# VISVESVARAYA TECHNOLOGICAL UNIVERSITY

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

**LAB REPORT**
**on**

# BIG DATA ANALYTICS
# (20CS6PEBDA)

***Submitted by***

**Prajith Aarya (1BM19CS113)**

***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**
**May-2022 to July-2022**

# 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 "**BIG DATA ANALYTICS**" carried out by **Prajith Aarya(1BM19CS113),** who is 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 2022. The Lab report has been approved as it satisfies the academic requirements in respect of Big data analytics - (20CS6PEBDA)work prescribed for the said degree.

Nameof the Lab-Incharge
Designation
Department of CSE
BMSCE, Bengaluru

ANTARA ROY CHOUDHURY
Assistant Professor
Department of CSE
BMSCE, Bengaluru

`

Index Sheet



## Course Outcome

| | |
|---|---|
| CO 1 | Apply the concept of NoSQL, Hadoop or Spark for a given task |
| CO 2 | Analyze the Big Data and obtain insight using data analytics mechanisms. |
| CO 3 | Design and implement Big data applications by applying NoSQL, Hadoop orSpark |

# LAB 1:

**1. Create a key space by name Employee**

```
cqlsh> create keyspace LAB1_Employee with replication = { 'class':'SimpleStrategy','replication_factor':1};
cqlsh> use LAB1_Employee;
cqlsh:lab1_employee>
```

**2. Create a column family by name Employee-Info with attributes Emp_Id Primary Key, Emp_Name, Designation, Date_of_Joining, Salary, Dept_Name**

```
cqlsh:lab1_employee> create table Employee_info(Emp_id int ,Emp_name text ,Designation text
,Date_of_joining timestamp,Salary double,Dept_name text,primary key(Emp_id));
cqlsh:lab1_employee>
```

**3. Insert the values into the table in batch**

```
cqlsh:lab1_employee> begin batch insert into employee_info(Emp_id,Emp_name,Designation,Date_of_joining,Salary,Dept_name)values(11,'
Pankaj','Senior_Developer','2022-05-12',4500000,'Developing') insert into employee_info(Emp_id,Emp_name,Designation,Date_of_joining
,Salary,Dept_name)values(12,'Preetham','Manager','2022-05-13',6500000,'Developing') insert into employee_info(Emp_id,Emp_name,Desig
nation,Date_of_joining,Salary,Dept_name)values(13,'Prithvi','CEO','2012-05-13',8500000,'Overall') apply batch;
cqlsh:lab1_employee> select * from employee_info;

 emp_id | date_of_joining                 | dept_name  | designation      | emp_name | salary
--------+---------------------------------+------------+------------------+----------+---------
     13 | 2012-05-12 18:30:00.000000+0000 |    Overall |              CEO |  Prithvi | 8.5e+06
     11 | 2022-05-11 18:30:00.000000+0000 | Developing | Senior_Developer |   Pankaj | 4.5e+06
     12 | 2022-05-12 18:30:00.000000+0000 | Developing |          Manager | Preetham | 6.5e+06

(3 rows)
cqlsh:lab1_employee>
```

## 4. Update Employee name and Department of Emp-Id 13

```
cqlsh:lab1_employee> update employee_info set Emp_name='Puneeth' ,Dept_name='Sales' where Emp_id=13;
cqlsh:lab1_employee> select * from employee_info;

 emp_id | date_of_joining                 | dept_name  | designation      | emp_name | salary
--------+---------------------------------+------------+------------------+----------+---------
     13 | 2012-05-12 18:30:00.000000+0000 |      Sales |              CEO |  Puneeth | 8.5e+06
     11 | 2022-05-11 18:30:00.000000+0000 | Developing | Senior_Developer |   Pankaj | 4.5e+06
     12 | 2022-05-12 18:30:00.000000+0000 | Developing |          Manager | Preetham | 6.5e+06

(3 rows)
```

## 5. Sort the details of Employee records based on salary

```
cqlsh:lab1_employee> begin batch
                ... insert into emp(id,salary,name)values(5,45000,'Pankaj')
                ... insert into emp(id,salary,name)values(7,455000,'Preetham')
                ... insert into emp(id,salary,name)values(9,55000,'ram')
                ... apply batch;
cqlsh:lab1_employee> select * from emp;

 id | salary   | name
----+----------+----------
  5 |    45000 |   Pankaj
  7 | 4.55e+05 | Preetham
  9 |    55000 |      ram

(3 rows)
cqlsh:lab1_employee> paging off;
Disabled Query paging.
cqlsh:lab1_employee> select * from emp where id in (5,7,9) order by salary;

 id | salary   | name
----+----------+----------
  5 |    45000 |   Pankaj
  9 |    55000 |      ram
  7 | 4.55e+05 | Preetham

(3 rows)
```

**6. Alter the schema of the table Employee_Info to add a column Projects which stores a set of Projects done by the corresponding Employee.**

```
cqlsh:lab1_employee> alter table employee_info add projects text;
cqlsh:lab1_employee> select * from employee_info;

 emp_id | date_of_joining                 | dept_name  | designation      | emp_name | projects | salary
--------+---------------------------------+------------+------------------+----------+----------+---------
     13 | 2012-05-12 18:30:00.000000+0000 |      Sales |              CEO |  Puneeth |     null | 8.5e+06
     11 | 2022-05-11 18:30:00.000000+0000 | Developing | Senior_Developer |   Pankaj |     null | 4.5e+06
     12 | 2022-05-12 18:30:00.000000+0000 | Developing |          Manager | Preetham |     null | 6.5e+06

(3 rows)
```

**7. Update the altered table to add project names.**

```
cqlsh:lab1_employee> update Employee_info set projects='Kubernetes' where Emp_id=11;
cqlsh:lab1_employee> update Employee_info set projects='node_js' where Emp_id=12;
cqlsh:lab1_employee> update Employee_info set projects='Mobile_app' where Emp_id=13;
cqlsh:lab1_employee> select * from employee_info;

 emp_id | date_of_joining                 | dept_name  | designation      | emp_name | projects   | salary
--------+---------------------------------+------------+------------------+----------+------------+---------
     13 | 2012-05-12 18:30:00.000000+0000 |      Sales |              CEO |  Puneeth | Mobile_app | 8.5e+06
     11 | 2022-05-11 18:30:00.000000+0000 | Developing | Senior_Developer |   Pankaj | Kubernetes | 4.5e+06
     12 | 2022-05-12 18:30:00.000000+0000 | Developing |          Manager | Preetham |    node_js | 6.5e+06

(3 rows)
```

**8. Create a TTL of 15 seconds to display the values of Employees.**

```
cqlsh:lab1_employee> insert into Employee_info (Emp_id,Emp_name,Designation,Date_of_joining,Salary,Dept_name)values(19,'Prithvi','S
enior_Developer','2022-08-12',400000,'Developing') using TTL 50;
cqlsh:lab1_employee> select TTL(emp_name) from Employee_info where Emp_id=19;

 ttl(emp_name)
---------------
            45
```

# LAB 2:

## 1.Create a keyspace by name Library

```
cqlsh> create keyspace lab2_library with replication={'class':'SimpleStrategy','replication_factor':1};
cqlsh> use lab2_library;
cqlsh:lab2_library>
```

## 2. Create a column family by name Library-Info with attributes Stud_Id Primary Key, Counter_value of type Counter, Stud_Name, Book-Name, Book-Id, Date_of_issue

```
cqlsh:lab2_library> create table library_info(stud_id int,counter_value counter,stud_name text,book_id int
,date_of_issue timestamp,primary key(stud_id,stud_name,book_id,date_of_issue));
cqlsh:lab2_library> A
```

**3. Insert the values into the table in batch**

```
cqlsh:lab2_library> update library_info set counter_value=counter_value + 2 where stud_id=2 and stud_name=
'Pankaj' and book_id=145 and date_of_issue='2022-08-04';
cqlsh:lab2_library> select * from library_info;

 stud_id | stud_name | book_id | date_of_issue                   | counter_value
---------+-----------+---------+---------------------------------+--------------
       2 |    Pankaj |     145 | 2022-08-03 18:30:00.000000+0000 |            2
```

**4. Display the details of the table created and increase the value of the counter**

```
cqlsh:lab2_library> update library_info set counter_value=counter_value + 2 where stud_id=2 and stud_name=
'Pankaj' and book_id=145 and date_of_issue='2022-08-04';
cqlsh:lab2_library> select * from library_info;

 stud_id | stud_name | book_id | date_of_issue                   | counter_value
---------+-----------+---------+---------------------------------+--------------
       2 |    Pankaj |     145 | 2022-08-03 18:30:00.000000+0000 |            4
```

**5. Write a query to show that a student with id 112 has taken a book “BDA” 2 times.**

```
cqlsh:lab2_library> update library_info set counter_value=counter_value + 2 where stud_id=112 and stud_nam
e='Preetham' and book_id=145 and date_of_issue='2022-08-04';
cqlsh:lab2_library> select counter_value from library_info where stud_id=112;

 counter_value
---------------
             2
```

## 6. Export the created column to a csv file

```
cqlsh:lab2_library> copy library_info(stud_id,stud_name,book_id,date_of_issue,counter_value)to 'lib.csv';
Using 7 child processes

Starting copy of lab2_library.library_info with columns [stud_id, stud_name, book_id, date_of_issue, counter_v
alue].
Processed: 2 rows; Rate:       9 rows/s; Avg. rate:       9 rows/s
2 rows exported to 1 files in 0.250 seconds.
```

## 7. Import a given csv dataset from local file system into Cassandra column family.

```
cqlsh:lab2_library> create table library_info2(stud_id int,counter_value counter,stud_name text,book_id int,da
te_of_issue timestamp,primary key(stud_id,stud_name,book_id,date_of_issue));
cqlsh:lab2_library> copy library_info2(stud_id,stud_name,book_id,date_of_issue,counter_value)from 'lib.csv';
Using 7 child processes

Starting copy of lab2_library.library_info2 with columns [stud_id, stud_name, book_id, date_of_issue, counter_
value].
Processed: 2 rows; Rate:       4 rows/s; Avg. rate:       6 rows/s
2 rows imported from 1 files in 0.356 seconds (0 skipped).
cqlsh:lab2_library> select * from library_info;

 stud_id | stud_name | book_id | date_of_issue                   | counter_value
---------+-----------+---------+---------------------------------+---------------
       2 |    Pankaj |     145 | 2022-08-03 18:30:00.000000+0000 |             4
     112 |  Preetham |     145 | 2022-08-03 18:30:00.000000+0000 |             2

(2 rows)
cqlsh:lab2_library> select * from library_info2;

 stud_id | stud_name | book_id | date_of_issue                   | counter_value
---------+-----------+---------+---------------------------------+---------------
       2 |    Pankaj |     145 | 2022-08-03 18:30:00.000000+0000 |             4
     112 |  Preetham |     145 | 2022-08-03 18:30:00.000000+0000 |             2
cqlsh:lab2_library>
```

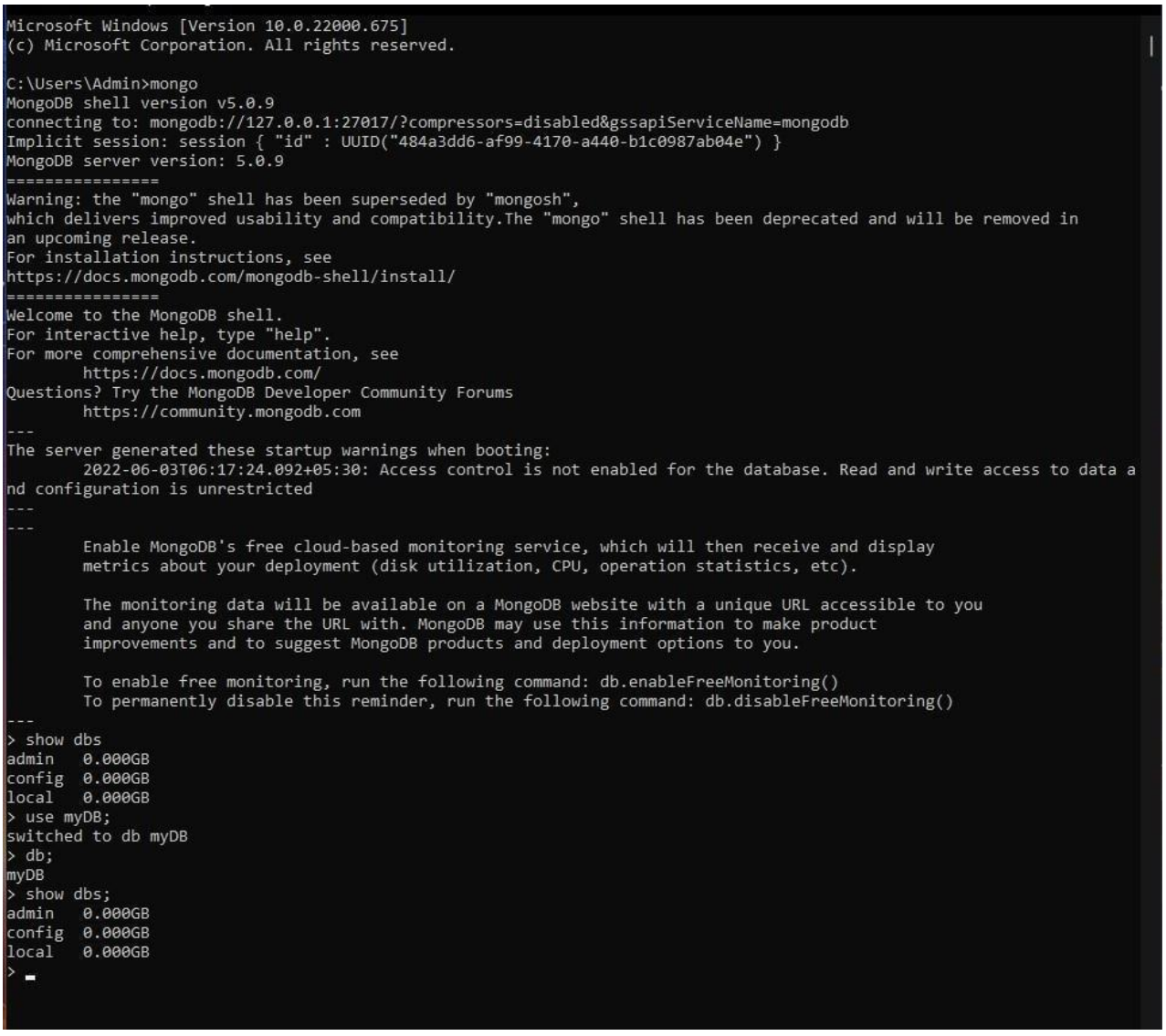
# LAB 3:

I. CREATE DATABASE IN MONGODB.

use myDB; db; (Confirm the

existence of your database)

show dbs; (To list all databases)



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”); => sql equivalent CREATE TABLE 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:"Int ernetS urfing"});

4. Insert the document for “AryanDavid” in to the Students collection only if it does not already exist in the collection. However, if it is already present in the collection, then update the document with new values. (Update his Hobbies from “Skating” to “Chess”. ) Use “Update else insert” (if there is an existing document, it will attempt to update it, if there is no existing document then it will insert it).

db.Student.update({_id:3,StudName:"AryanDavid",Grade:"VII"},{$set:{Hobbies:&quo t;Skatin g"}},{upsert:true});

```
> db.createCollection("Student");
{ "ok" : 1 }
> db.Student.insert({_id:1, StudName:"MichelleJacintha", Grade:"VII", Hobbies:"InternetSurfing"});
WriteResult({ "nInserted" : 1 })
> db.Student.insert({_id:1, StudName:"MichelleJacintha", Grade:"VII", Hobbies:"InternetSurfing"});
WriteResult({
        "nInserted" : 0,
        "writeError" : {
                "code" : 11000,
                "errmsg" : "E11000 duplicate key error collection: myDB.Student index: _id_ dup key: { _id: 1.0 }"
        }
})
> db.Student.updateelseinsert({_id:3, StudName:"AryanDavid", Grade:"VII"},{$set:{Hobbies:"Skating"}},{upset:true});
uncaught exception: TypeError: db.Student.updateelseinsert is not a function :
@(shell):1:1
> db.Student.update({_id:3, StudName:"AryanDavid", Grade:"VII"},{$set:{Hobbies:"Skating"}},{upsert:true});
WriteResult({ "nMatched" : 0, "nUpserted" : 1, "nModified" : 0, "_id" : 3 })
>
```

```
> show collections
Student
> db.Student.find();
{ "_id" : 1, "StudName" : "MichelleJacintha", "Grade" : "VII", "Hobbies" : "InternetSurfing" }
{ "_id" : 3, "Grade" : "VII", "StudName" : "AryanDavid", "Hobbies" : "Skating" }
>
```

5. FIND METHOD

A. To search for documents from the "Students" collection based on certain search criteria.

db.Student.find({StudName:"Aryan David"});

({cond..},{columns.. column:1, columnname:0} )

```
> db.Student.find({StudName:"AryanDavid"});
{ "_id" : 3, "Grade" : "VII", "StudName" : "AryanDavid", "Hobbies" : "Skating" }
>
```

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});

```
> db.Student.find({},{StudName:1,Grade:1,_id:0});
{ "StudName" : "MichelleJacintha", "Grade" : "VII" }
{ "Grade" : "VII", "StudName" : "AryanDavid" }
```

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

```
> db.Student.find({Grade:{$eq:'VII'}}).pretty();
{
        "_id" : 1,
        "StudName" : "MichelleJacintha",
        "Grade" : "VII",
        "Hobbies" : "InternetSurfing"
}
{
        "_id" : 3,
        "Grade" : "VII",
        "StudName" : "AryanDavid",
        "Hobbies" : "Skating"
```

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 ();

```
> db.Student.find({Hobbies:{$in: ['Chess','Skating']}}).pretty();
{
        "_id" : 3,
        "Grade" : "VII",
        "StudName" : "AryanDavid",
        "Hobbies" : "Skating"
```

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

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

```
> db.Student.find({StudName:/^M/}).pretty();
{
        "_id" : 1,
        "StudName" : "MichelleJacintha",
        "Grade" : "VII",
        "Hobbies" : "InternetSurfing"
}
```

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

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

```
> db.Student.find({StudName:/e/}).pretty();
{
        "_id" : 1,
        "StudName" : "MichelleJacintha",
        "Grade" : "VII",
        "Hobbies" : "InternetSurfing"
}
```

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

db.Student.count();

```
> db.Student.count();
2
>
```

H. To sort the documents from the Students collection in the descending order of StudName. db.Student.find().sort({StudName:-1}).pretty();

```
> db.Student.find().sort({StudNam:-1}).pretty();
{
        "_id" : 1,
        "StudName" : "MichelleJacintha",
        "Grade" : "VII",
        "Hobbies" : "InternetSurfing"
}
{
        "_id" : 3,
        "Grade" : "VII",
        "StudName" : "AryanDavid",
        "Hobbies" : "Skating"
}
```

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

```
C:\Program Files\MongoDB\Server\5.0\bin>mongoimport --db Student --collection airlines --type csv --file "C:\Program Fil
es\MongoDB\airline.csv" --headerline
2022-06-03T08:24:18.366+0530    connected to: mongodb://localhost/
2022-06-03T08:24:18.395+0530    6 document(s) imported successfully. 0 document(s) failed to import.
```

IV. Export data to a CSV file

This command used at the command prompt exports MongoDB JSON documents from

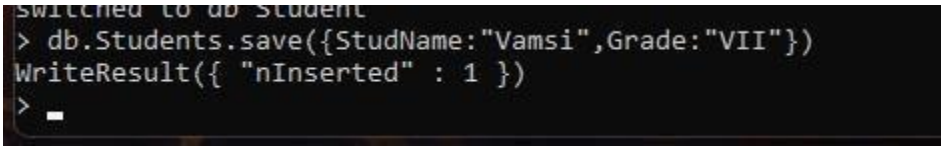
“Customers” collection in the “test” database into a CSV file “Output.txt” in the D:drive.

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”}})

```
> db.Students.update({_id:4},{$set:{Location:"Network"}})
WriteResult({ "nMatched" : 0, "nUpserted" : 0, "nModified" : 0 })
>
```

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();

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

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

IX. to set a particular field value to NULL

```
> db.Students.update({_id:3},{$set:{Location:null}})
WriteResult({ "nMatched" : 0, "nUpserted" : 0, "nModified" : 0 })
>
```

X Count the number of documents in Student Collections

```
> db.Student.count()
0
```

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(); Note: for

desending order : db.Students.find().sort({StudName:-

1}).pretty(); to Skip the 1 st two documents from the

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

```
> db.Students.find().sort({StudName:1}).pretty();
{
        "_id" : ObjectId("629979944de3211e43081306"),
        "StudName" : "Vamsi",
        "Grade" : "VII"
}
```

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'] } )

```
> db.food.insert({_id:1,fruits:['grapes','mango','apple']})
WriteResult({ "nInserted" : 1 })
> db.food.insert({_id:2,fruits:['grapes','mango','cherry']})
WriteResult({ "nInserted" : 1 })
> db.food.insert({_id:3,fruits:['banana','mango']})
WriteResult({ "nInserted" : 1 })
>
```

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().

```
> db.food.find({fruits:['grapes','mango','apple']}).pretty()
{ "_id" : 1, "fruits" : [ "grapes", "mango", "apple" ] }
>
```

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

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

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

To find those documents from the “food” collection where the size of the array istwo.

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

```
> db.food.find ( {"fruits": {$size:2}} )
{ "_id" : 3, "fruits" : [ "banana", "mango" ] }
>
```

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}})

```
> db.food.find({_id:1},{"fruits":{$slice:2}})
{ "_id" : 1, "fruits" : [ "grapes", "mango" ] }
>
```

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”]}})

```
> db.food.find({fruits:{$all:["mango","grapes"]}})
{ "_id" : 1, "fruits" : [ "grapes", "mango", "apple" ] }
{ "_id" : 2, "fruits" : [ "grapes", "mango", "cherry" ] }
>
```

update on Array: using particular id replace the element present in the 1 st

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

}}})

```
> db.food.update({_id:3},{$set:{'fruits.1':'apple'}})
WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })
> db.food.update({_id:2},{$push:{price:{grapes:80,mango:200,cherry:100}}})
WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })
>
```

Note: perform query operations using - pop, addToSet, pullAll and pull

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}}});

```
WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })
> db.Customers.aggregate ( {$group : { _id : "$custID",TotAccBal : {$sum:"$AccBal"} } } );
> db.Customers.aggregate ( {$match:{AcctType:”S”}},{$group : { _id : “$custID”,TotAccBal :
... {$sum:”$AccBal”} } } );
uncaught exception: SyntaxError: illegal character :
@(shell):1:43
> db.Customers.aggregate ( {$match:{AcctType:"S"}},{$group : { _id :"$custID",TotAccBal :{$sum:"$AccBal
"} } } );
> db.Customers.aggregate ( {$match:{AcctType:"S"}},{$group : { _id : "$custID",TotAccBal :{$sum:"$AccBa
l"} } }, {$match:{TotAccBal:{$gt:1200}}});
>
```

## LAB 4:

hdusersbmsce–OptiPlus–3000:–$ sudo su hduser
[sudo] password for hduser:

hdusersbmsce–OptiPlus–3000: $ start–all.sh
This script is Deprecated. Instead use start–dfs.sh and start–yarn.sh
22/06/06 14:43:45 WARN util.NativeCodeLoader: Unable to load native–hadoop Library for your platform... using builtin–java classes where applicable
Starting namenodes on [localhost]
localhost: nanenade running as process 3396. Stop it first.
localhost: datanode running as process 3564, Stop it first.
starting secondary nanenodes [0.0.0.0)
0.0.0.0: secondarynamenode running as process 3773. Stop it first.
O22/06/06 14:43:47 WARN uttt.NativeCodeLoader: Unable to load native–hadoop library for your
starting yarn daemons
resource process 3932. Stop it first.
Localhost: running as process 4255. stop it first.
6003 Jps
3932 ResourceManager
3773 SecondaryNameNode
4255 NodeManager
hdusersbmsce–OptiPlus–3060:–$ hdfs dfs –mkdir /Aarya
hdusersbmsce–OptiPlus–3060: $ hdfs dfs –ls /
22/06/06 14:45:30 WARN util.NativeCodeLoader: Unable to load native–hadoop library for your platform... using builtin–java classes where applicable Found 19 itens
drwxr–xr–x hduser supergroup
02022–06–06 11:44 /AAA
drwxr–xr–x –hduser supergroup
2022–06–03 12:17 /Army
drwxr–xr–x hduser supergroup
02022–06–06 11:40 /Avnit
drwxr–xr–x –hduser supergroup
02022–05–31 10:44 /88
drwxr–xr–x –hduser supergroup

02022–06–01 15:03 /Cath
drwxr–xr–x –hduser supergroup
drwxr–xr–x hduser supergroup
drwxr–xr–x –hduser supergroup
drwxr–xr–x –hduser supergroup
drwxr–xr–x –hduser supergroup
drwxr–xr–x –hduser supergroup
drwxr–xr–x –hduser supergroup
drwxr–xr–x –hduser supergroup
drwxr–xr–x –hduser supergroup
drwxr–xr–x – hduser supergroup
drwxr–xr–x –hduser supergroup
82022–06–04 10:06 /FFF
02022–06–06 14:40 /Kmrv
02022–06–06 14:44 /Aarya
02022–06–01 15:03 /Neha
02022–06–04 09:54 /WC.txt
0 2022–06–04 09:54 /welcone.txt
02022–06–06 11:36 /abc
62022–06–03 12:13 /akash
0 2022–06–03 15:12 /darshan
0 2022–06–04 09:31 /ghh
8 2022–06–06 11:45 /hello
drwxr–xr–x –hduser supergroup
62022–06–04 09:35 /rahul
drwxr–xr–x –hduser supergroup
02022–06–03 12:11 /shre
drwxr–xr–x .hduser supergroup
02022–06–03 12:41 /shreshtha

hdusersbmsce–OptiPlus–3060:–$ hdfs dfs put /home/hduser/Desktop/6b.txt

/Aarya/WC.txt
22/05/06 14:46:40 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using butltin-java classes where applicable

hduserabesce-OptiPlex-3060:-$ hdfs dfs cat /Aarya/WC.txt
22/06/06 14:47:00 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable hello fron of

hdusersbmsce-OptiPlus-3040:-$ hdfs dfs-get /Aarya/WC.txt /home/hduser/Downloads/newic.txt
22/05/06 14:51:43 WARN util.NativeCodeLoader: Unable to load nattve-hadoop library for your platform... using builtin-java classes where applicable

hdusersbmsce-OptiPlus-3066:-$ cd Downloads
hdusersbmsce-OptiPlus-3060:-/Downloads$ cat newwMC.Ext
hello from 6E

hdusersbmsce-OptiPlus-3060:-$ hdfs dfs -1s /Aarya/
22/06/06 14:54:04 WARN util.NativeCodeLoader: Unable to load native-hadoop Library for your platform... using builtin java classes where applicable
Found 2 itens
-rw-r--r-- 1 hduser supergroup
23 2822-06-06 14:46 /Aarya/MC.txt
1 hduser supergroup
23 2022-06-06 14:58 /Aarya/newwc.txt

hdusersbmsce-OptiPlus-3060:-5 hdfs drs -getmerge /Aarya/wc.txt /Aarya/newwc.txt /bone/hduser/Desktop/newmerge.txt
22/06/06 14:55:18 NARN util.NativeCodeLoader: Unable to load nattve-hadoop library for your platform... using butitin-Java classes where applicable

hduserabesce-OptiPlex-3060:~$ cd Desktop

hduser@besce-OptiPlex-3060:-/Desktops cat newmerge.txt

hello from 68
D
B
hello from 68
D
B

hdusersbmsce–OptiPlus–3060:–/Desktops hadoop fs getfacl /Aarya/
22/06/06 14:56:24 WARN util.NativeCodeLoader: Unable to load native hadoop library for your platform... using builtin java classes where applicable
# file: /Aarya
# owner: hduser
# group: supergroup
user::rwx
group::r–x
other::r–x

hdusersbmsce–OptiPlus–3060:–/Desktop5 hdfs dfs copyToLocal /Aarya/HC.txt /home/hduser/Desktop
22/05/06 14:58:09 WARN util.NativeCodeLoader: Unable to load native–hadoop Library for your platform... using butltin–java classes where applicable

hdusersbmsce–OptiPlus–3000:–/Desktop5 cat MC.txt
hello fron 68
hdusersbmsce–OptiPlus–3060:–/Desktops hdfs dfs –cat /Aarya/MC.txt
22/06/06 14:58:59 WARN util.NativeCodeLoader: Unable to load native–hadoop Library for your platform... ustng bulltin–Java classes where applicable hello from GB
B

hdusersbmsce–OptiPlus–3060:–/Desktop5 hadoop fs – /Aarya /FFF 22/06/06 14:59:46 WARN util.NativeCodeLoader: Unable to load native–hadoop Library for your platform... using builtin–java classes where applicable hduseransce–OptiPlex–3060:–/Desktops hadoop fs–Ls /FFF 22/05/06 15:00:00 WARN util.NativeCodeLoader: Unable to load native–hadoop library for your platform... using butltin–java classes where applicable Found 2 itens drwxr–xr–x –hduser supergroup TWEE 1 hduser supergroup 02022–05–06

14:50 /FFF/Aarya 17 2022-05-04 10:06 /FFF/MC.txt

hdusersbmsce-OptiPlus-3060:-/Desktops hadoop fs cp /FFF/ /LLL

22/06/06 15:09:34 WARN util.NativeCodeLoader: Unable to load native hadoop library for your platform... using butltin-java classes where applicable

hdusersbmsce-OptiPlus-3060:-/Desktops hadoop fs -Ls /LLL

22/06/06 15:10:07 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable

Found 2 1tens

drwxr-xr-x -hduser supergroup

hdusersbmsce-OptiPlus-3000:-/Desktops

02022-06-06 15:09 /LLL/Aarya

17 2022-00-00 15:09 /LLL/MC.t

# LAB 6:

AverageDriver

```
package temp;


import org.apache.hadoop.fs.Path;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Job;
import org.apache.hadoop.mapreduce.lib.input.FileInputFormat;
import org.apache.hadoop.mapreduce.lib.output.FileOutputFormat;


public class AverageDriver {
  public static void main(String[] args) throws Exception {
    if (args.length != 2) {
      System.err.println("Please Enter the input and output parameters");
      System.exit(-1);
    }
    Job job = new Job();
    job.setJarByClass(AverageDriver.class);
    job.setJobName("Max temperature");
    FileInputFormat.addInputPath(job, new Path(args[0]));
    FileOutputFormat.setOutputPath(job, new Path(args[1]));
    job.setMapperClass(AverageMapper.class);
    job.setReducerClass(AverageReducer.class);
    job.setOutputKeyClass(Text.class);
    job.setOutputValueClass(IntWritable.class);
    System.exit(job.waitForCompletion(true) ? 0 : 1);
  }
```

```
}
```

### AverageMapper

```
package temp;


import java.io.IOException;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.LongWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Mapper;


public class AverageMapper extends Mapper<LongWritable, Text, Text, IntWritable> {
  public static final int MISSING = 9999;

  public void map(LongWritable key, Text value, Mapper<LongWritable, Text, Text,
IntWritable>.Context context) throws IOException, InterruptedException {
    int temperature;
    String line = value.toString();
    String year = line.substring(15, 19);
    if (line.charAt(87) == '+') {
      temperature = Integer.parseInt(line.substring(88, 92));
    } else {
      temperature = Integer.parseInt(line.substring(87, 92));
    }
    String quality = line.substring(92, 93);
    if (temperature != 9999 && quality.matches("[01459]"))
      context.write(new Text(year), new IntWritable(temperature));
  }
}
```

AverageReducer

```
package temp;

import java.io.IOException;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Reducer;

public class AverageReducer extends Reducer<Text, IntWritable, Text, IntWritable> {
  public void reduce(Text key, Iterable<IntWritable> values, Reducer<Text, IntWritable,
Text, IntWritable>.Context context) throws IOException, InterruptedException {
    int max_temp = 0;
    int count = 0;
    for (IntWritable value : values) {
      max_temp += value.get();
      count++;
    }
    context.write(key, new IntWritable(max_temp / count));
  }
}
```

OUTPUT:

```
hduser@bmsce-Precision-T1700:~/Desktop/temperature$ start-all.sh
This script is Deprecated. Instead use start-dfs.sh and start-yarn.sh
Starting namenodes on [localhost]
hduser@localhost's password:
localhost: starting namenode, logging to /usr/local/hadoop/logs/hadoop-hduser-namenode-bmsce-
Precision-T1700.out
hduser@localhost's password:
localhost: starting datanode, logging to /usr/local/hadoop/logs/hadoop-hduser-datanode-bmsce-
Precision-T1700.out
Starting secondary namenodes [0.0.0.0]
hduser@0.0.0.0's password:
0.0.0.0: starting secondarynamenode, logging to /usr/local/hadoop/logs/hadoop-hduser-
secondarynamenode-bmsce-Precision-T1700.out
starting yarn daemons
starting resourcemanager, logging to /usr/local/hadoop/logs/yarn-hduser-resourcemanager-bmsce-
Precision-T1700.out
hduser@localhost's password:
localhost: starting nodemanager, logging to /usr/local/hadoop/logs/yarn-hduser-nodemanager-bmsce-
Precision-T1700.out
hduser@bmsce-Precision-T1700:~/Desktop/temperature$ jps
6832 NodeManager
6498 ResourceManager
6339 SecondaryNameNode
4887 org.eclipse.equinox.launcher_1.5.600.v20191014-2022.jar
6954 Jps
6123 DataNode
5951 NameNode
hduser@bmsce-Precision-T1700:~/Desktop/temperature$ hdfs dfs -le /
-le: Unknown command
hduser@bmsce-Precision-T1700:~/Desktop/temperature$ hdfs dfs -ls /
Found 31 items
drwxr-xr-x   - hduser supergroup          0 2022-06-06 12:35 /CSE
drwxr-xr-x   - hduser supergroup          0 2022-06-06 12:23 /FFF
drwxr-xr-x   - hduser supergroup          0 2022-06-06 12:36 /LLL
drwxr-xr-x   - hduser supergroup          0 2022-06-20 12:06 /amit_bda
drwxr-xr-x   - hduser supergroup          0 2022-06-27 11:42 /amit_lab
drwxr-xr-x   - hduser supergroup          0 2022-06-03 14:52 /bharath
drwxr-xr-x   - hduser supergroup          0 2022-06-03 14:43 /bharath035
drwxr-xr-x   - hduser supergroup          0 2022-06-24 14:54 /chi
drwxr-xr-x   - hduser supergroup          0 2022-05-31 10:21 /example
drwxr-xr-x   - hduser supergroup          0 2022-06-01 15:13 /foldernew
drwxr-xr-x   - hduser supergroup          0 2022-06-06 15:04 /hemang061
drwxr-xr-x   - hduser supergroup          0 2022-06-20 15:16 /input_khushil
drwxr-xr-x   - hduser supergroup          0 2022-06-03 12:27 /irfan
drwxr-xr-x   - hduser supergroup          0 2022-06-22 10:44 /lwde
drwxr-xr-x   - hduser supergroup          0 2022-06-27 13:03 /mapreducejoin_amit
drwxr-xr-x   - hduser supergroup          0 2022-06-22 15:32 /muskan
drwxr-xr-x   - hduser supergroup          0 2022-06-22 15:06 /muskan_op
drwxr-xr-x   - hduser supergroup          0 2022-06-22 15:35 /muskan_output
drwxr-xr-x   - hduser supergroup          0 2022-06-06 15:04 /new_folder
drwxr-xr-x   - hduser supergroup          0 2022-05-31 10:26 /one
drwxr-xr-x   - hduser supergroup          0 2022-06-24 15:30 /out55
drwxr-xr-x   - hduser supergroup          0 2022-06-20 12:17 /output
drwxr-xr-x   - hduser supergroup          0 2022-06-27 13:04 /output_TOPn
drwxr-xr-x   - hduser supergroup          0 2022-06-27 12:14 /output_Topn
drwxr-xr-x   - hduser supergroup          0 2022-06-24 12:42 /r1
drwxr-xr-x   - hduser supergroup          0 2022-06-24 12:24 /rgs
```

```
drwxr-xr-x   - hduser supergroup          0 2022-06-03 12:08 /saurab
drwxrwxr-x   - hduser supergroup          0 2019-08-01 16:19 /tmp
drwxr-xr-x   - hduser supergroup          0 2019-08-01 16:03 /user
drwxr-xr-x   - hduser supergroup          0 2022-06-01 09:46 /user1
-rw-r--r--   1 hduser supergroup       2436 2022-06-24 12:17 /wc.jar
hduser@bmsce-Precision-T1700:~/Desktop/temperature$ hdfs dfs -mkdir /khushil_temperature
hduser@bmsce-Precision-T1700:~/Desktop/temperature$ hdfs dfs -put ./1901 /khushil_temperature
hduser@bmsce-Precision-T1700:~/Desktop/temperature$ hdfs dfs -put ./1902 /khushil_temperature
hduser@bmsce-Precision-T1700:~/Desktop/temperature$ hdfs dfs -ls /khushil_temperature
Found 2 items
-rw-r--r--   1 hduser supergroup     888190 2022-06-27 14:47 /khushil_temperature/1901
-rw-r--r--   1 hduser supergroup     888978 2022-06-27 14:47 /khushil_temperature/1902
hduser@bmsce-Precision-T1700:~/Desktop/temperature$ hadoop jar ./avgtemp.jar AverageDriver
/khushil_temperature/1901 /khushil_temperature/output/
Exception in thread "main" java.lang.ClassNotFoundException: AverageDriver
 at java.net.URLClassLoader.findClass(URLClassLoader.java:382)
 at java.lang.ClassLoader.loadClass(ClassLoader.java:418)
 at java.lang.ClassLoader.loadClass(ClassLoader.java:351)
 at java.lang.Class.forName0(Native Method)
 at java.lang.Class.forName(Class.java:348)
 at org.apache.hadoop.util.RunJar.run(RunJar.java:214)
 at org.apache.hadoop.util.RunJar.main(RunJar.java:136)
hduser@bmsce-Precision-T1700:~/Desktop/temperature$ hadoop jar ./avgtemp.jar
temperature.AverageDriver /khushil_temperature/1901 /khushil_temperature/output/
22/06/27 14:53:27 INFO Configuration.deprecation: session.id is deprecated. Instead, use
dfs.metrics.session-id
22/06/27 14:53:27 INFO jvm.JvmMetrics: Initializing JVM Metrics with processName=JobTracker,
sessionId=
22/06/27 14:53:27 WARN mapreduce.JobSubmitter: Hadoop command-line option parsing not performed.
Implement the Tool interface and execute your application with ToolRunner to remedy this.
22/06/27 14:53:27 INFO input.FileInputFormat: Total input paths to process : 1
22/06/27 14:53:27 INFO mapreduce.JobSubmitter: number of splits:1
22/06/27 14:53:28 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_local254968295_0001
22/06/27 14:53:28 INFO mapreduce.Job: The url to track the job: http://localhost:8080/
22/06/27 14:53:28 INFO mapreduce.Job: Running job: job_local254968295_0001
22/06/27 14:53:28 INFO mapred.LocalJobRunner: OutputCommitter set in config null
22/06/27 14:53:28 INFO mapred.LocalJobRunner: OutputCommitter is
org.apache.hadoop.mapreduce.lib.output.FileOutputCommitter
22/06/27 14:53:28 INFO mapred.LocalJobRunner: Waiting for map tasks
22/06/27 14:53:28 INFO mapred.LocalJobRunner: Starting task: attempt_local254968295_0001_m_000000_0
22/06/27 14:53:28 INFO mapred.Task:  Using ResourceCalculatorProcessTree : [ ]
22/06/27 14:53:28 INFO mapred.MapTask: Processing split:
hdfs://localhost:54310/khushil_temperature/1901:0+888190
22/06/27 14:53:28 INFO mapred.MapTask: (EQUATOR) 0 kvi 26214396(104857584)
22/06/27 14:53:28 INFO mapred.MapTask: mapreduce.task.io.sort.mb: 100
22/06/27 14:53:28 INFO mapred.MapTask: soft limit at 83886080
22/06/27 14:53:28 INFO mapred.MapTask: bufstart = 0; bufvoid = 104857600
22/06/27 14:53:28 INFO mapred.MapTask: kvstart = 26214396; length = 6553600
22/06/27 14:53:28 INFO mapred.MapTask: Map output collector class =
org.apache.hadoop.mapred.MapTask$MapOutputBuffer
22/06/27 14:53:28 INFO mapred.LocalJobRunner:
22/06/27 14:53:28 INFO mapred.MapTask: Starting flush of map output
22/06/27 14:53:28 INFO mapred.MapTask: Spilling map output
22/06/27 14:53:28 INFO mapred.MapTask: bufstart = 0; bufend = 59076; bufvoid = 104857600
22/06/27 14:53:28 INFO mapred.MapTask: kvstart = 26214396(104857584); kvend = 26188144(104752576);
length = 26253/6553600
22/06/27 14:53:28 INFO mapred.MapTask: Finished spill 0
```

```
        FILE: Number of bytes written=723014
        FILE: Number of read operations=0
        FILE: Number of large read operations=0
        FILE: Number of write operations=0
        HDFS: Number of bytes read=1776380
        HDFS: Number of bytes written=8
        HDFS: Number of read operations=13
        HDFS: Number of large read operations=0
        HDFS: Number of write operations=4
    Map-Reduce Framework
        Map input records=6565
        Map output records=6564
        Map output bytes=59076
        Map output materialized bytes=72210
        Input split bytes=112
        Combine input records=0
        Combine output records=0
        Reduce input groups=1
        Reduce shuffle bytes=72210
        Reduce input records=6564
        Reduce output records=1
        Spilled Records=13128
        Shuffled Maps =1
        Failed Shuffles=0
        Merged Map outputs=1
        GC time elapsed (ms)=55
        CPU time spent (ms)=0
        Physical memory (bytes) snapshot=0
        Virtual memory (bytes) snapshot=0
        Total committed heap usage (bytes)=999292928
    Shuffle Errors
        BAD_ID=0
        CONNECTION=0
        IO_ERROR=0
        WRONG_LENGTH=0
        WRONG_MAP=0
        WRONG_REDUCE=0
    File Input Format Counters
        Bytes Read=888190
    File Output Format Counters
        Bytes Written=8
hduser@bmsce-Precision-T1700:~/Desktop/temperature$ hdfs dfs -ls /khushil_temperature/output/
Found 2 items
-rw-r--r--   1 hduser supergroup          0 2022-06-27 14:53 /khushil_temperature/output/_SUCCESS
-rw-r--r--   1 hduser supergroup          8 2022-06-27 14:53 /khushil_temperature/output/part-r-
00000
hduser@bmsce-Precision-T1700:~/Desktop/temperature$ hdfs dfs -cat /khushil_temperature/output/part-
r-00000
1901    46
hduser@bmsce-Precision-T1700:~/Desktop/temperature$
```

# LAB 7:

## Driver–TopN.class

```
package samples.topn;


import java.io.IOException;
import java.util.StringTokenizer;
import org.apache.hadoop.conf.Configuration;
import org.apache.hadoop.fs.Path;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Job;
import org.apache.hadoop.mapreduce.Mapper;
import org.apache.hadoop.mapreduce.lib.input.FileInputFormat;
import org.apache.hadoop.mapreduce.lib.output.FileOutputFormat;
import org.apache.hadoop.util.GenericOptionsParser;


public class TopN {
  public static void main(String[] args) throws Exception {
    Configuration conf = new Configuration();
    String[] otherArgs = (new GenericOptionsParser(conf, args)).getRemainingArgs();
    if (otherArgs.length != 2) {
      System.err.println("Usage: TopN <in> <out>");
      System.exit(2);
    }
    Job job = Job.getInstance(conf);
    job.setJobName("Top N");
    job.setJarByClass(TopN.class);
    job.setMapperClass(TopNMapper.class);
```

```
    job.setReducerClass(TopNReducer.class);
    job.setOutputKeyClass(Text.class);
    job.setOutputValueClass(IntWritable.class);
    FileInputFormat.addInputPath(job, new Path(otherArgs[0]));
    FileOutputFormat.setOutputPath(job, new Path(otherArgs[1]));
    System.exit(job.waitForCompletion(true) ? 0 : 1);
  }

  public static class TopNMapper extends Mapper<Object, Text, Text, IntWritable> {
    private static final IntWritable one = new IntWritable(1);

    private Text word = new Text();

    private String tokens = "[_|$#<>\\^=\\[\\]\\*/\\\\,;,.\\-:()?!\"']";

    public void map(Object key, Text value, Mapper<Object, Text, Text,
IntWritable>.Context context) throws IOException, InterruptedException {
      String cleanLine = value.toString().toLowerCase().replaceAll(this.tokens, " ");
      StringTokenizer itr = new StringTokenizer(cleanLine);
      while (itr.hasMoreTokens()) {
        this.word.set(itr.nextToken().trim());
        context.write(this.word, one);
      }
    }
  }
}
```

TopNCombiner.class

```
package samples.topn;

import java.io.IOException;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Reducer;

public class TopNCombiner extends Reducer<Text, IntWritable, Text, IntWritable> {
  public void reduce(Text key, Iterable<IntWritable> values, Reducer<Text, IntWritable,
Text, IntWritable>.Context context) throws IOException, InterruptedException {
    int sum = 0;
    for (IntWritable val : values)
      sum += val.get();
    context.write(key, new IntWritable(sum));
  }
}
```

## TopNMapper.class

```
package samples.topn;

import java.io.IOException;
import java.util.StringTokenizer;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Mapper;

public class TopNMapper extends Mapper<Object, Text, Text, IntWritable> {
  private static final IntWritable one = new IntWritable(1);
```

```
  private Text word = new Text();

  private String tokens = "[_|$#<>\\^=\\[\\]\\*/\\\\,;,.\\-:()?!\"']";

  public vo```\\id map(Object key, Text value, Mapper<Object, Text, Text,
IntWritable>.Context context) throws IOException, InterruptedException {
    String cleanLine = value.toString().toLowerCase().replaceAll(this.tokens, " ");
    StringTokenizer itr = new StringTokenizer(cleanLine);
    while (itr.hasMoreTokens()) {
      this.word.set(itr.nextToken().trim());
      context.write(this.word, one);
    }
  }
}
```

## TopNReducer.class

```
package samples.topn;

import java.io.IOException;
import java.util.HashMap;
import java.util.Map;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Reducer;
import utils.MiscUtils;
```

```
public class TopNReducer extends Reducer<Text, IntWritable, Text, IntWritable> {
  private Map<Text, IntWritable> countMap = new HashMap<>();

  public void reduce(Text key, Iterable<IntWritable> values, Reducer<Text, IntWritable,
Text, IntWritable>.Context context) throws IOException, InterruptedException {
    int sum = 0;
    for (IntWritable val : values)
      sum += val.get();
    this.countMap.put(new Text(key), new IntWritable(sum));
  }

  protected void cleanup(Reducer<Text, IntWritable, Text, IntWritable>.Context
context) throws IOException, InterruptedException {
    Map<Text, IntWritable> sortedMap = MiscUtils.sortByValues(this.countMap);
    int counter = 0;
    for (Text key : sortedMap.keySet()) {
      if (counter++ == 20)
        break;
      context.write(key, sortedMap.get(key));
    }
  }
}
```

# OUTPUT:

```
hduser@bmsce-Precision-T1700:~/Desktop/temperature$ hdfs dfs -mkdir /khushil_topn
hduser@bmsce-Precision-T1700:~/Desktop/temperature$ hdfs dfs -put ./input.txt /khushil_topn/
hduser@bmsce-Precision-T1700:~/Desktop/temperature$ hdfs dfs -ls /khushil_topn/
Found 1 items
-rw-r--r--   1 hduser supergroup        103 2022-06-27 15:43 /khushil_topn/input.txt
hduser@bmsce-Precision-T1700:~/Desktop/temperature$ hadoop jar topn.jar TopNDriver
/khushil_topn/input.txt /khushil_topn/output
Exception in thread "main" java.lang.ClassNotFoundException: TopNDriver
 at java.net.URLClassLoader.findClass(URLClassLoader.java:382)
 at java.lang.ClassLoader.loadClass(ClassLoader.java:418)
 at java.lang.ClassLoader.loadClass(ClassLoader.java:351)
 at java.lang.Class.forName0(Native Method)
 at java.lang.Class.forName(Class.java:348)
 at org.apache.hadoop.util.RunJar.run(RunJar.java:214)
 at org.apache.hadoop.util.RunJar.main(RunJar.java:136)
hduser@bmsce-Precision-T1700:~/Desktop/temperature$ hadoop jar topn.jar topn.TopNDriver
/khushil_topn/input.txt /khushil_topn/output
22/06/27 15:45:22 INFO Configuration.deprecation: session.id is deprecated. Instead, use
dfs.metrics.session-id
22/06/27 15:45:22 INFO jvm.JvmMetrics: Initializing JVM Metrics with processName=JobTracker,
sessionId=
22/06/27 15:45:22 INFO input.FileInputFormat: Total input paths to process : 1
22/06/27 15:45:22 INFO mapreduce.JobSubmitter: number of splits:1
22/06/27 15:45:22 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_local691635730_0001
22/06/27 15:45:22 INFO mapreduce.Job: The url to track the job: http://localhost:8080/
22/06/27 15:45:22 INFO mapreduce.Job: Running job: job_local691635730_0001
22/06/27 15:45:22 INFO mapred.LocalJobRunner: OutputCommitter set in config null
22/06/27 15:45:22 INFO mapred.LocalJobRunner: OutputCommitter is
org.apache.hadoop.mapreduce.lib.output.FileOutputCommitter
22/06/27 15:45:22 INFO mapred.LocalJobRunner: Waiting for map tasks
22/06/27 15:45:22 INFO mapred.LocalJobRunner: Starting task: attempt_local691635730_0001_m_000000_0
22/06/27 15:45:22 INFO mapred.Task:  Using ResourceCalculatorProcessTree : [ ]
22/06/27 15:45:22 INFO mapred.MapTask: Processing split:
hdfs://localhost:54310/khushil_topn/input.txt:0+103
22/06/27 15:45:22 INFO mapred.MapTask: (EQUATOR) 0 kvi 26214396(104857584)
22/06/27 15:45:22 INFO mapred.MapTask: mapreduce.task.io.sort.mb: 100
22/06/27 15:45:22 INFO mapred.MapTask: soft limit at 83886080
22/06/27 15:45:22 INFO mapred.MapTask: bufstart = 0; bufvoid = 104857600
22/06/27 15:45:22 INFO mapred.MapTask: kvstart = 26214396; length = 6553600
22/06/27 15:45:22 INFO mapred.MapTask: Map output collector class =
org.apache.hadoop.mapred.MapTask$MapOutputBuffer
22/06/27 15:45:22 INFO mapred.LocalJobRunner:
22/06/27 15:45:22 INFO mapred.MapTask: Starting flush of map output
22/06/27 15:45:22 INFO mapred.MapTask: Spilling map output
22/06/27 15:45:22 INFO mapred.MapTask: bufstart = 0; bufend = 187; bufvoid = 104857600
22/06/27 15:45:22 INFO mapred.MapTask: kvstart = 26214396(104857584); kvend = 26214316(104857264);
length = 81/6553600
22/06/27 15:45:22 INFO mapred.MapTask: Finished spill 0
22/06/27 15:45:22 INFO mapred.Task: Task:attempt_local691635730_0001_m_000000_0 is done. And is in
the process of committing
22/06/27 15:45:22 INFO mapred.LocalJobRunner: map
22/06/27 15:45:22 INFO mapred.Task: Task 'attempt_local691635730_0001_m_000000_0' done.
22/06/27 15:45:22 INFO mapred.LocalJobRunner: Finishing task: attempt_local691635730_0001_m_000000_0
22/06/27 15:45:22 INFO mapred.LocalJobRunner: map task executor complete.
22/06/27 15:45:22 INFO mapred.LocalJobRunner: Waiting for reduce tasks
22/06/27 15:45:22 INFO mapred.LocalJobRunner: Starting task: attempt_local691635730_0001_r_000000_0
22/06/27 15:45:22 INFO mapred.Task:  Using ResourceCalculatorProcessTree : [ ]
```

```
 Map input records=6
 Map output records=21
 Map output bytes=187
 Map output materialized bytes=235
 Input split bytes=110
 Combine input records=0
 Combine output records=0
 Reduce input groups=15
 Reduce shuffle bytes=235
 Reduce input records=21
 Reduce output records=15
 Spilled Records=42
 Shuffled Maps =1
 Failed Shuffles=0
 Merged Map outputs=1
 GC time elapsed (ms)=42
 CPU time spent (ms)=0
 Physical memory (bytes) snapshot=0
 Virtual memory (bytes) snapshot=0
 Total committed heap usage (bytes)=578289664
 Shuffle Errors
 BAD_ID=0
 CONNECTION=0
 IO_ERROR=0
 WRONG_LENGTH=0
 WRONG_MAP=0
 WRONG_REDUCE=0
 File Input Format Counters
 Bytes Read=103
 File Output Format Counters
 Bytes Written=105
hduser@bmsce-Precision-T1700:~/Desktop/temperature$ hdfs dfs -ls /khushil_topn/output/
Found 2 items
-rw-r--r--   1 hduser supergroup          0 2022-06-27 15:45 /khushil_topn/output/_SUCCESS
-rw-r--r--   1 hduser supergroup        105 2022-06-27 15:45 /khushil_topn/output/part-r-00000
hduser@bmsce-Precision-T1700:~/Desktop/temperature$ hdfs dfs -cat /khushil_topn/output/part-r-00000
hadoop  4
i3
am      2
hi      1
im      1
is      1
there   1
bye     1
learing 1
awesome 1
love    1
khushil 1
cool    1
and     1
using   1
hduser@bmsce-Precision-T1700:~/Desktop/temperature$
```

# LAB 8:

```
// JoinDriver.java
import org.apache.hadoop.conf.Configured;
import org.apache.hadoop.fs.Path;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapred.*;
import org.apache.hadoop.mapred.lib.MultipleInputs;
import org.apache.hadoop.util.*;

public class JoinDriver extends Configured implements Tool {

   public static class KeyPartitioner implements Partitioner<TextPair, Text> {
      @Override
      public void configure(JobConf job) {
      }

      @Override
      public int getPartition(TextPair key, Text value, int numPartitions) {
         return (key.getFirst().hashCode() & Integer.MAX_VALUE) %
               numPartitions;
      }
   }

@Override

public int run(String[] args) throws Exception {

if (args.length != 3) {
System.out.println("Usage: <Department Emp Strength input>

<Department Name input> <output>");
return -1;
}

JobConf conf = new JobConf(getConf(), getClass());

conf.setJobName("Join 'Department Emp Strength input' with 'Department Name
input'");

Path AInputPath = new Path(args[0]);
Path BInputPath = new Path(args[1]);
Path outputPath = new Path(args[2]);

MultipleInputs.addInputPath(conf, AInputPath, TextInputFormat.class,

Posts.class);
MultipleInputs.addInputPath(conf, BInputPath, TextInputFormat.class,
User.class);
FileOutputFormat.setOutputPath(conf, outputPath);
conf.setPartitionerClass(KeyPartitioner.class);
```

```
conf.setOutputValueGroupingComparator(TextPair.FirstComparator.class);
conf.setMapOutputKeyClass(TextPair.class);
conf.setReducerClass(JoinReducer.class);
conf.setOutputKeyClass(Text.class);
JobClient.runJob(conf);

return 0;
}

   public static void main(String[] args) throws Exception {

      int exitCode = ToolRunner.run(new JoinDriver(), args);
      System.exit(exitCode);
   }
}

// JoinReducer.java
import java.io.IOException;
import java.util.Iterator;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapred.*;
public class JoinReducer extends MapReduceBase implements Reducer<TextPair, Text, Text,
Text> {
@Override
public void reduce (TextPair key, Iterator<Text> values, OutputCollector<Text, Text>
output, Reporter reporter)
throws IOException
{

Text nodeId = new Text(values.next());
while (values.hasNext()) {

Text node = values.next();
Text outValue = new Text(nodeId.toString() + "\t\t" + node.toString());
output.collect(key.getFirst(), outValue);
}
}
}

// User.java
import java.io.IOException;
import java.util.Iterator;
import org.apache.hadoop.conf.Configuration;
import org.apache.hadoop.fs.FSDataInputStream;
import org.apache.hadoop.fs.FSDataOutputStream;
import org.apache.hadoop.fs.FileSystem;
import org.apache.hadoop.fs.Path;
import org.apache.hadoop.io.LongWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapred.*;

import org.apache.hadoop.io.IntWritable;
```

```
public class User extends MapReduceBase implements Mapper<LongWritable, Text, TextPair,
Text> {

@Override
public void map(LongWritable key, Text value, OutputCollector<TextPair, Text> output,
Reporter reporter)

throws IOException

{

String valueString = value.toString();

String[] SingleNodeData = valueString.split("\t");
output.collect(new TextPair(SingleNodeData[0], "1"), new

Text(SingleNodeData[1]));
}
}

// Posts.java
import java.io.IOException;

import org.apache.hadoop.io.*;
import org.apache.hadoop.mapred.*;

public class Posts extends MapReduceBase implements Mapper<LongWritable, Text, TextPair,
Text> {

@Override
public void map(LongWritable key, Text value, OutputCollector<TextPair, Text> output,
Reporter reporter)
throws IOException
{
String valueString = value.toString();
String[] SingleNodeData = valueString.split("\t");
output.collect(new TextPair(SingleNodeData[3], "0"), new

Text(SingleNodeData[9]));
}
}

// TextPair.java
import java.io.*;

import org.apache.hadoop.io.*;

public class TextPair implements WritableComparable<TextPair> {

   private Text first;
   private Text second;
```

```
public TextPair() {
   set(new Text(), new Text());
}

public TextPair(String first, String second) {
   set(new Text(first), new Text(second));
}

public TextPair(Text first, Text second) {
   set(first, second);
}

public void set(Text first, Text second) {
   this.first = first;
   this.second = second;
}

public Text getFirst() {
   return first;
}

public Text getSecond() {
   return second;
}

@Override
public void write(DataOutput out) throws IOException {
   first.write(out);
   second.write(out);
}

@Override
public void readFields(DataInput in) throws IOException {
   first.readFields(in);
   second.readFields(in);
}

@Override
public int hashCode() {
   return first.hashCode() * 163 + second.hashCode();
}

@Override
public boolean equals(Object o) {
   if (o instanceof TextPair) {
      TextPair tp = (TextPair) o;
      return first.equals(tp.first) && second.equals(tp.second);
   }
   return false;
}
```

```
@Override
public String toString() {
   return first + "\t" + second;
}

@Override
public int compareTo(TextPair tp) {
   int cmp = first.compareTo(tp.first);
   if (cmp != 0) {
      return cmp;
   }
   return second.compareTo(tp.second);
}
// ^^ TextPair

// vv TextPairComparator
public static class Comparator extends WritableComparator {

   private static final Text.Comparator TEXT_COMPARATOR = new Text.Comparator();

   public Comparator() {
      super(TextPair.class);
   }

   @Override
   public int compare(byte[] b1, int s1, int l1,
         byte[] b2, int s2, int l2) {

      try {
         int firstL1 = WritableUtils.decodeVIntSize(b1[s1]) + readVInt(b1, s1);
         int firstL2 = WritableUtils.decodeVIntSize(b2[s2]) + readVInt(b2, s2);
         int cmp = TEXT_COMPARATOR.compare(b1, s1, firstL1, b2, s2, firstL2);
         if (cmp != 0) {
            return cmp;
         }
         return TEXT_COMPARATOR.compare(b1, s1 + firstL1, l1 - firstL1,

               b2, s2 + firstL2, l2 - firstL2);
      } catch (IOException e) {
         throw new IllegalArgumentException(e);
      }
   }
}

static {
   WritableComparator.define(TextPair.class, new Comparator());
}

public static class FirstComparator extends WritableComparator {

   private static final Text.Comparator TEXT_COMPARATOR = new Text.Comparator();
```

```
    public FirstComparator() {
      super(TextPair.class);
    }

    @Override
    public int compare(byte[] b1, int s1, int l1,
        byte[] b2, int s2, int l2) {

      try {
        int firstL1 = WritableUtils.decodeVIntSize(b1[s1]) + readVInt(b1, s1);
        int firstL2 = WritableUtils.decodeVIntSize(b2[s2]) + readVInt(b2, s2);
        return TEXT_COMPARATOR.compare(b1, s1, firstL1, b2, s2, firstL2);
      } catch (IOException e) {
        throw new IllegalArgumentException(e);
      }
    }

    @Override
    public int compare(WritableComparable a, WritableComparable b) {
      if (a instanceof TextPair && b instanceof TextPair) {
        return ((TextPair) a).first.compareTo(((TextPair) b).first);
      }
      return super.compare(a, b);
    }
  }
}
```

# OUTPUT:

```
hduser@bmsce-Precision-T1700:~/khushil/join/MapReduceJoin$ hdfs dfs -ls /khushil_join
ls: `/khushil_join': No such file or directory
hduser@bmsce-Precision-T1700:~/khushil/join/MapReduceJoin$ hdfs dfs -mkdir /khushil_join
hduser@bmsce-Precision-T1700:~/khushil/join/MapReduceJoin$ hdfs dfs -ls /khushil_join
hduser@bmsce-Precision-T1700:~/khushil/join/MapReduceJoin$ hdfs dfs -put ./DeptName.txt
/khushil_join/
hduser@bmsce-Precision-T1700:~/khushil/join/MapReduceJoin$ hdfs dfs -put ./DeptStrength.txt
/khushil_join/
hduser@bmsce-Precision-T1700:~/khushil/join/MapReduceJoin$ hadoop jar MapReduceJoin.jar
/khushil_join/DeptName.txt /khushil_join/DeptStrength.txt /khushil_join/output/
22/06/27 15:12:24 INFO Configuration.deprecation: session.id is deprecated. Instead, use
dfs.metrics.session-id
22/06/27 15:12:24 INFO jvm.JvmMetrics: Initializing JVM Metrics with processName=JobTracker,
sessionId=
22/06/27 15:12:24 INFO jvm.JvmMetrics: Cannot initialize JVM Metrics with processName=JobTracker,
sessionId= - already initialized
22/06/27 15:12:24 INFO mapred.FileInputFormat: Total input paths to process : 1
22/06/27 15:12:24 INFO mapred.FileInputFormat: Total input paths to process : 1
22/06/27 15:12:24 INFO mapreduce.JobSubmitter: number of splits:2
22/06/27 15:12:24 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_local1238804660_0001
22/06/27 15:12:24 INFO mapreduce.Job: The url to track the job: http://localhost:8080/
22/06/27 15:12:24 INFO mapred.LocalJobRunner: OutputCommitter set in config null
22/06/27 15:12:24 INFO mapreduce.Job: Running job: job_local1238804660_0001
22/06/27 15:12:24 INFO mapred.LocalJobRunner: OutputCommitter is
org.apache.hadoop.mapred.FileOutputCommitter
22/06/27 15:12:24 INFO mapred.LocalJobRunner: Waiting for map tasks
22/06/27 15:12:24 INFO mapred.LocalJobRunner: Starting task: attempt_local1238804660_0001_m_000000_0
22/06/27 15:12:24 INFO mapred.Task:  Using ResourceCalculatorProcessTree : [ ]
22/06/27 15:12:24 INFO mapred.MapTask: Processing split:
hdfs://localhost:54310/khushil_join/DeptName.txt:0+59
22/06/27 15:12:24 INFO mapred.MapTask: numReduceTasks: 1
22/06/27 15:12:24 INFO mapred.MapTask: (EQUATOR) 0 kvi 26214396(104857584)
22/06/27 15:12:24 INFO mapred.MapTask: mapreduce.task.io.sort.mb: 100
22/06/27 15:12:24 INFO mapred.MapTask: soft limit at 83886080
22/06/27 15:12:24 INFO mapred.MapTask: bufstart = 0; bufvoid = 104857600
22/06/27 15:12:24 INFO mapred.MapTask: kvstart = 26214396; length = 6553600
22/06/27 15:12:24 INFO mapred.MapTask: Map output collector class =
org.apache.hadoop.mapred.MapTask$MapOutputBuffer
22/06/27 15:12:24 INFO mapred.LocalJobRunner:
22/06/27 15:12:24 INFO mapred.MapTask: Starting flush of map output
22/06/27 15:12:24 INFO mapred.MapTask: Spilling map output
22/06/27 15:12:24 INFO mapred.MapTask: bufstart = 0; bufend = 63; bufvoid = 104857600
22/06/27 15:12:24 INFO mapred.MapTask: kvstart = 26214396(104857584); kvend = 26214384(104857536);
length = 13/6553600
22/06/27 15:12:24 INFO mapred.MapTask: Finished spill 0
22/06/27 15:12:24 INFO mapred.Task: Task:attempt_local1238804660_0001_m_000000_0 is done. And is in
the process of committing
22/06/27 15:12:24 INFO mapred.LocalJobRunner: hdfs://localhost:54310/khushil_join/DeptName.txt:0+59
22/06/27 15:12:24 INFO mapred.Task: Task 'attempt_local1238804660_0001_m_000000_0' done.
22/06/27 15:12:24 INFO mapred.LocalJobRunner: Finishing task:
attempt_local1238804660_0001_m_000000_0
22/06/27 15:12:24 INFO mapred.LocalJobRunner: Starting task: attempt_local1238804660_0001_m_000001_0
22/06/27 15:12:24 INFO mapred.Task:  Using ResourceCalculatorProcessTree : [ ]
22/06/27 15:12:24 INFO mapred.MapTask: Processing split:
hdfs://localhost:54310/khushil_join/DeptStrength.txt:0+50
22/06/27 15:12:24 INFO mapred.MapTask: numReduceTasks: 1
22/06/27 15:12:24 INFO mapred.MapTask: (EQUATOR) 0 kvi 26214396(104857584)
22/06/27 15:12:24 INFO mapred.MapTask: mapreduce.task.io.sort.mb: 100
```

```
        FILE: Number of bytes read=26370
        FILE: Number of bytes written=782871
        FILE: Number of read operations=0
        FILE: Number of large read operations=0
        FILE: Number of write operations=0
        HDFS: Number of bytes read=277
        HDFS: Number of bytes written=85
        HDFS: Number of read operations=28
        HDFS: Number of large read operations=0
        HDFS: Number of write operations=5
    Map-Reduce Framework
        Map input records=8
        Map output records=8
        Map output bytes=117
        Map output materialized bytes=145
        Input split bytes=443
        Combine input records=0
        Combine output records=0
        Reduce input groups=4
        Reduce shuffle bytes=145
        Reduce input records=8
        Reduce output records=4
        Spilled Records=16
        Shuffled Maps =2
        Failed Shuffles=0
        Merged Map outputs=2
        GC time elapsed (ms)=2
        CPU time spent (ms)=0
        Physical memory (bytes) snapshot=0
        Virtual memory (bytes) snapshot=0
        Total committed heap usage (bytes)=913833984
    Shuffle Errors
        BAD_ID=0
        CONNECTION=0
        IO_ERROR=0
        WRONG_LENGTH=0
        WRONG_MAP=0
        WRONG_REDUCE=0
    File Input Format Counters
        Bytes Read=0
    File Output Format Counters
        Bytes Written=85
hduser@bmsce-Precision-T1700:~/khushil/join/MapReduceJoin$ hdfs dfs -cat /khushil_join/output2/part-
00000
A11     50          Finance
B12     100         HR
C13     250         Manufacturing
Dept_ID Total_Employee          Dept_Name
hduser@bmsce-Precision-T1700:~/khushil/join/MapReduceJoin$
```

# LAB 9:

```
val data=sc.textFile("sparkdata.txt")
data.collect;
val splitdata = data.flatMap(line => line.split(" "));
splitdata.collect;
val mapdata = splitdata.map(word => (word,1));
mapdata.collect;
val reducedata = mapdata.reduceByKey(_+_);
reducedata.collect;
```

```
scala> val file= sc.textFile("/home/aarya/Desktop/sample.txt");
file: org.apache.spark.rdd.RDD[String] = /home/aarya/Desktop/sample.txt MapPartitionsRDD[1] at textFile at <console>:24

scala> file.collect;
res0: Array[String] = Array(hi, hello wats up, hows ur life, spark is an amzing tool, spar, hows everythin, whats up whats cooking, "")

scala> val splitdata = file.flatMap(line => line.split(" "));
splitdata: org.apache.spark.rdd.RDD[String] = MapPartitionsRDD[2] at flatMap at <console>:25

scala> splidata.collect;
<console>:24: error: not found: value splidata
       splidata.collect;
       ^

scala> splitdata.collect;
res2: Array[String] = Array(hi, hello, wats, up, hows, ur, life, spark, is, an, amzing, tool, spar, hows, everythin, whats, up, whats, cooking, "")

scala> val mapdata = splitdata.map(word => (word,1));
mapdata: org.apache.spark.rdd.RDD[(String, Int)] = MapPartitionsRDD[3] at map at <console>:25

scala> mapdata.collect;
res3: Array[(String, Int)] = Array((hi,1), (hello,1), (wats,1), (up,1), (hows,1), (ur,1), (life,1), (spark,1), (is,1), (an,1), (amzing,1), (tool,1), (
spar,1), (hows,1), (everythin,1), (whats,1), (up,1), (whats,1), (cooking,1), ("",1))

scala> val reducedata = mapdata.reduceByKey(_+_);
reducedata: org.apache.spark.rdd.RDD[(String, Int)] = ShuffledRDD[4] at reduceByKey at <console>:25

scala> reducedata.collect;
res4: Array[(String, Int)] = Array((is,1), (cooking,1), (spar,1), (life,1), ("",1), (hello,1), (everythin,1), (tool,1), (amzing,1), (up,2), (spark,1),
 (wats,1), (hi,1), (ur,1), (hows,2), (whats,2), (an,1))
```

# LAB 10:

```
val textFile = sc.textFile("/home/bhoom/Desktop/wc.txt")
val counts = textFile.flatMap(line => line.split(" ")).map(word => (word,
1)).reduceByKey(_ + _)
import scala.collection.immutable.ListMap
val sorted=ListMap(counts.collect.sortWith(_._2 > _._2):_*)// sort in
descending order based on values
println(sorted)
for((k,v)<-sorted)
{
if(v>4)
{
print(k+",")
print(v)
println()
}}
```

```
scala> val textFile = sc.textFile("/home/aarya/Desktop/sample.txt")
textFile: org.apache.spark.rdd.RDD[String] = /home/aarya/Desktop/sample.txt MapPartitionsRDD[6] at textFile at <console>:24

scala> val counts = textFile.flatMap(line => line.split(" ")).map(word => (word, 1)).reduceByKey(_ + _)
counts: org.apache.spark.rdd.RDD[(String, Int)] = ShuffledRDD[9] at reduceByKey at <console>:25

scala> import scala.collection.immutable.ListMap
import scala.collection.immutable.ListMap

scala> val sorted=ListMap(counts.collect.sortWith(_._2 > _._2):_*)
sorted: scala.collection.immutable.ListMap[String,Int] = Map(up -> 2, hows -> 2, whats -> 2, is -> 1, cooking -> 1, spar -> 1, life -> 1, "" -> 1, hel
lo -> 1, everythin -> 1, tool -> 1, amzing -> 1, spark -> 1, wats -> 1, hi -> 1, ur -> 1, an -> 1)

scala> println(sorted)
Map(up -> 2, hows -> 2, whats -> 2, is -> 1, cooking -> 1, spar -> 1, life -> 1,  -> 1, hello -> 1, everythin -> 1, tool -> 1, amzing -> 1, spark -> 1
, wats -> 1, hi -> 1, ur -> 1, an -> 1)
```

```
scala> for((k,v) <- sorted){
     | print(k+" ")
     | print(v)
     | println()
     | }
up 2
hows 2
whats 2
is 1
cooking 1
spar 1
life 1
 1
hello 1
everythin 1
tool 1
amzing 1
spark 1
wats 1
hi 1
ur 1
an 1
```