost --db Student --collection airlines --csv --out /home/hduser/Desktop/output.txt –
fields “Year”,”Quarter”
```

V. **Save Method :**

**Save() method will insert a new document, if the document with the _id does not exist. If it exists it will replace the exisiting document:**

```
db.Students.save({StudName:”Vamsi”, Grade:”VI”})
```

VI. **Add a new field to existing Document:**

```
db.Students.update({_id:4},{$set:{Location:”Network”}})
```

VII. **Remove the field in an existing Document**

```
db.Students.update({_id:4},{$unset:{Location:”Network”}})
```

VIII. **Finding Document based on search criteria suppressing few fields**

```
db.Student.find({_id:1},{StudName:1,Grade:1,_id:0});
```

**To find those documents where the Grade is not set to ‘VII’**

```
db.Student.find({Grade:{$ne:'VII'}}).pretty();
```

**To find documents from the Students collection where the StudName ends with s.**

```
db.Student.find({StudName:/s$/}).pretty();
```

IX. **to set a particular field value to NULL** db.Students.update({_id:3},{$set:{Location:null}})

X. **Count the number of documents in Student Collections** db.Students.count()

XI. **Count the number of documents in Student Collections with grade :VII**

```
db.Students.count({Grade:”VII”})
```

**retrieve first 3 documents**

```
db.Students.find({Grade:”VII”}).limit(3).pretty();
```

**Sort the document in Ascending order**

```
db.Students.find().sort({StudName:1}).pretty();
```

**to Skip the 1st two documents from the Students Collections**

```
db.Students.find().skip(2).pretty()
```

XII. Create a collection by name “food” and add to each document add a “fruits” array db.food.insert( { _id:1, fruits:['grapes','mango','apple'] } ) db.food.insert( { _id:2, fruits:['grapes','mango','cherry'] } ) db.food.insert( { _id:3, fruits:['banana','mango'] } )

**To find those documents from the “food” collection which has the “fruits array” constitute of “grapes”, “mango” and “apple”.** db.food.find ( {fruits: ['grapes','mango','apple'] } ). pretty().

**To find in “fruits” array having “mango” in the first index position.**

```
db.food.find ( {'fruits.1':'grapes'} )
```

**To find those documents from the “food” collection where the size of the array is two.**

```
db.food.find ( {“fruits”: {$size:2}} )
```

**To find the document with a particular id and display the first two elements from the array “fruits”**

```
db.food.find({_id:1},{“fruits”:{$slice:2}})
```

**To find all the documets from the food collection which have elements mango and grapes in the array “fruits”**

```
db.food.find({fruits:{$all:[“mango”,”grapes”]}})
```

**update on Array:**

**using particular id replace the element present in the 1st index position of the fruits array with apple**

```
db.food.update({_id:3},{$set:{'fruits.1':'apple'}})
```

insert new key value pairs in the fruits array

```
db.food.update({_id:2},{$push:{price:{grapes:80,mango:200,cherry:100}}})
```

**XII. Aggregate Function :**

**Create a collection Customers with fields custID, AcctBal, AcctType.**

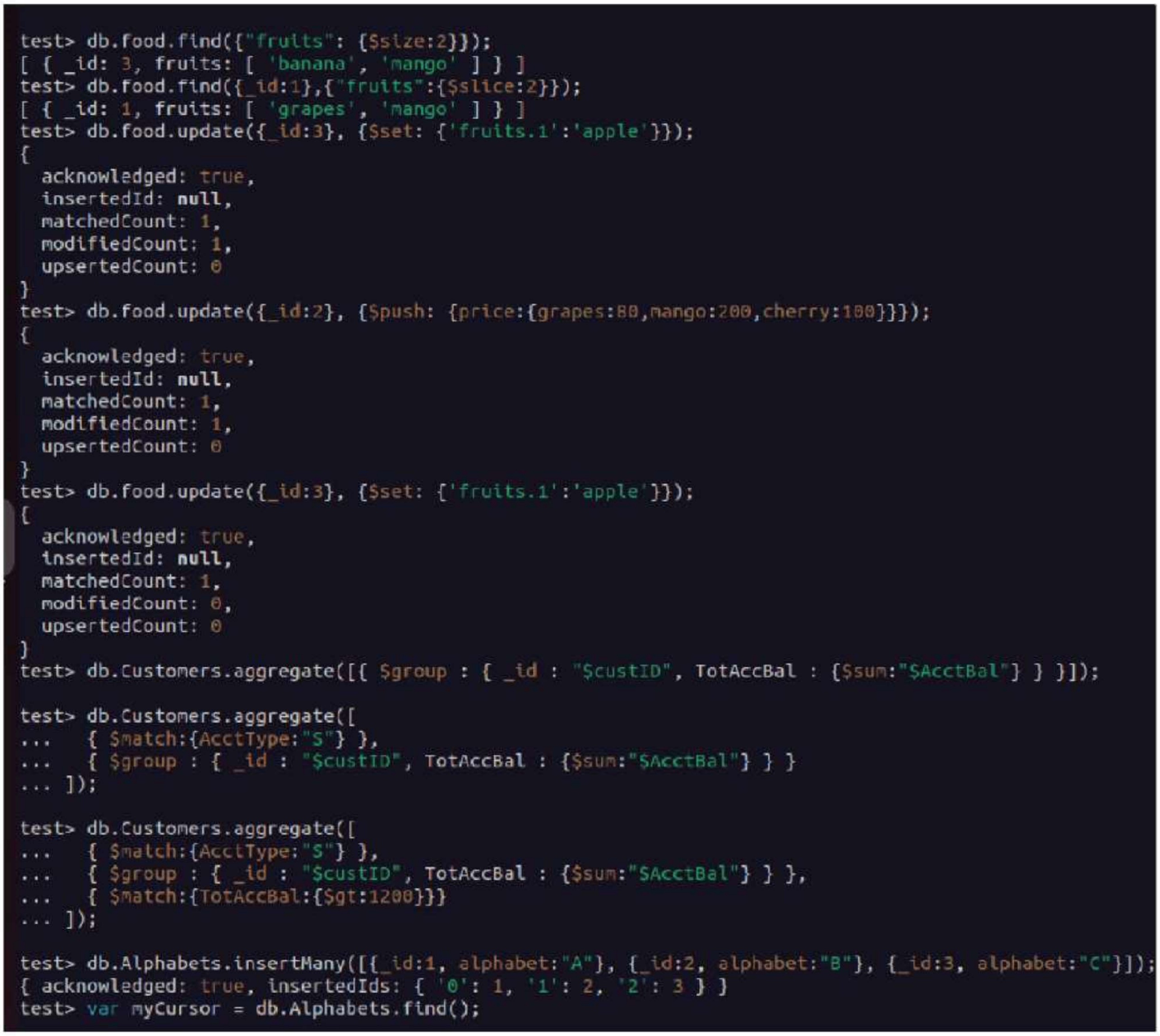
**Now group on “custID” and compute the sum of “AccBal”.** db.Customers.aggregate ( {$group : { _id : “$custID”,TotAccBal : {$sum:”$AccBal”} } } );

**match on AcctType:”S” then group on “CustID” and compute the sum of “AccBal”.** db.Customers.aggregate ( {$match:{AcctType:”S”}},{$group : { _id : “$custID”,TotAccBal : {$sum:”$AccBal”} } } );

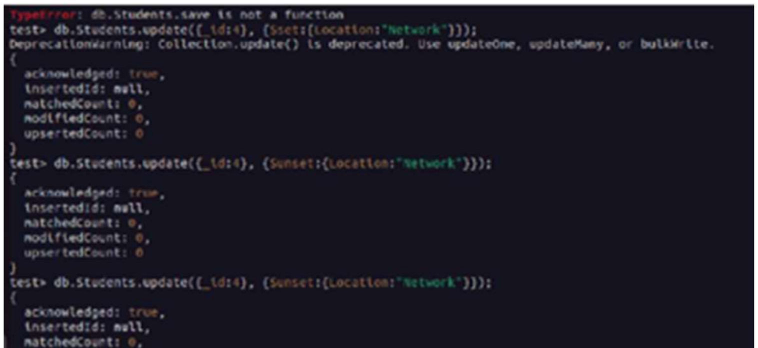
**match on AcctType:”S” then group on “CustID” and compute the sum of “AccBal” and total balance greater than 1200.**

```
db.Customers.aggregate ( {$match:{AcctType:”S”}},{$group : { _id : “$custID”,TotAccBal : {$sum:”$AccBal”} } },
{$match:{TotAccBal:{$gt:1200}}});
```

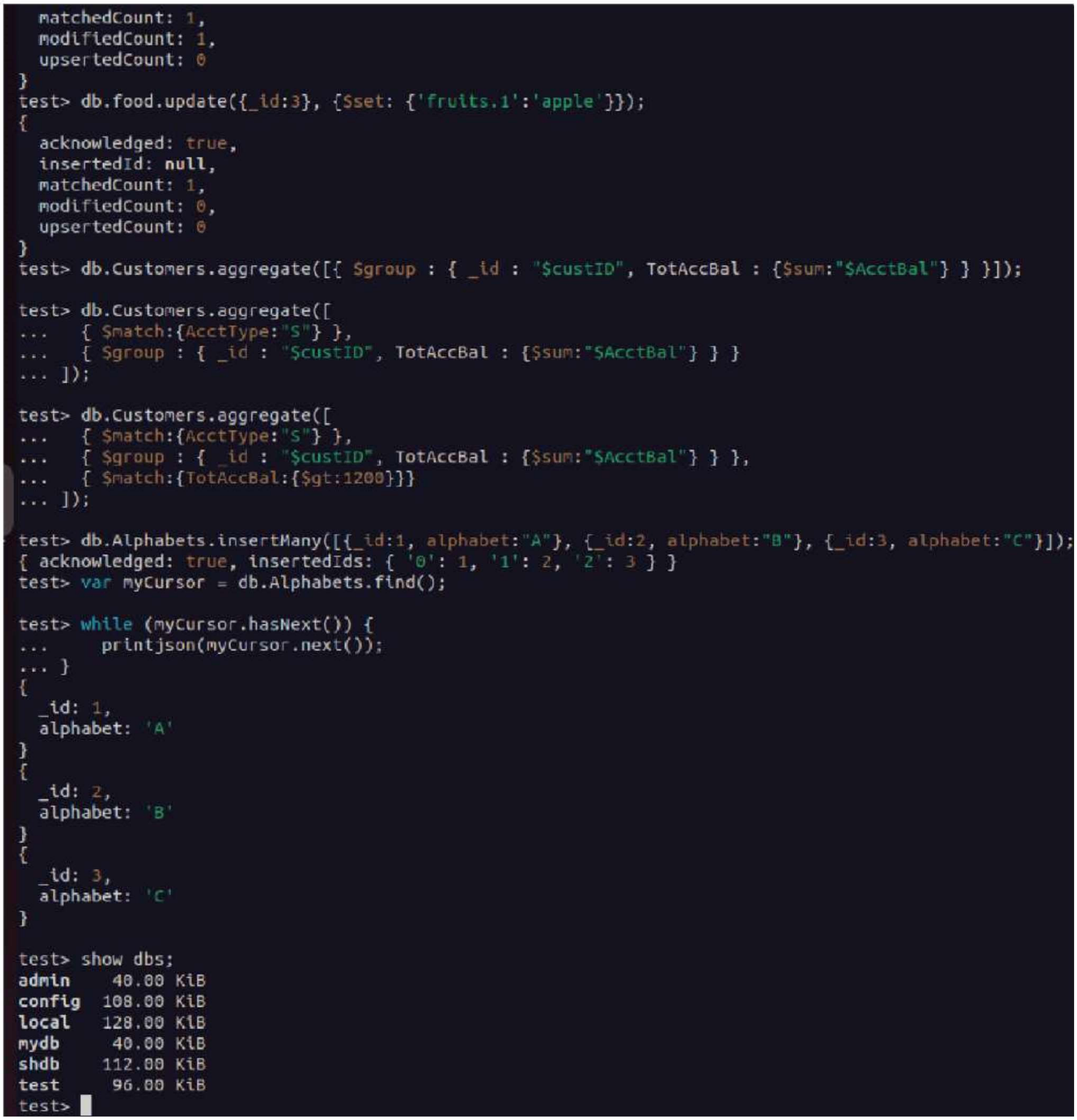
# Lab 2 MongoDB Part - 2



```
test> db.food.find({"fruits": {$size:2}});
[ { _id: 3, fruits: [ 'banana', 'mango' ] } ]
test> db.food.find({_id:1},{"fruits":{$slice:2}});
[ { _id: 1, fruits: [ 'grapes', 'mango' ] } ]
test> db.food.update({_id:3}, {$set: {'fruits.1':'apple'}});
{
  acknowledged: true,
  insertedId: null,
  matchedCount: 1,
  modifiedCount: 1,
  upsertedCount: 0
}
test> db.food.update({_id:2}, {$push: {price:{grapes:80,mango:200,cherry:100}}});
{
  acknowledged: true,
  insertedId: null,
  matchedCount: 1,
  modifiedCount: 1,
  upsertedCount: 0
}
test> db.food.update({_id:3}, {$set: {'fruits.1':'apple'}});
{
  acknowledged: true,
  insertedId: null,
  matchedCount: 1,
  modifiedCount: 0,
  upsertedCount: 0
}
test> db.Customers.aggregate([{ $group : { _id : "$custID", TotAccBal : {$sum:"$AcctBal"} } }]);

test> db.Customers.aggregate([
...   { $match:{AcctType:"S"} },
...   { $group : { _id : "$custID", TotAccBal : {$sum:"$AcctBal"} } }
... ]);

test> db.Customers.aggregate([
...   { $match:{AcctType:"S"} },
...   { $group : { _id : "$custID", TotAccBal : {$sum:"$AcctBal"} } },
...   { $match:{TotAccBal:{$gt:1200}}}
... ]);

test> db.Alphabets.insertMany([{_id:1, alphabet:"A"}, {_id:2, alphabet:"B"}, {_id:3, alphabet:"C"}]);
{ acknowledged: true, insertedIds: { '0': 1, '1': 2, '2': 3 } }
test> var myCursor = db.Alphabets.find();
```

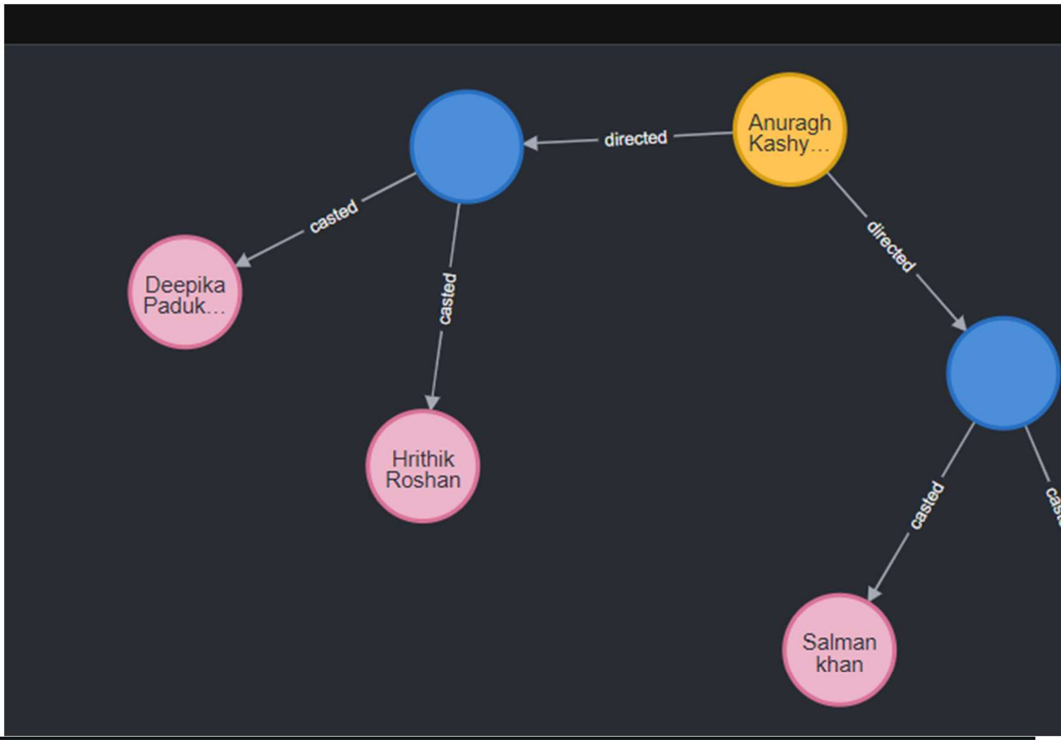


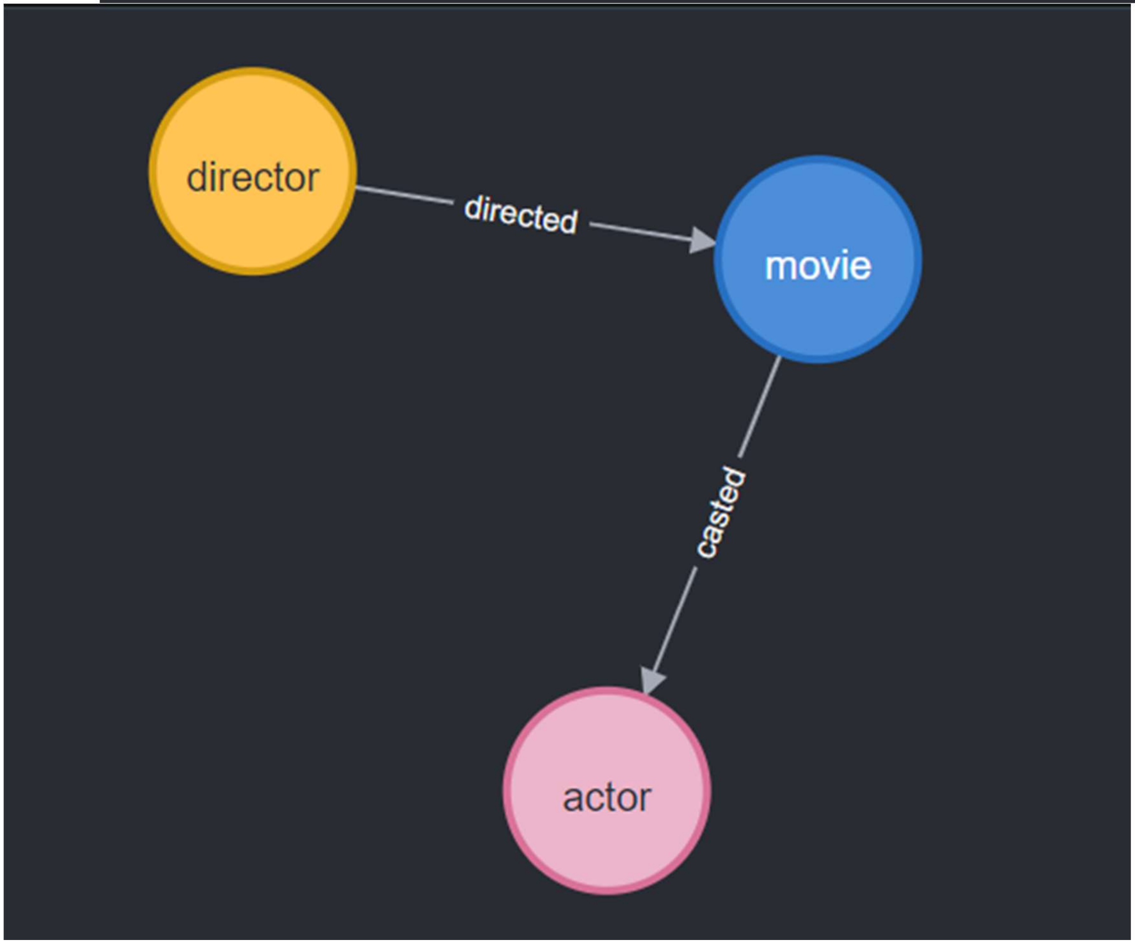
```
TypeError: db.Students.save is not a function
test> db.Students.update({_id:4}, {$set:{Location:"Network"}});
DeprecationWarning: Collection.update() is deprecated. Use updateOne, updateMany, or bulkWrite.
{
  acknowledged: true,
  insertedId: null,
  matchedCount: 0,
  modifiedCount: 0,
  upsertedCount: 0
}
test> db.Students.update({_id:4}, {$unset:{Location:"Network"}});
{
  acknowledged: true,
  insertedId: null,
  matchedCount: 0,
  modifiedCount: 0,
  upsertedCount: 0
}
test> db.Students.update({_id:4}, {$unset:{Location:"Network"}});
{
  acknowledged: true,
  insertedId: null,
  matchedCount: 0,
```



```
  matchedCount: 1,
  modifiedCount: 1,
  upsertedCount: 0
}
test> db.food.update({_id:3}, {$set: {'fruits.1':'apple'}});
{
  acknowledged: true,
  insertedId: null,
  matchedCount: 1,
  modifiedCount: 0,
  upsertedCount: 0
}
test> db.Customers.aggregate([{ $group : { _id : "$custID", TotAccBal : {$sum:"$AcctBal"} } }]);

test> db.Customers.aggregate([
...    { $match:{AcctType:"S"} },
...    { $group : { _id : "$custID", TotAccBal : {$sum:"$AcctBal"} } }
... ]);

test> db.Customers.aggregate([
...    { $match:{AcctType:"S"} },
...    { $group : { _id : "$custID", TotAccBal : {$sum:"$AcctBal"} } },
...    { $match:{TotAccBal:{$gt:1200}}}
... ]);

test> db.Alphabets.insertMany([{_id:1, alphabet:"A"}, {_id:2, alphabet:"B"}, {_id:3, alphabet:"C"}]);
{ acknowledged: true, insertedIds: { '0': 1, '1': 2, '2': 3 } }
test> var myCursor = db.Alphabets.find();

test> while (myCursor.hasNext()) {
...      printjson(myCursor.next());
... }
{
  _id: 1,
  alphabet: 'A'
}
{
  _id: 2,
  alphabet: 'B'
}
{
  _id: 3,
  alphabet: 'C'
}

test> show dbs;
admin     40.00 KiB
config   108.00 KiB
local    128.00 KiB
mydb      40.00 KiB
shdb     112.00 KiB
test      96.00 KiB
test>
```

# Lab 3 Neo4J


Anuragh Kashy…
directed
casted
Deepika Paduk…
casted
Hrithik Roshan
directed
casted
Salman khan
cast


director
directed
movie
casted
actor

# Lab 4 Cassandra Part - I

1.What is the command used to create a keyspace named Employee with SimpleStrategy and replication factor 1?

```
CREATE KEYSPACE Employee
WITH replication = {'class': 'SimpleStrategy', 'replication_factor': 1};
```

How do you create a table named Employee_Info with fields for ID, name, designation, joining date, salary, and department?

```
CREATE TABLE Employee_Info (
   Emp_Id int PRIMARY KEY,
   Emp_Name text,
   Designation text,
   Date_of_Joining date,
   Salary float,
   Dept_Name text
);
```

2.How do you insert multiple records in a batch in Cassandra?

```
BEGIN BATCH
INSERT INTO Employee_Info (Emp_Id, Emp_Name, Designation, Date_of_Joining, Salary, Dept_Name)
VALUES (121, 'Anit', 'Manager', '2018-02-01', 70000.0, 'Sales');
INSERT INTO Employee_Info (Emp_Id, Emp_Name, Designation, Date_of_Joining, Salary, Dept_Name)
VALUES (122, 'Priya', 'Developer', '2020-06-15', 50000.0, 'IT');
```

```
INSERT INTO Employee_Info (Emp_Id, Emp_Name, Designation, Date_of_Joining, Salary, Dept_Name)

VALUES (123, 'Rahul', 'Analyst', '2019-11-20', 60000.0, 'Finance');
APPLY BATCH;
```

3.What query updates the name and department of the employee with Emp_Id = 121?

```
UPDATE Employee_Info

SET Emp_Name = 'Anit Kumar', Dept_Name = 'Marketing'

WHERE Emp_Id = 121;
```

4.What is the correct query to fetch employees whose salary is greater than 0 using ALLOW FILTERING?

```
SELECT * FROM Employee_Info

WHERE Salary > 0

ALLOW FILTERING;
```

5.How do you add a new column Projects of type set<text> to the table?

```
ALTER TABLE Employee_Info ADD Projects set<text>;
```

6.How do you update the projects of employee with Emp_Id = 121?

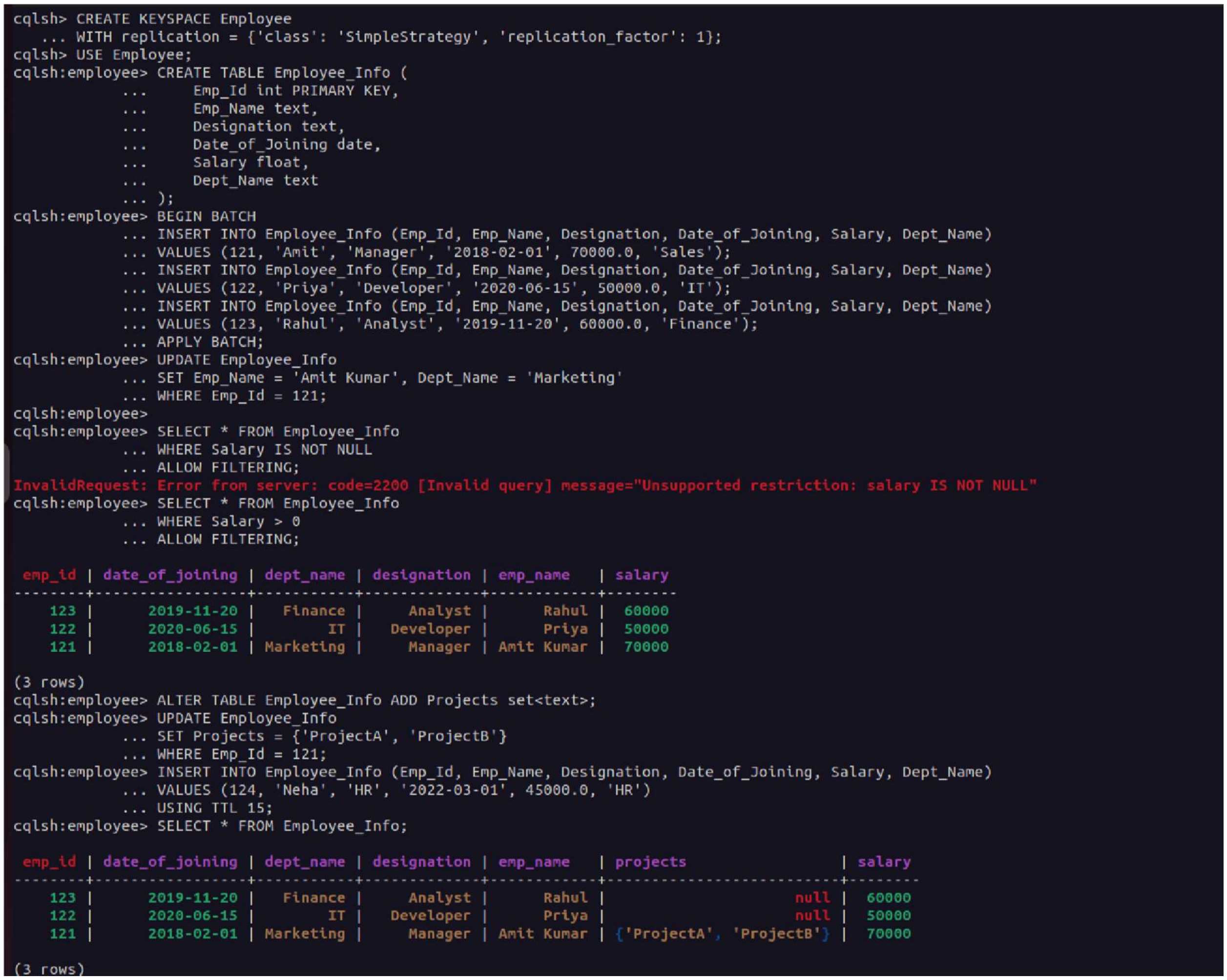
```
UPDATE Employee_Info

SET Projects = {'ProjectA', 'ProjectB'}

WHERE Emp_Id = 121;
```

7.How do you insert a new record into the updated table including the new Projects column with TTL?

INSERT INTO Employee_Info (Emp_Id, Emp_Name, Designation, Date_of_Joining, Salary, Dept_Name)

VALUES (124, 'Neha', 'HR', '2022-03-01', 45000.0, 'HR')

USING TTL 15;



```
cqlsh> CREATE KEYSPACE Employee
   ... WITH replication = {'class': 'SimpleStrategy', 'replication_factor': 1};
cqlsh> USE Employee;
cqlsh:employee> CREATE TABLE Employee_Info (
            ...     Emp_Id int PRIMARY KEY,
            ...     Emp_Name text,
            ...     Designation text,
            ...     Date_of_Joining date,
            ...     Salary float,
            ...     Dept_Name text
            ... );
cqlsh:employee> BEGIN BATCH
            ... INSERT INTO Employee_Info (Emp_Id, Emp_Name, Designation, Date_of_Joining, Salary, Dept_Name)
            ... VALUES (121, 'Amit', 'Manager', '2018-02-01', 70000.0, 'Sales');
            ... INSERT INTO Employee_Info (Emp_Id, Emp_Name, Designation, Date_of_Joining, Salary, Dept_Name)
            ... VALUES (122, 'Priya', 'Developer', '2020-06-15', 50000.0, 'IT');
            ... INSERT INTO Employee_Info (Emp_Id, Emp_Name, Designation, Date_of_Joining, Salary, Dept_Name)
            ... VALUES (123, 'Rahul', 'Analyst', '2019-11-20', 60000.0, 'Finance');
            ... APPLY BATCH;
cqlsh:employee> UPDATE Employee_Info
            ... SET Emp_Name = 'Amit Kumar', Dept_Name = 'Marketing'
            ... WHERE Emp_Id = 121;
cqlsh:employee>
cqlsh:employee> SELECT * FROM Employee_Info
            ... WHERE Salary IS NOT NULL
            ... ALLOW FILTERING;
InvalidRequest: Error from server: code=2200 [Invalid query] message="Unsupported restriction: salary IS NOT NULL"
cqlsh:employee> SELECT * FROM Employee_Info
            ... WHERE Salary > 0
            ... ALLOW FILTERING;

 emp_id | date_of_joining | dept_name | designation | emp_name   | salary
--------+-----------------+-----------+-------------+------------+--------
    123 |      2019-11-20 |   Finance |     Analyst |      Rahul |  60000
    122 |      2020-06-15 |        IT |   Developer |      Priya |  50000
    121 |      2018-02-01 | Marketing |     Manager | Amit Kumar |  70000

(3 rows)
cqlsh:employee> ALTER TABLE Employee_Info ADD Projects set<text>;
cqlsh:employee> UPDATE Employee_Info
            ... SET Projects = {'ProjectA', 'ProjectB'}
            ... WHERE Emp_Id = 121;
cqlsh:employee> INSERT INTO Employee_Info (Emp_Id, Emp_Name, Designation, Date_of_Joining, Salary, Dept_Name)
            ... VALUES (124, 'Neha', 'HR', '2022-03-01', 45000.0, 'HR')
            ... USING TTL 15;
cqlsh:employee> SELECT * FROM Employee_Info;

 emp_id | date_of_joining | dept_name | designation | emp_name   | projects                 | salary
--------+-----------------+-----------+-------------+------------+--------------------------+--------
    123 |      2019-11-20 |   Finance |     Analyst |      Rahul |                     null |  60000
    122 |      2020-06-15 |        IT |   Developer |      Priya |                     null |  50000
    121 |      2018-02-01 | Marketing |     Manager | Amit Kumar | {'ProjectA', 'ProjectB'} |  70000

(3 rows)
```

## Lab 5 Cassandra Part - II

**A. Table: library_student_info**

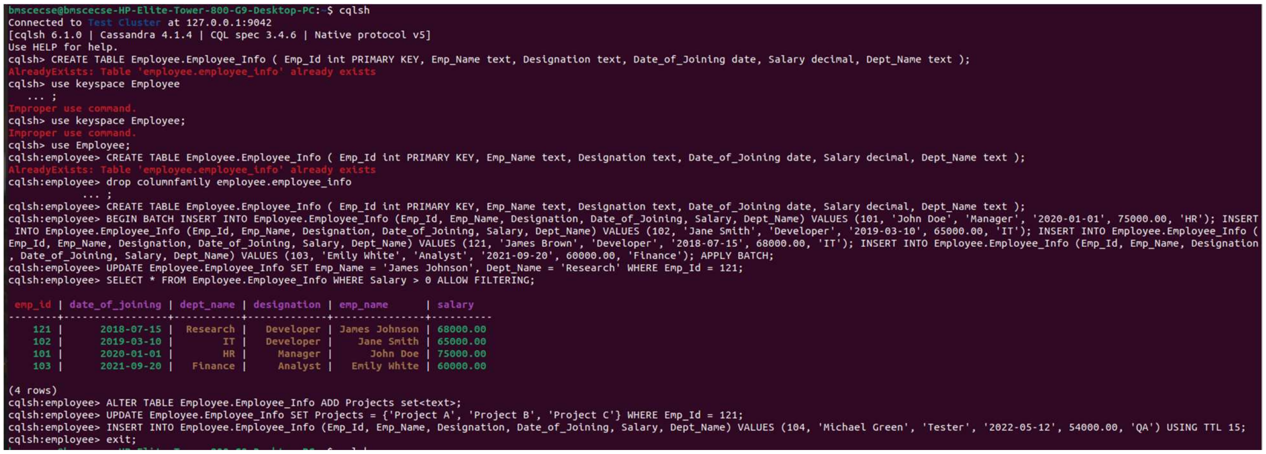
**B.Table:book_counter_info**

**C. Insert Data in Batch**

You can repeat the `UPDATE` if you want to increment the counter multiple times. To Simulate Borrowing Book “BDA” 2 Times by Student 112

## Display Table & Increase Counter

Query: Student 112 took “BDA” 2 times



```
bmscecse@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ cqlsh
Connected to Test Cluster at 127.0.0.1:9042
[cqlsh 6.1.0 | Cassandra 4.1.4 | CQL spec 3.4.6 | Native protocol v5]
Use HELP for help.
cqlsh> CREATE TABLE Employee.Employee_Info ( Emp_Id int PRIMARY KEY, Emp_Name text, Designation text, Date_of_Joining date, Salary decimal, Dept_Name text );
AlreadyExists: Table 'employee.employee_info' already exists
cqlsh> use keyspace Employee
   ... ;
Improper use command.
cqlsh> use keyspace Employee;
Improper use command.
cqlsh> use Employee;
cqlsh:employee> CREATE TABLE Employee.Employee_Info ( Emp_Id int PRIMARY KEY, Emp_Name text, Designation text, Date_of_Joining date, Salary decimal, Dept_Name text );
AlreadyExists: Table 'employee.employee_info' already exists
cqlsh:employee> drop columnfamily employee.employee_info
            ... ;
cqlsh:employee> CREATE TABLE Employee.Employee_Info ( Emp_Id int PRIMARY KEY, Emp_Name text, Designation text, Date_of_Joining date, Salary decimal, Dept_Name text );
cqlsh:employee> BEGIN BATCH INSERT INTO Employee.Employee_Info (Emp_Id, Emp_Name, Designation, Date_of_Joining, Salary, Dept_Name) VALUES (101, 'John Doe', 'Manager', '2020-01-01', 75000.00, 'HR'); INSERT
 INTO Employee.Employee_Info (Emp_Id, Emp_Name, Designation, Date_of_Joining, Salary, Dept_Name) VALUES (102, 'Jane Smith', 'Developer', '2019-03-10', 65000.00, 'IT'); INSERT INTO Employee.Employee_Info (
Emp_Id, Emp_Name, Designation, Date_of_Joining, Salary, Dept_Name) VALUES (121, 'James Brown', 'Developer', '2018-07-15', 68000.00, 'IT'); INSERT INTO Employee.Employee_Info (Emp_Id, Emp_Name, Designation
, Date_of_Joining, Salary, Dept_Name) VALUES (103, 'Emily White', 'Analyst', '2021-09-20', 60000.00, 'Finance'); APPLY BATCH;
cqlsh:employee> UPDATE Employee.Employee_Info SET Emp_Name = 'James Johnson', Dept_Name = 'Research' WHERE Emp_Id = 121;
cqlsh:employee> SELECT * FROM Employee.Employee_Info WHERE Salary > 0 ALLOW FILTERING;

 emp_id | date_of_joining | dept_name | designation | emp_name      | salary
--------+-----------------+-----------+-------------+---------------+----------
    121 |      2018-07-15 |  Research |   Developer | James Johnson | 68000.00
    102 |      2019-03-10 |        IT |   Developer |    Jane Smith | 65000.00
    101 |      2020-01-01 |        HR |     Manager |      John Doe | 75000.00
    103 |      2021-09-20 |   Finance |     Analyst |   Emily White | 60000.00

(4 rows)
cqlsh:employee> ALTER TABLE Employee.Employee_Info ADD Projects set<text>;
cqlsh:employee> UPDATE Employee.Employee_Info SET Projects = {'Project A', 'Project B', 'Project C'} WHERE Emp_Id = 121;
cqlsh:employee> INSERT INTO Employee.Employee_Info (Emp_Id, Emp_Name, Designation, Date_of_Joining, Salary, Dept_Name) VALUES (104, 'Michael Green', 'Tester', '2022-05-12', 54000.00, 'QA') USING TTL 15;
cqlsh:employee> exit;
```

# Lab 6 Hadoop HDFS

**1. mkdir**

**Command:** hdfs dfs -mkdir /abc

**Description:** Creates a directory /abc in HDFS.

**2. ls**

**Command:** hadoop fs -ls /Hadoop

**Description:** Lists contents of the /Hadoop directory with details like permissions, owner, size, and modification date.

**3. put**

**Command:** hdfs dfs -put /home/hduser/Desktop/Welcome.txt /abc/WC.txt

**Description:** Copies Welcome.txt from the local file system to HDFS path /abc/WC.txt.

To view the file contents in HDFS, use:

**Command:** hdfs dfs -cat /abc/WC.txt

**4. copyFromLocal**

**Command:** hdfs dfs -copyFromLocal /home/hduser/Desktop/Welcome.txt /abc/WC.txt
**Description:** Similar to put, but only accepts local file paths as source.

To view the copied file's contents:

**Command:** hdfs dfs -cat /abc/WC2.txt

**5. get**

**Command:** hdfs dfs -get /abc/WC.txt /home/hduser/Downloads/WWC.txt

**Description:** Downloads WC.txt from HDFS to the local path /home/hduser/Downloads/WWC.txt.

To merge multiple HDFS files into one local file:

**Command:** hdfs dfs -getmerge /abc/WC.txt /abc/WC2.txt /home/hduser/Desktop/Merge.txt

To check ACLs of a directory:

**Command:** hadoop fs -getfacl /abc/

### 6. copyToLocal

**Command:** hdfs dfs -copyToLocal /abc/WC.txt /home/hduser/Desktop
**Description:** Similar to get, but destination must be a local file path.

### 7. cat

**Command:** hdfs dfs -cat /abc/WC.txt

**Description:** Displays the contents of the file WC.txt in the terminal.

### 8. mv

**Command:** hadoop fs -mv /abc /FFF

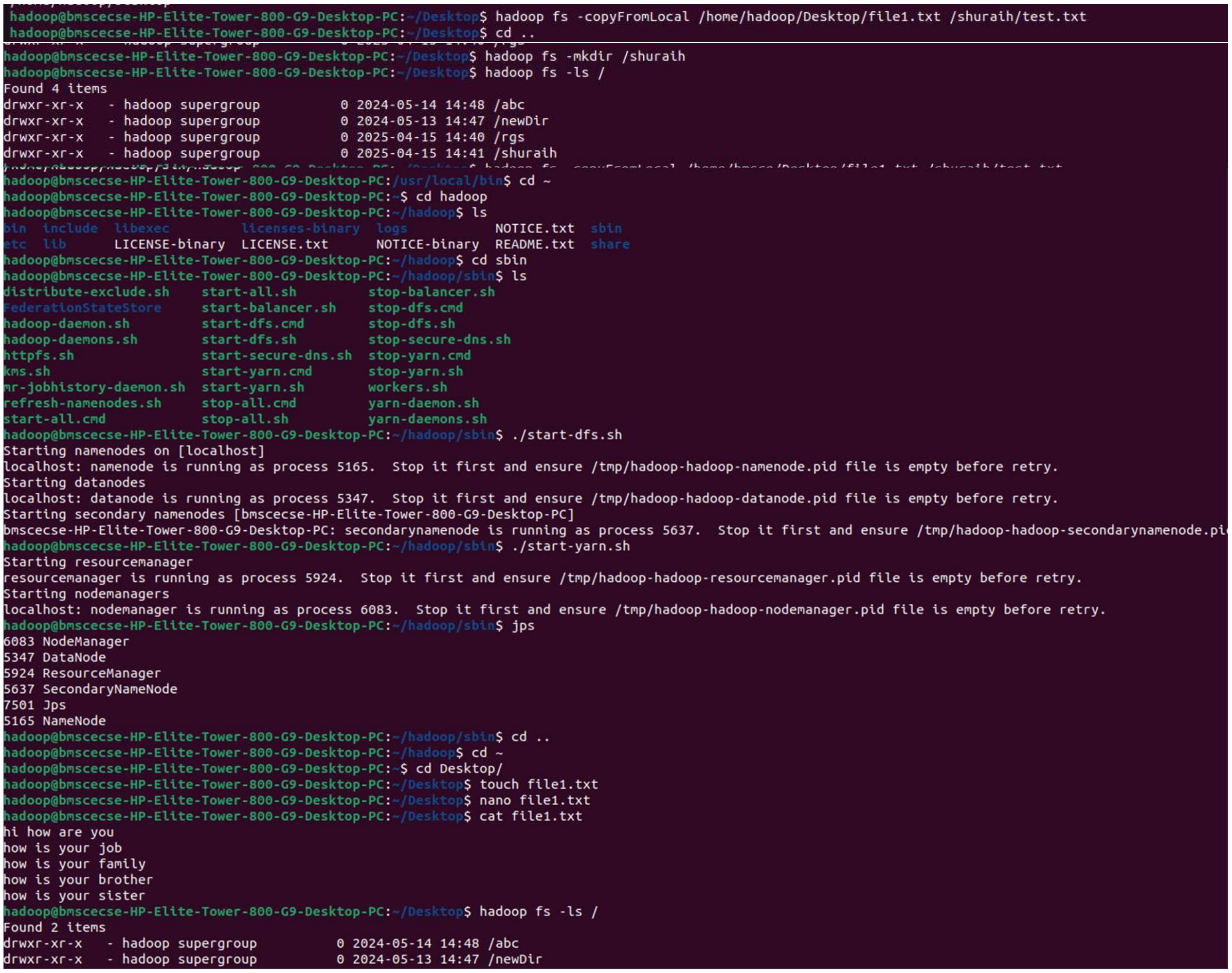
**Description:** Moves /abc directory in HDFS to /FFF.

### 9. cp

**Command:** hadoop fs -cp /CSE/ /LLL

**Description:** Copies contents from /CSE/ to /LLL within HDFS.

## Screenshots

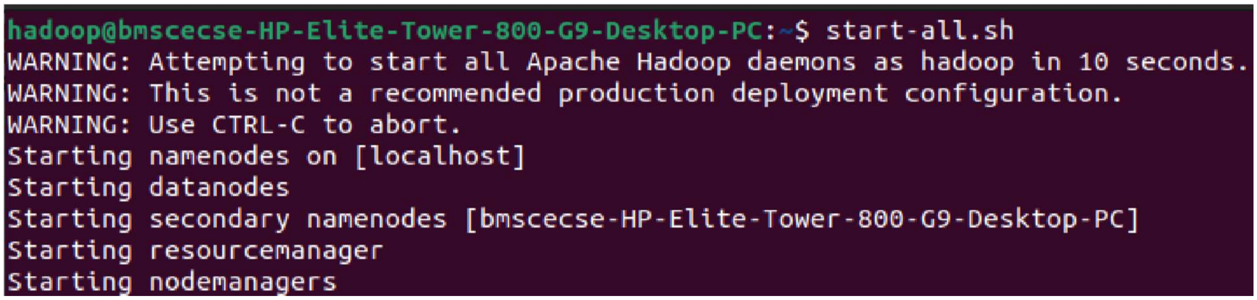


```
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hadoop fs -copyFromLocal /home/hadoop/Desktop/file1.txt /shuraih/test.txt
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ cd ..
```

```
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hadoop fs -mkdir /shuraih
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hadoop fs -ls /
Found 4 items
drwxr-xr-x   - hadoop supergroup          0 2024-05-14 14:48 /abc
drwxr-xr-x   - hadoop supergroup          0 2024-05-13 14:47 /newDir
drwxr-xr-x   - hadoop supergroup          0 2025-04-15 14:40 /rgs
drwxr-xr-x   - hadoop supergroup          0 2025-04-15 14:41 /shuraih
```

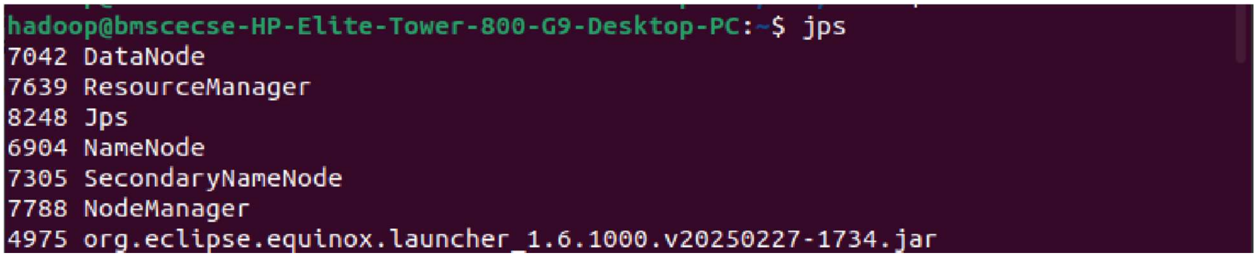
```
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:/usr/local/bin$ cd ~
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ cd hadoop
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/hadoop$ ls
bin  include  libexec         licenses-binary  logs           NOTICE.txt  sbin
etc  lib      LICENSE-binary  LICENSE.txt      NOTICE-binary  README.txt  share
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/hadoop$ cd sbin
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/hadoop/sbin$ ls
distribute-exclude.sh    start-all.sh         stop-balancer.sh
FederationStateStore     start-balancer.sh    stop-dfs.cmd
hadoop-daemon.sh         start-dfs.cmd        stop-dfs.sh
hadoop-daemons.sh        start-dfs.sh         stop-secure-dns.sh
httpfs.sh                start-secure-dns.sh  stop-yarn.cmd
kms.sh                   start-yarn.cmd       stop-yarn.sh
mr-jobhistory-daemon.sh  start-yarn.sh        workers.sh
refresh-namenodes.sh     stop-all.cmd         yarn-daemon.sh
start-all.cmd            stop-all.sh          yarn-daemons.sh
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/hadoop/sbin$ ./start-dfs.sh
Starting namenodes on [localhost]
localhost: namenode is running as process 5165.  Stop it first and ensure /tmp/hadoop-hadoop-namenode.pid file is empty before retry.
Starting datanodes
localhost: datanode is running as process 5347.  Stop it first and ensure /tmp/hadoop-hadoop-datanode.pid file is empty before retry.
Starting secondary namenodes [bmscecse-HP-Elite-Tower-800-G9-Desktop-PC]
bmscecse-HP-Elite-Tower-800-G9-Desktop-PC: secondarynamenode is running as process 5637.  Stop it first and ensure /tmp/hadoop-hadoop-secondarynamenode.pi
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/hadoop/sbin$ ./start-yarn.sh
Starting resourcemanager
resourcemanager is running as process 5924.  Stop it first and ensure /tmp/hadoop-hadoop-resourcemanager.pid file is empty before retry.
Starting nodemanagers
localhost: nodemanager is running as process 6083.  Stop it first and ensure /tmp/hadoop-hadoop-nodemanager.pid file is empty before retry.
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/hadoop/sbin$ jps
6083 NodeManager
5347 DataNode
5924 ResourceManager
5637 SecondaryNameNode
7501 Jps
5165 NameNode
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/hadoop/sbin$ cd ..
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/hadoop$ cd ~
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ cd Desktop/
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ touch file1.txt
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ nano file1.txt
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ cat file1.txt
hi how are you
how is your job
how is your family
how is your brother
how is your sister
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hadoop fs -ls /
Found 2 items
drwxr-xr-x   - hadoop supergroup          0 2024-05-14 14:48 /abc
drwxr-xr-x   - hadoop supergroup          0 2024-05-13 14:47 /newDir
```

# Lab 7 Word Count using Map-Reduce



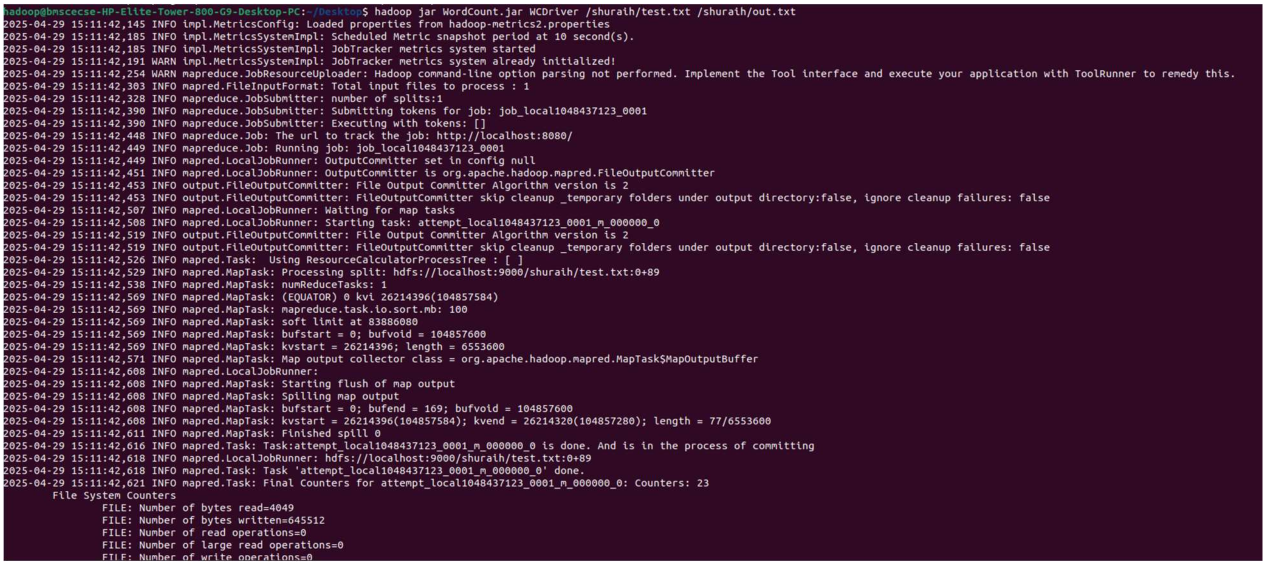
```
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ start-all.sh
WARNING: Attempting to start all Apache Hadoop daemons as hadoop in 10 seconds.
WARNING: This is not a recommended production deployment configuration.
WARNING: Use CTRL-C to abort.
Starting namenodes on [localhost]
Starting datanodes
Starting secondary namenodes [bmscecse-HP-Elite-Tower-800-G9-Desktop-PC]
Starting resourcemanager
Starting nodemanagers
```

Hadoop services are started using start-all.sh, launching daemons like NameNode, DataNode, and ResourceManager.



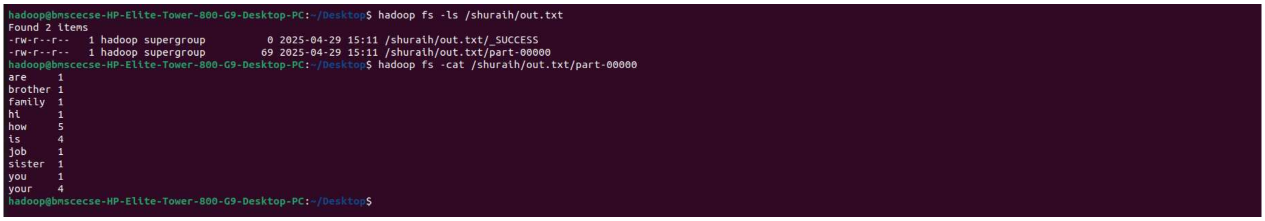
```
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ jps
7042 DataNode
7639 ResourceManager
8248 Jps
6904 NameNode
7305 SecondaryNameNode
7788 NodeManager
4975 org.eclipse.equinox.launcher_1.6.1000.v20250227-1734.jar
```

The jps command lists all running Hadoop-related Java processes such as NameNode, DataNode, and ResourceManager.



```
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hadoop jar WordCount.jar WCDriver /shuraih/test.txt /shuraih/out.txt
2025-04-29 15:11:42,145 INFO impl.MetricsConfig: Loaded properties from hadoop-metrics2.properties
2025-04-29 15:11:42,185 INFO impl.MetricsSystemImpl: Scheduled Metric snapshot period at 10 second(s).
2025-04-29 15:11:42,185 INFO impl.MetricsSystemImpl: JobTracker metrics system started
2025-04-29 15:11:42,191 WARN impl.MetricsSystemImpl: JobTracker metrics system already initialized!
2025-04-29 15:11:42,254 WARN mapreduce.JobResourceUploader: Hadoop command-line option parsing not performed. Implement the Tool interface and execute your application with ToolRunner to remedy this.
2025-04-29 15:11:42,303 INFO mapred.FileInputFormat: Total input files to process : 1
2025-04-29 15:11:42,328 INFO mapreduce.JobSubmitter: number of splits:1
2025-04-29 15:11:42,390 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_local1048437123_0001
2025-04-29 15:11:42,390 INFO mapreduce.JobSubmitter: Executing with tokens: []
2025-04-29 15:11:42,448 INFO mapreduce.Job: The url to track the job: http://localhost:8080/
2025-04-29 15:11:42,449 INFO mapreduce.Job: Running job: job_local1048437123_0001
2025-04-29 15:11:42,449 INFO mapred.LocalJobRunner: OutputCommitter set in config null
2025-04-29 15:11:42,451 INFO mapred.LocalJobRunner: OutputCommitter is org.apache.hadoop.mapred.FileOutputCommitter
2025-04-29 15:11:42,453 INFO output.FileOutputCommitter: File Output Committer Algorithm version is 2
2025-04-29 15:11:42,453 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup _temporary folders under output directory:false, ignore cleanup failures: false
2025-04-29 15:11:42,507 INFO mapred.LocalJobRunner: Waiting for map tasks
2025-04-29 15:11:42,508 INFO mapred.LocalJobRunner: Starting task: attempt_local1048437123_0001_m_000000_0
2025-04-29 15:11:42,519 INFO output.FileOutputCommitter: File Output Committer Algorithm version is 2
2025-04-29 15:11:42,519 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup _temporary folders under output directory:false, ignore cleanup failures: false
2025-04-29 15:11:42,526 INFO mapred.Task:  Using ResourceCalculatorProcessTree : [ ]
2025-04-29 15:11:42,529 INFO mapred.MapTask: Processing split: hdfs://localhost:9000/shuraih/test.txt:0+89
2025-04-29 15:11:42,538 INFO mapred.MapTask: numReduceTasks: 1
2025-04-29 15:11:42,569 INFO mapred.MapTask: (EQUATOR) 0 kvi 26214396(104857584)
2025-04-29 15:11:42,569 INFO mapred.MapTask: mapreduce.task.io.sort.mb: 100
2025-04-29 15:11:42,569 INFO mapred.MapTask: soft limit at 83886080
2025-04-29 15:11:42,569 INFO mapred.MapTask: bufstart = 0; bufvoid = 104857600
2025-04-29 15:11:42,569 INFO mapred.MapTask: kvstart = 26214396; length = 6553600
2025-04-29 15:11:42,571 INFO mapred.MapTask: Map output collector class = org.apache.hadoop.mapred.MapTask$MapOutputBuffer
2025-04-29 15:11:42,608 INFO mapred.LocalJobRunner: 
2025-04-29 15:11:42,608 INFO mapred.MapTask: Starting flush of map output
2025-04-29 15:11:42,608 INFO mapred.MapTask: Spilling map output
2025-04-29 15:11:42,608 INFO mapred.MapTask: bufstart = 0; bufend = 169; bufvoid = 104857600
2025-04-29 15:11:42,608 INFO mapred.MapTask: kvstart = 26214396(104857584); kvend = 26214320(104857280); length = 77/6553600
2025-04-29 15:11:42,611 INFO mapred.MapTask: Finished spill 0
2025-04-29 15:11:42,616 INFO mapred.Task: Task:attempt_local1048437123_0001_m_000000_0 is done. And is in the process of committing
2025-04-29 15:11:42,618 INFO mapred.LocalJobRunner: hdfs://localhost:9000/shuraih/test.txt:0+89
2025-04-29 15:11:42,618 INFO mapred.Task: Task 'attempt_local1048437123_0001_m_000000_0' done.
2025-04-29 15:11:42,621 INFO mapred.Task: Final Counters for attempt_local1048437123_0001_m_000000_0: Counters: 23
        File System Counters
                FILE: Number of bytes read=4049
                FILE: Number of bytes written=645512
                FILE: Number of read operations=0
                FILE: Number of large read operations=0
                FILE: Number of write operations=0
```

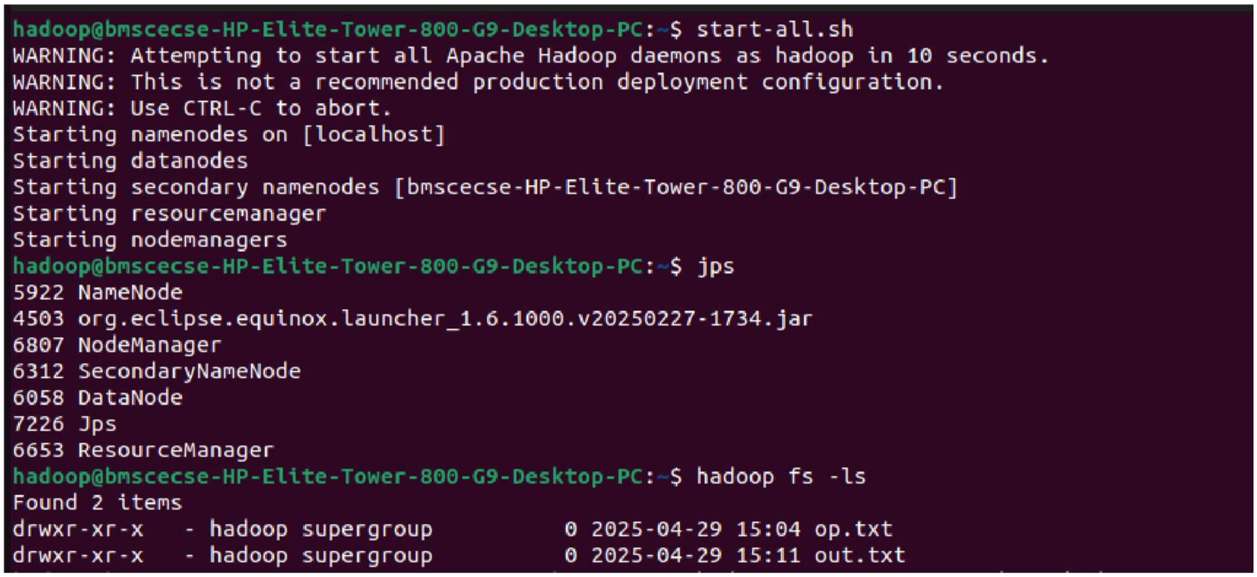
A MapReduce job is executed using hadoop jar to process test.txt and generate output in out.txt.



```
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hadoop fs -ls /shuraih/out.txt
Found 2 items
-rw-r--r--   1 hadoop supergroup          0 2025-04-29 15:11 /shuraih/out.txt/_SUCCESS
-rw-r--r--   1 hadoop supergroup         69 2025-04-29 15:11 /shuraih/out.txt/part-00000
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hadoop fs -cat /shuraih/out.txt/part-00000
are     1
brother 1
family  1
hi      1
how     5
is      4
job     1
sister  1
you     1
your    4
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$
```

The output of the MapReduce job is displayed using hadoop fs –cat.

# Lab 8 Mean-Max and Avg Temperature using Map-Reduce



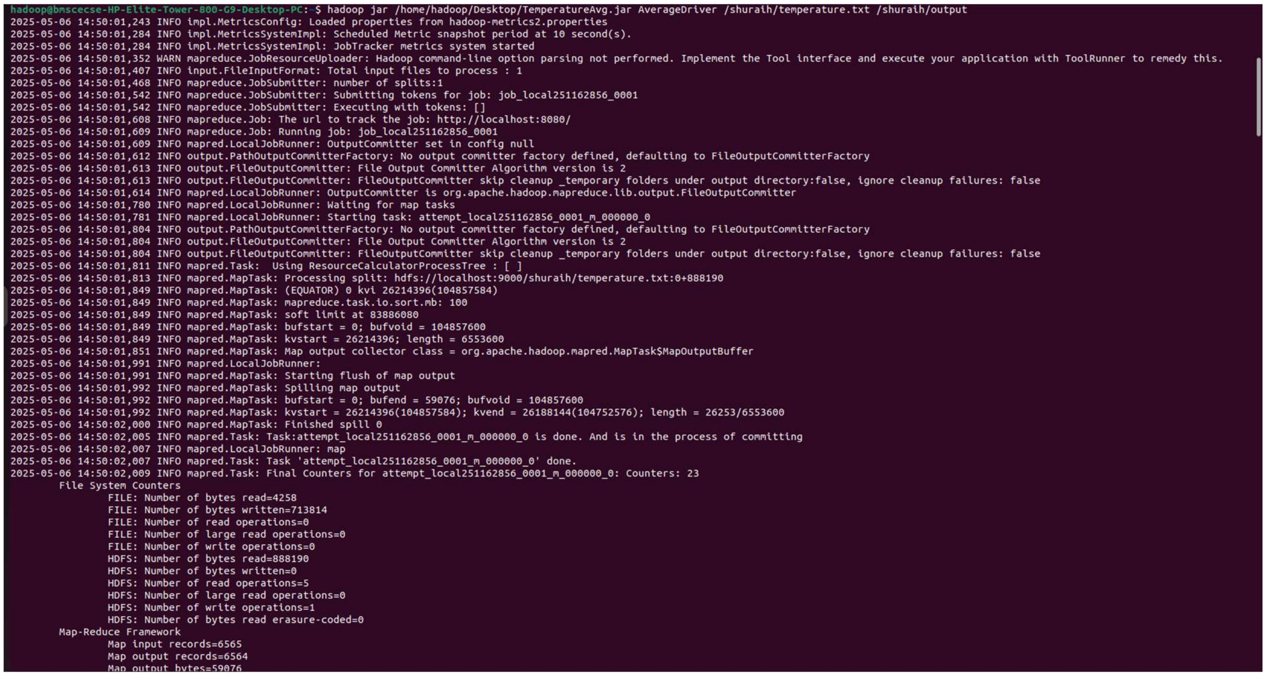
```
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ start-all.sh
WARNING: Attempting to start all Apache Hadoop daemons as hadoop in 10 seconds.
WARNING: This is not a recommended production deployment configuration.
WARNING: Use CTRL-C to abort.
Starting namenodes on [localhost]
Starting datanodes
Starting secondary namenodes [bmscecse-HP-Elite-Tower-800-G9-Desktop-PC]
Starting resourcemanager
Starting nodemanagers
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ jps
5922 NameNode
4503 org.eclipse.equinox.launcher_1.6.1000.v20250227-1734.jar
6807 NodeManager
6312 SecondaryNameNode
6058 DataNode
7226 Jps
6653 ResourceManager
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -ls
Found 2 items
drwxr-xr-x   - hadoop supergroup          0 2025-04-29 15:04 op.txt
drwxr-xr-x   - hadoop supergroup          0 2025-04-29 15:11 out.txt
```

All Hadoop daemons (NameNode, DataNode, etc.) are started using start-all.sh on the local machine.

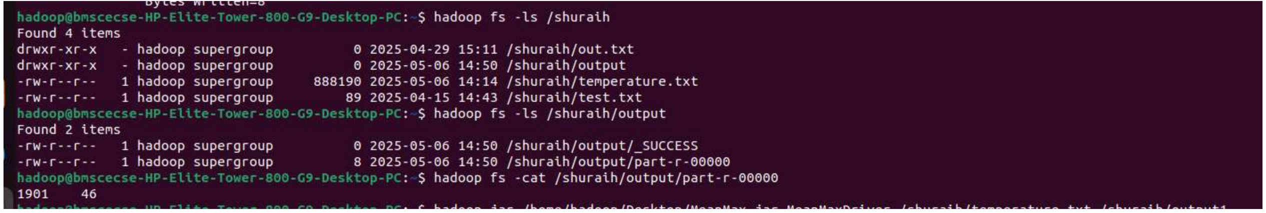
The jps command confirms active Hadoop services such as NameNode, DataNode, and ResourceManager are running.

The hadoop fs -ls command lists the contents of the HDFS root directory, showing two output folders: op.txt and out.txt.

Average Temperature :

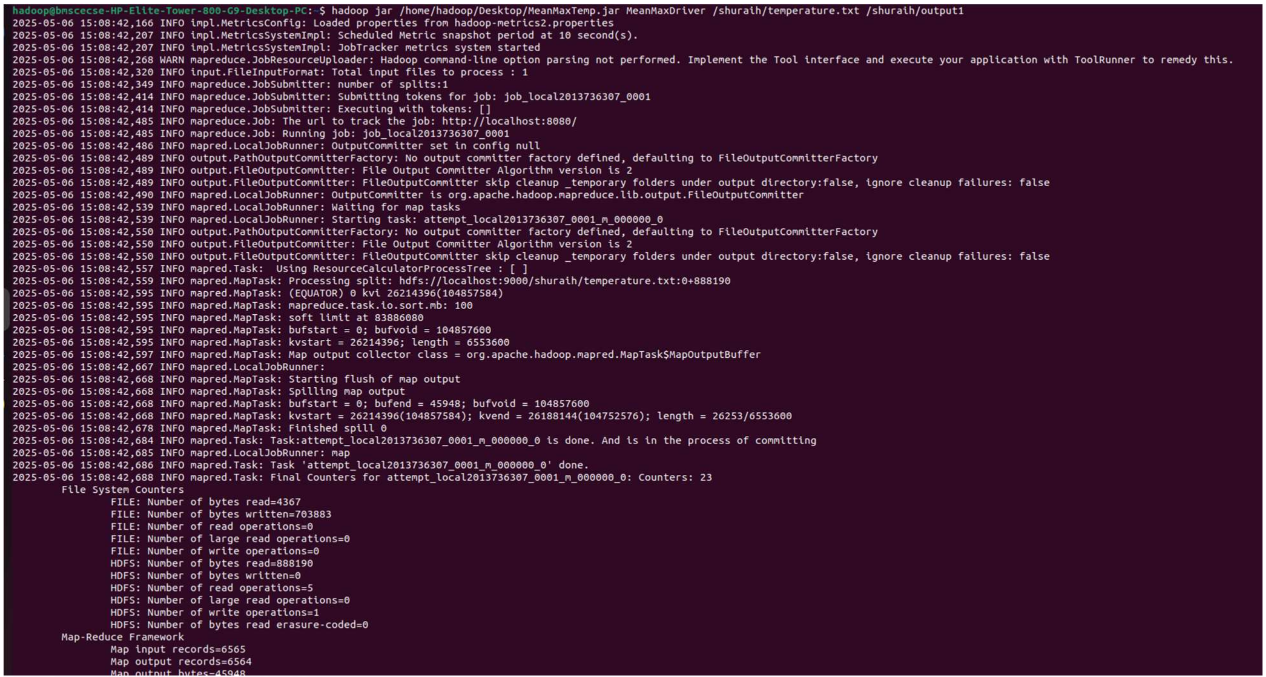


```
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop jar /home/hadoop/Desktop/TemperatureAvg.jar AverageDriver /shuraih/temperature.txt /shuraih/output
2025-05-06 14:50:01,243 INFO impl.MetricsConfig: Loaded properties from hadoop-metrics2.properties
2025-05-06 14:50:01,284 INFO impl.MetricsSystemImpl: Scheduled Metric snapshot period at 10 second(s).
2025-05-06 14:50:01,284 INFO impl.MetricsSystemImpl: JobTracker metrics system started
2025-05-06 14:50:01,352 WARN mapreduce.JobResourceUploader: Hadoop command-line option parsing not performed. Implement the Tool interface and execute your application with ToolRunner to remedy this.
2025-05-06 14:50:01,407 INFO input.FileInputFormat: Total input files to process : 1
2025-05-06 14:50:01,468 INFO mapreduce.JobSubmitter: number of splits:1
2025-05-06 14:50:01,542 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_local251162856_0001
2025-05-06 14:50:01,542 INFO mapreduce.JobSubmitter: Executing with tokens: []
2025-05-06 14:50:01,608 INFO mapreduce.Job: The url to track the job: http://localhost:8080/
2025-05-06 14:50:01,609 INFO mapreduce.Job: Running job: job_local251162856_0001
2025-05-06 14:50:01,609 INFO mapred.LocalJobRunner: OutputCommitter set in config null
2025-05-06 14:50:01,612 INFO output.PathOutputCommitterFactory: No output committer factory defined, defaulting to FileOutputCommitterFactory
2025-05-06 14:50:01,613 INFO output.FileOutputCommitter: File Output Committer Algorithm version is 2
2025-05-06 14:50:01,613 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup _temporary folders under output directory:false, ignore cleanup failures: false
2025-05-06 14:50:01,614 INFO mapred.LocalJobRunner: OutputCommitter is org.apache.hadoop.mapreduce.lib.output.FileOutputCommitter
2025-05-06 14:50:01,780 INFO mapred.LocalJobRunner: Waiting for map tasks
2025-05-06 14:50:01,781 INFO mapred.LocalJobRunner: Starting task: attempt_local251162856_0001_m_000000_0
2025-05-06 14:50:01,804 INFO output.PathOutputCommitterFactory: No output committer factory defined, defaulting to FileOutputCommitterFactory
2025-05-06 14:50:01,804 INFO output.FileOutputCommitter: File Output Committer Algorithm version is 2
2025-05-06 14:50:01,804 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup _temporary folders under output directory:false, ignore cleanup failures: false
2025-05-06 14:50:01,811 INFO mapred.Task:  Using ResourceCalculatorProcessTree : [ ]
2025-05-06 14:50:01,813 INFO mapred.MapTask: Processing split: hdfs://localhost:9000/shuraih/temperature.txt:0+888190
2025-05-06 14:50:01,849 INFO mapred.MapTask: (EQUATOR) 0 kvi 26214396(104857584)
2025-05-06 14:50:01,849 INFO mapred.MapTask: mapreduce.task.io.sort.mb: 100
2025-05-06 14:50:01,849 INFO mapred.MapTask: soft limit at 83886080
2025-05-06 14:50:01,849 INFO mapred.MapTask: bufstart = 0; bufvoid = 104857600
2025-05-06 14:50:01,849 INFO mapred.MapTask: kvstart = 26214396; length = 6553600
2025-05-06 14:50:01,851 INFO mapred.MapTask: Map output collector class = org.apache.hadoop.mapred.MapTask$MapOutputBuffer
2025-05-06 14:50:01,991 INFO mapred.LocalJobRunner:
2025-05-06 14:50:01,991 INFO mapred.MapTask: Starting flush of map output
2025-05-06 14:50:01,992 INFO mapred.MapTask: Spilling map output
2025-05-06 14:50:01,992 INFO mapred.MapTask: bufstart = 0; bufend = 59076; bufvoid = 104857600
2025-05-06 14:50:01,992 INFO mapred.MapTask: kvstart = 26214396(104857584); kvend = 26188144(104752576); length = 26253/6553600
2025-05-06 14:50:02,000 INFO mapred.MapTask: Finished spill 0
2025-05-06 14:50:02,005 INFO mapred.Task: Task:attempt_local251162856_0001_m_000000_0 is done. And is in the process of committing
2025-05-06 14:50:02,007 INFO mapred.LocalJobRunner: map
2025-05-06 14:50:02,007 INFO mapred.Task: Task 'attempt_local251162856_0001_m_000000_0' done.
2025-05-06 14:50:02,009 INFO mapred.Task: Final Counters for attempt_local251162856_0001_m_000000_0: Counters: 23
        File System Counters
                FILE: Number of bytes read=4258
                FILE: Number of bytes written=713814
                FILE: Number of read operations=0
                FILE: Number of large read operations=0
                FILE: Number of write operations=0
                HDFS: Number of bytes read=888190
                HDFS: Number of bytes written=0
                HDFS: Number of read operations=5
                HDFS: Number of large read operations=0
                HDFS: Number of write operations=1
                HDFS: Number of bytes read erasure-coded=0
        Map-Reduce Framework
                Map input records=6565
                Map output records=6564
                Map output bytes=59076
```

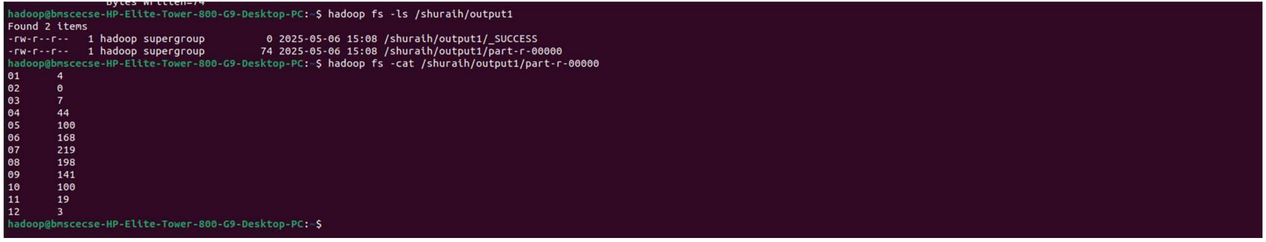


```
                Bytes Written=8
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -ls /shuraih
Found 4 items
drwxr-xr-x   - hadoop supergroup          0 2025-04-29 15:11 /shuraih/out.txt
drwxr-xr-x   - hadoop supergroup          0 2025-05-06 14:50 /shuraih/output
-rw-r--r--   1 hadoop supergroup     888190 2025-05-06 14:14 /shuraih/temperature.txt
-rw-r--r--   1 hadoop supergroup         89 2025-04-15 14:43 /shuraih/test.txt
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -ls /shuraih/output
Found 2 items
-rw-r--r--   1 hadoop supergroup          0 2025-05-06 14:50 /shuraih/output/_SUCCESS
-rw-r--r--   1 hadoop supergroup          8 2025-05-06 14:50 /shuraih/output/part-r-00000
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -cat /shuraih/output/part-r-00000
1901    46
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop jar /home/hadoop/Desktop/MeanMax.jar MeanMaxDriver /shuraih/temperature.txt /shuraih/output1
```

Mean Max Temperature:



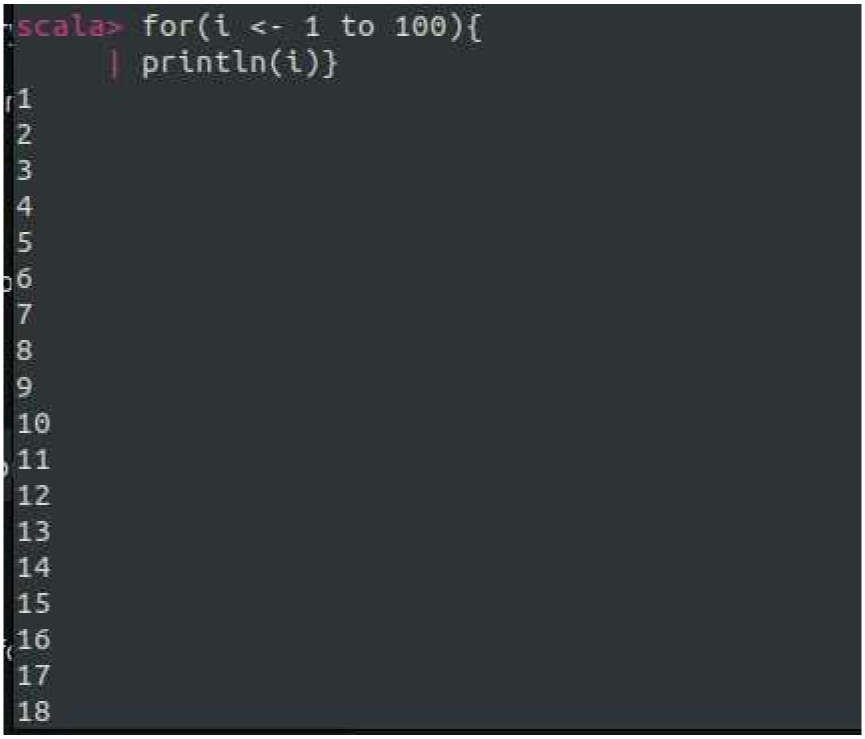
```
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop jar /home/hadoop/Desktop/MeanMaxTemp.jar MeanMaxDriver /shuraih/temperature.txt /shuraih/output1
2025-05-06 15:08:42,166 INFO impl.MetricsConfig: Loaded properties from hadoop-metrics2.properties
2025-05-06 15:08:42,207 INFO impl.MetricsSystemImpl: Scheduled Metric snapshot period at 10 second(s).
2025-05-06 15:08:42,207 INFO impl.MetricsSystemImpl: JobTracker metrics system started
2025-05-06 15:08:42,268 WARN mapreduce.JobResourceUploader: Hadoop command-line option parsing not performed. Implement the Tool interface and execute your application with ToolRunner to remedy this.
2025-05-06 15:08:42,320 INFO input.FileInputFormat: Total input files to process : 1
2025-05-06 15:08:42,349 INFO mapreduce.JobSubmitter: number of splits:1
2025-05-06 15:08:42,414 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_local2013736307_0001
2025-05-06 15:08:42,414 INFO mapreduce.JobSubmitter: Executing with tokens: []
2025-05-06 15:08:42,485 INFO mapreduce.Job: The url to track the job: http://localhost:8080/
2025-05-06 15:08:42,485 INFO mapreduce.Job: Running job: job_local2013736307_0001
2025-05-06 15:08:42,486 INFO mapred.LocalJobRunner: OutputCommitter set in config null
2025-05-06 15:08:42,489 INFO output.PathOutputCommitterFactory: No output committer factory defined, defaulting to FileOutputCommitterFactory
2025-05-06 15:08:42,489 INFO output.FileOutputCommitter: File Output Committer Algorithm version is 2
2025-05-06 15:08:42,489 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup _temporary folders under output directory:false, ignore cleanup failures: false
2025-05-06 15:08:42,490 INFO mapred.LocalJobRunner: OutputCommitter is org.apache.hadoop.mapreduce.lib.output.FileOutputCommitter
2025-05-06 15:08:42,539 INFO mapred.LocalJobRunner: Waiting for map tasks
2025-05-06 15:08:42,539 INFO mapred.LocalJobRunner: Starting task: attempt_local2013736307_0001_m_000000_0
2025-05-06 15:08:42,550 INFO output.PathOutputCommitterFactory: No output committer factory defined, defaulting to FileOutputCommitterFactory
2025-05-06 15:08:42,550 INFO output.FileOutputCommitter: File Output Committer Algorithm version is 2
2025-05-06 15:08:42,550 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup _temporary folders under output directory:false, ignore cleanup failures: false
2025-05-06 15:08:42,557 INFO mapred.Task:  Using ResourceCalculatorProcessTree : [ ]
2025-05-06 15:08:42,559 INFO mapred.MapTask: Processing split: hdfs://localhost:9000/shuraih/temperature.txt:0+888190
2025-05-06 15:08:42,595 INFO mapred.MapTask: (EQUATOR) 0 kvi 26214396(104857584)
2025-05-06 15:08:42,595 INFO mapred.MapTask: mapreduce.task.io.sort.mb: 100
2025-05-06 15:08:42,595 INFO mapred.MapTask: soft limit at 83886080
2025-05-06 15:08:42,595 INFO mapred.MapTask: bufstart = 0; bufvoid = 104857600
2025-05-06 15:08:42,595 INFO mapred.MapTask: kvstart = 26214396; length = 6553600
2025-05-06 15:08:42,597 INFO mapred.MapTask: Map output collector class = org.apache.hadoop.mapred.MapTask$MapOutputBuffer
2025-05-06 15:08:42,667 INFO mapred.LocalJobRunner:
2025-05-06 15:08:42,668 INFO mapred.MapTask: Starting flush of map output
2025-05-06 15:08:42,668 INFO mapred.MapTask: Spilling map output
2025-05-06 15:08:42,668 INFO mapred.MapTask: bufstart = 0; bufend = 45948; bufvoid = 104857600
2025-05-06 15:08:42,668 INFO mapred.MapTask: kvstart = 26214396(104857584); kvend = 26188144(104752576); length = 26253/6553600
2025-05-06 15:08:42,678 INFO mapred.MapTask: Finished spill 0
2025-05-06 15:08:42,684 INFO mapred.Task: Task:attempt_local2013736307_0001_m_000000_0 is done. And is in the process of committing
2025-05-06 15:08:42,685 INFO mapred.LocalJobRunner: map
2025-05-06 15:08:42,686 INFO mapred.Task: Task 'attempt_local2013736307_0001_m_000000_0' done.
2025-05-06 15:08:42,688 INFO mapred.Task: Final Counters for attempt_local2013736307_0001_m_000000_0: Counters: 23
        File System Counters
                FILE: Number of bytes read=4367
                FILE: Number of bytes written=703883
                FILE: Number of read operations=0
                FILE: Number of large read operations=0
                FILE: Number of write operations=0
                HDFS: Number of bytes read=888190
                HDFS: Number of bytes written=0
                HDFS: Number of read operations=5
                HDFS: Number of large read operations=0
                HDFS: Number of write operations=1
                HDFS: Number of bytes read erasure-coded=0
        Map-Reduce Framework
                Map input records=6565
                Map output records=6564
                Map output bytes=45948
```



```
                Bytes Written=74
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -ls /shuraih/output1
Found 2 items
-rw-r--r--   1 hadoop supergroup          0 2025-05-06 15:08 /shuraih/output1/_SUCCESS
-rw-r--r--   1 hadoop supergroup         74 2025-05-06 15:08 /shuraih/output1/part-r-00000
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -cat /shuraih/output1/part-r-00000
01      4
02      0
03      7
04      44
05      100
06      168
07      219
08      198
09      141
10      100
11      19
12      3
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$
```

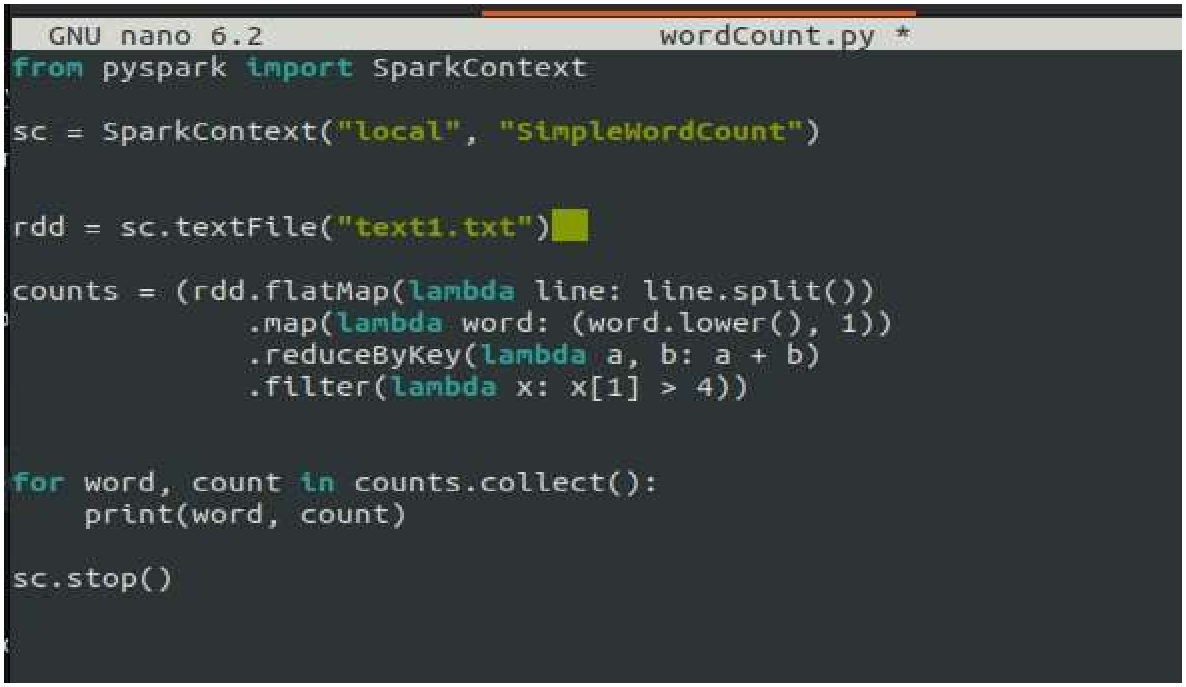
# Lab 9 Scala and pySpark

1.Write a Scala program to print numbers from 1 to 100 using for loop.



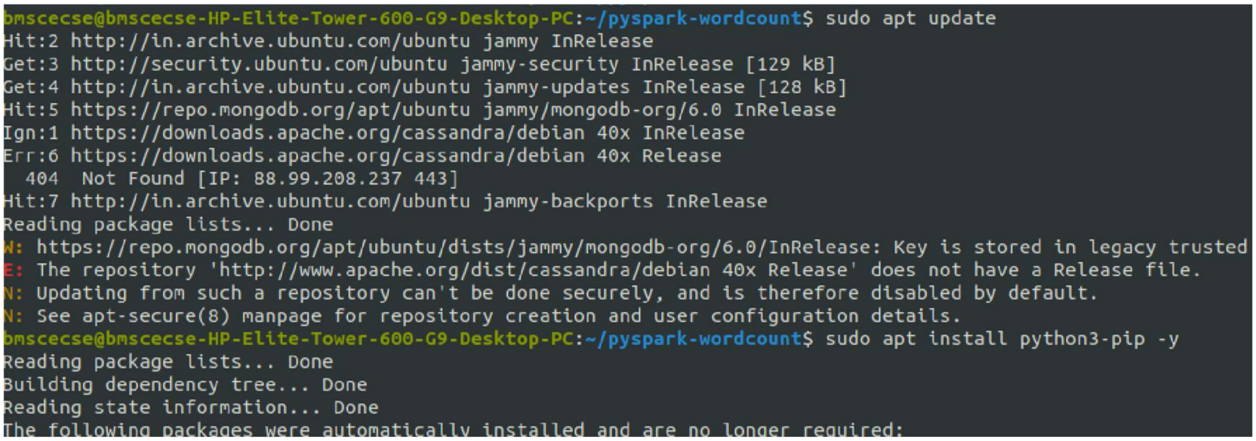
```
scala> for(i <- 1 to 100){
     | println(i)}
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
```

2.Using RDD and FlatMap count how many times each word appears in a file and write out a list of words whose count is strictly greater than 4 using Spark.

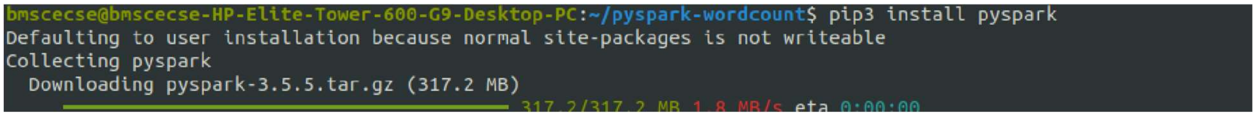


```
  GNU nano 6.2                                   wordCount.py *
from pyspark import SparkContext

sc = SparkContext("local", "SimpleWordCount")


rdd = sc.textFile("text1.txt")

counts = (rdd.flatMap(lambda line: line.split())
             .map(lambda word: (word.lower(), 1))
             .reduceByKey(lambda a, b: a + b)
             .filter(lambda x: x[1] > 4))


for word, count in counts.collect():
    print(word, count)

sc.stop()
```

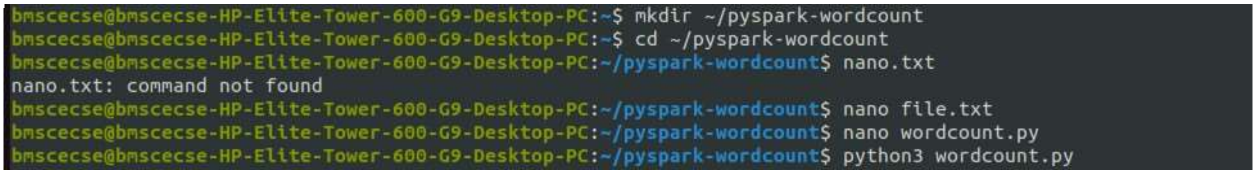
Spark Shell Execution Screenshots



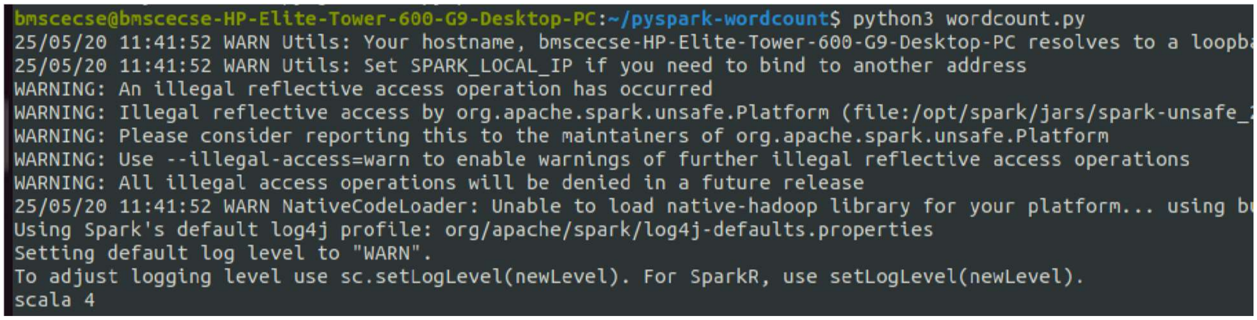
```
bmscecse@bmscecse-HP-Elite-Tower-600-G9-Desktop-PC:~/pyspark-wordcount$ sudo apt update
Hit:2 http://in.archive.ubuntu.com/ubuntu jammy InRelease
Get:3 http://security.ubuntu.com/ubuntu jammy-security InRelease [129 kB]
Get:4 http://in.archive.ubuntu.com/ubuntu jammy-updates InRelease [128 kB]
Hit:5 https://repo.mongodb.org/apt/ubuntu jammy/mongodb-org/6.0 InRelease
Ign:1 https://downloads.apache.org/cassandra/debian 40x InRelease
Err:6 https://downloads.apache.org/cassandra/debian 40x Release
  404  Not Found [IP: 88.99.208.237 443]
Hit:7 http://in.archive.ubuntu.com/ubuntu jammy-backports InRelease
Reading package lists... Done
W: https://repo.mongodb.org/apt/ubuntu/dists/jammy/mongodb-org/6.0/InRelease: Key is stored in legacy trusted
E: The repository 'http://www.apache.org/dist/cassandra/debian 40x Release' does not have a Release file.
N: Updating from such a repository can't be done securely, and is therefore disabled by default.
N: See apt-secure(8) manpage for repository creation and user configuration details.
bmscecse@bmscecse-HP-Elite-Tower-600-G9-Desktop-PC:~/pyspark-wordcount$ sudo apt install python3-pip -y
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following packages were automatically installed and are no longer required:
```



```
bmscecse@bmscecse-HP-Elite-Tower-600-G9-Desktop-PC:~/pyspark-wordcount$ pip3 install pyspark
Defaulting to user installation because normal site-packages is not writeable
Collecting pyspark
  Downloading pyspark-3.5.5.tar.gz (317.2 MB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 317.2/317.2 MB 1.8 MB/s eta 0:00:00
```

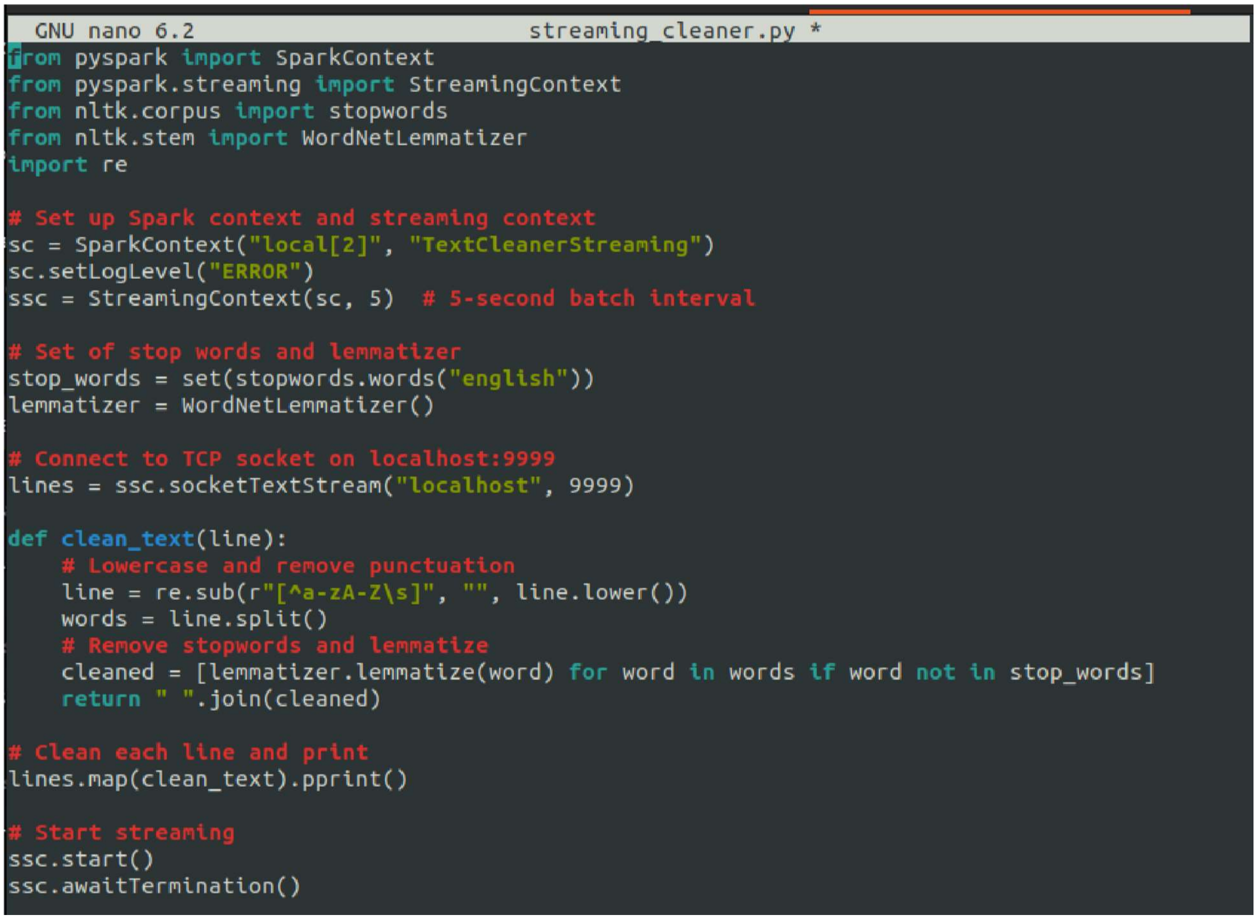


```
bmscecse@bmscecse-HP-Elite-Tower-600-G9-Desktop-PC:~$ mkdir ~/pyspark-wordcount
bmscecse@bmscecse-HP-Elite-Tower-600-G9-Desktop-PC:~$ cd ~/pyspark-wordcount
bmscecse@bmscecse-HP-Elite-Tower-600-G9-Desktop-PC:~/pyspark-wordcount$ nano.txt
nano.txt: command not found
bmscecse@bmscecse-HP-Elite-Tower-600-G9-Desktop-PC:~/pyspark-wordcount$ nano file.txt
bmscecse@bmscecse-HP-Elite-Tower-600-G9-Desktop-PC:~/pyspark-wordcount$ nano wordcount.py
bmscecse@bmscecse-HP-Elite-Tower-600-G9-Desktop-PC:~/pyspark-wordcount$ python3 wordcount.py
```

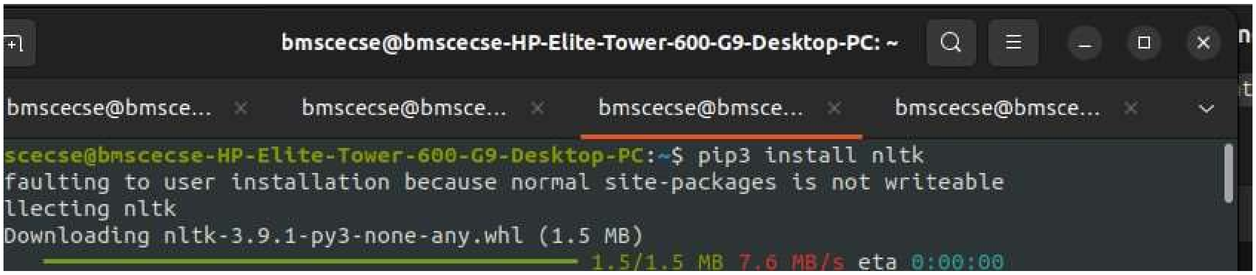


```
bmscecse@bmscecse-HP-Elite-Tower-600-G9-Desktop-PC:~/pyspark-wordcount$ python3 wordcount.py
25/05/20 11:41:52 WARN Utils: Your hostname, bmscecse-HP-Elite-Tower-600-G9-Desktop-PC resolves to a loopba
25/05/20 11:41:52 WARN Utils: Set SPARK_LOCAL_IP if you need to bind to another address
WARNING: An illegal reflective access operation has occurred
WARNING: Illegal reflective access by org.apache.spark.unsafe.Platform (file:/opt/spark/jars/spark-unsafe_
WARNING: Please consider reporting this to the maintainers of org.apache.spark.unsafe.Platform
WARNING: Use --illegal-access=warn to enable warnings of further illegal reflective access operations
WARNING: All illegal access operations will be denied in a future release
25/05/20 11:41:52 WARN NativeCodeLoader: Unable to load native-hadoop library for your platform... using b
Using Spark's default log4j profile: org/apache/spark/log4j-defaults.properties
Setting default log level to "WARN".
To adjust logging level use sc.setLogLevel(newLevel). For SparkR, use setLogLevel(newLevel).
scala 4
```

3.Write a simple streaming program in Spark to receive text data streams on a particular port, perform basic text cleaning (like white space removal, stop words removal, lemmatization, etc.), and print the cleaned text on the screen.



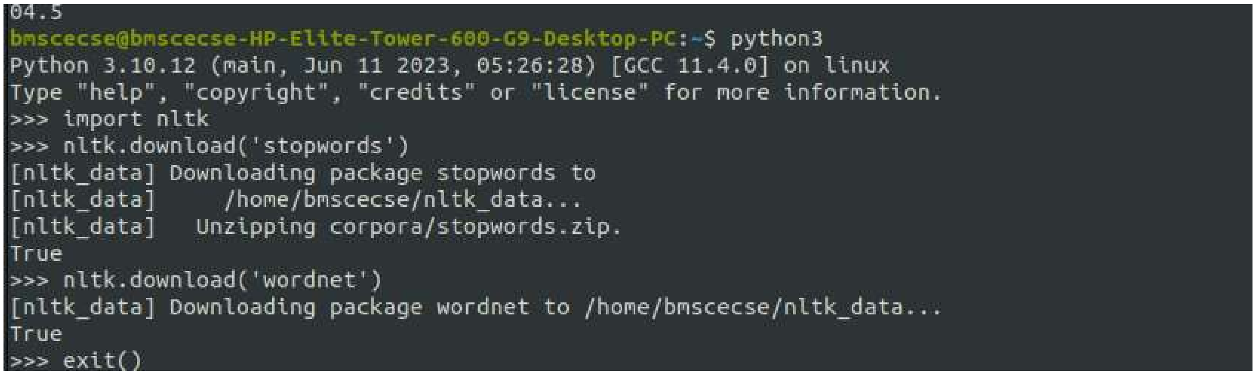
```
  GNU nano 6.2                          streaming_cleaner.py *
from pyspark import SparkContext
from pyspark.streaming import StreamingContext
from nltk.corpus import stopwords
from nltk.stem import WordNetLemmatizer
import re

# Set up Spark context and streaming context
sc = SparkContext("local[2]", "TextCleanerStreaming")
sc.setLogLevel("ERROR")
ssc = StreamingContext(sc, 5)  # 5-second batch interval

# Set of stop words and lemmatizer
stop_words = set(stopwords.words("english"))
lemmatizer = WordNetLemmatizer()

# Connect to TCP socket on localhost:9999
lines = ssc.socketTextStream("localhost", 9999)

def clean_text(line):
    # Lowercase and remove punctuation
    line = re.sub(r"[^a-zA-Z\s]", "", line.lower())
    words = line.split()
    # Remove stopwords and lemmatize
    cleaned = [lemmatizer.lemmatize(word) for word in words if word not in stop_words]
    return " ".join(cleaned)

# Clean each line and print
lines.map(clean_text).pprint()

# Start streaming
ssc.start()
ssc.awaitTermination()
```



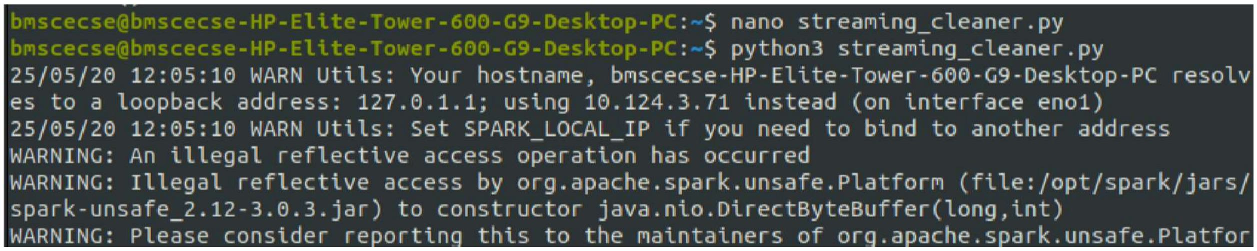
```
scecse@bmscecse-HP-Elite-Tower-600-G9-Desktop-PC:~$ pip3 install nltk
faulting to user installation because normal site-packages is not writeable
llecting nltk
Downloading nltk-3.9.1-py3-none-any.whl (1.5 MB)
                                             1.5/1.5 MB 7.6 MB/s eta 0:00:00
```

Installation of Natural Language Toolkit (nltk)

nlt

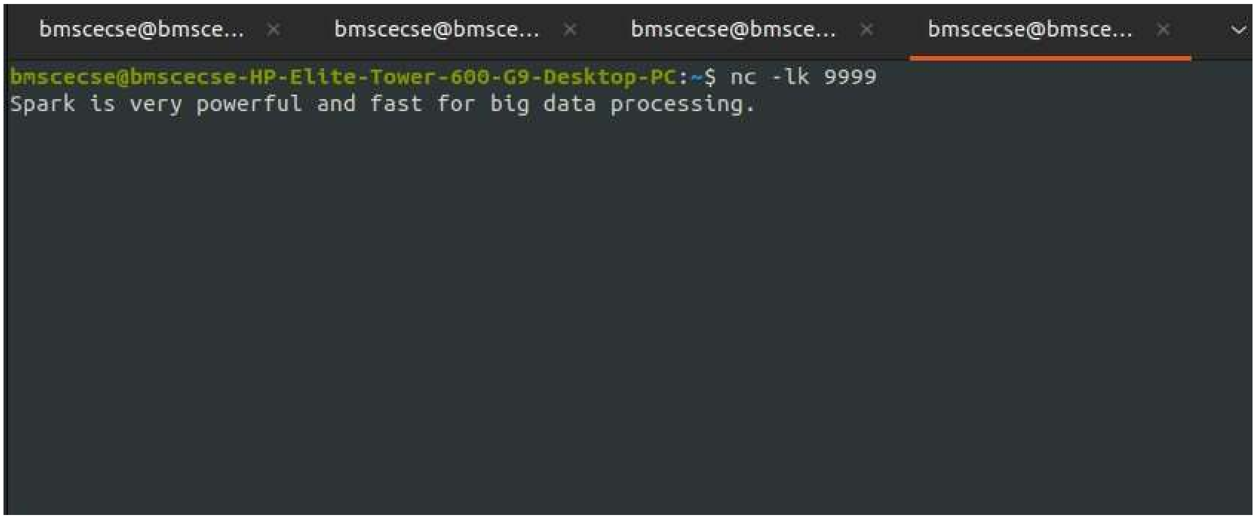


```
04.5
bmscecse@bmscecse-HP-Elite-Tower-600-G9-Desktop-PC:~$ python3
Python 3.10.12 (main, Jun 11 2023, 05:26:28) [GCC 11.4.0] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>> import nltk
>>> nltk.download('stopwords')
[nltk_data] Downloading package stopwords to
[nltk_data]     /home/bmscecse/nltk_data...
[nltk_data]   Unzipping corpora/stopwords.zip.
True
>>> nltk.download('wordnet')
[nltk_data] Downloading package wordnet to /home/bmscecse/nltk_data...
True
>>> exit()
```



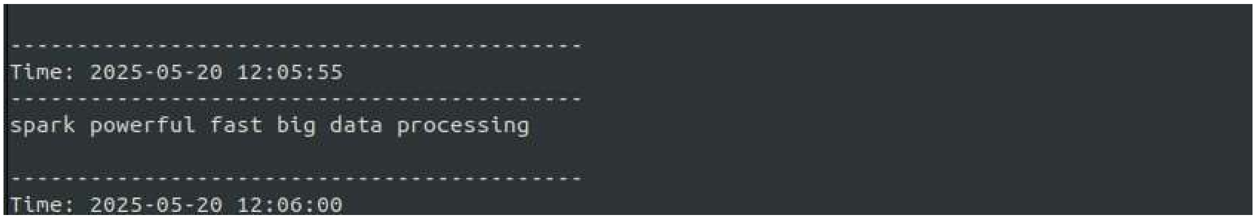
```
bmscecse@bmscecse-HP-Elite-Tower-600-G9-Desktop-PC:~$ nano streaming_cleaner.py
bmscecse@bmscecse-HP-Elite-Tower-600-G9-Desktop-PC:~$ python3 streaming_cleaner.py
25/05/20 12:05:10 WARN Utils: Your hostname, bmscecse-HP-Elite-Tower-600-G9-Desktop-PC resolv
es to a loopback address: 127.0.1.1; using 10.124.3.71 instead (on interface eno1)
25/05/20 12:05:10 WARN Utils: Set SPARK_LOCAL_IP if you need to bind to another address
WARNING: An illegal reflective access operation has occurred
WARNING: Illegal reflective access by org.apache.spark.unsafe.Platform (file:/opt/spark/jars/
spark-unsafe_2.12-3.0.3.jar) to constructor java.nio.DirectByteBuffer(long,int)
WARNING: Please consider reporting this to the maintainers of org.apache.spark.unsafe.Platfor
```

Executing the streaming_cleaner.py



```
bmscecse@bmscecse-HP-Elite-Tower-600-G9-Desktop-PC:~$ nc -lk 9999
Spark is very powerful and fast for big data processing.
```

Starting a TCP server that listens for incoming connections on port 9999



```
-------------------------------------------
Time: 2025-05-20 12:05:55
-------------------------------------------
spark powerful fast big data processing

-------------------------------------------
Time: 2025-05-20 12:06:00
```

Output- cleaned data