

VISVESVARAYA TECHNOLOGICAL UNIVERSITY

“JnanaSangama”, Belgaum -590014, Karnataka.



LAB REPORT

On

BIG DATA ANALYTICS

Submitted by

KEERTHI P REDDY (1BM21CS090)

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

March 2024 to June 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 “**BIG DATA ANALYTICS**” carried out by **KEERTHI P REDDY(1BM21CS090)**, 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 2023-24. The Lab report has been approved as it satisfies the academic requirements in respect of Big Data Analytics Lab - (**22CS6PCBDA**) work prescribed for the said degree.

Vikranth B.M
Assistant Professor
Department of CSE
BMSCE, Bengaluru

Dr. Jyothi S Nayak
Professor and Head
Department of CSE
BMSCE, Bengaluru

Index

Sl. No.	Experiment Title	Page No.
1	MongoDB- CRUD Demonstration	1
2	Perform the following DB operations using CassandraEmployee keyspace.	10
3	Perform the following DB operations using Cassandra-Library keyspace.	13
4	Screenshot of Hadoop installed	15
5	Execution of HDFS Commands for interaction with Hadoop Environment.	16
6	Implement WordCount Program on Hadoop framework	18
7	From the following link extract the weather data https://github.com/tomwhite/hadoopbook/tree/master/input/ncdc/all Create a Map Reduce program to a) find average temperature for each year from NCDC data set. b) find the mean max temperature for every month	22
8	For a given Text file, Create a Map Reduce program to sort the content in an alphabetic order listing only top 10 maximum occurrences of words.	25

Course outcomes:

CO1	Apply the concepts of NoSQL, Hadoop, Spark for a given task
CO2	Analyse data analytic techniques for a given problem
CO3	Conduct experiments using data analytics mechanisms for a given problem.

1 MongoDB- CRUD Demonstration

```
bmscecse@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ mongosh "mongodb+srv://cluster0.fvi8mso.mongodb.net/DBMS_Demo" --apiVersion 1 --username Jyothika083 --password Kishore#18
Current Mongosh Log ID: 660bc91502f7840baee085b9
Connecting to:      mongodb+srv://<credentials>@cluster0.fvi8mso.mongodb.net/DBMS_Demo?appName=mongosh+2.1.5
Using MongoDB:      7.0.7 (API Version 1)
Using Mongosh:      2.1.5
mongosh 2.2.1 is available for download: https://www.mongodb.com/try/download/shell

For mongosh info see: https://docs.mongodb.com/mongodb-shell/

Atlas atlas-12eb3b-shard-0 [primary] DBMS_Demo> use MY_DB
switched to db MY_DB
Atlas atlas-12eb3b-shard-0 [primary] MY_DB> 
```

I. Perform the following DB operations using MongoDB.

1. Create a database “Student” with the following attributes Rollno, Age, ContactNo, Email- Id.
2. Insert appropriate values
3. Write query to update Email-Id of a student with rollno 10.
4. . Replace the student name from “ABC” to “FEM” of rollno 11

Solution:

```
Atlas atlas-12eb3b-shard-0 [primary] MY_DB> db.createCollection("Student")
;
{ ok: 1 }
Atlas atlas-12eb3b-shard-0 [primary] MY_DB>
db.Student.insert({_id:1,name:"Alice",rollNo:80,age:20,phNo:"9999988888",email:"alice@gmail.com"})
;
DeprecationWarning: Collection.insert() is deprecated. Use insertOne, insertMany, or bulkWrite.
{ acknowledged: true, insertedIds: { '0': 1 } } Atlas
atlas-12eb3b-shard-0 [primary] MY_DB>
db.Student.insert({_id:2,name:"Bob",rollNo:81,age:20,phno:"8888855555",email:"bob@gmail.com"});
{ acknowledged: true, insertedIds: { '0': 2 } } Atlas atlas-12eb3b-shard-0 [primary] MY_DB>
db.Student.insert({_id:3,name:"Cath",rollNo:82,age:21,phno:"8888877777",email:"cath@gmail.com"}); {
acknowledged: true, insertedIds: { '0': 3 } }

Atlas atlas-12eb3b-shard-0 [primary] MY_DB> db.Student.find();
[
  {
```

```

    _id: 1,
    name: 'Alice',
    rollNo: 80,
    age: 20,    phNo:
'9999988888',
    email: 'alice@gmail.com'
  },
  {
    _id: 2,
    name: 'Bob',
    rollNo: 81,
    age: 20,
    email: 'bob@gmail.com',
    phNo: '8888855555'
  },
  {
    _id: 3,
    name: 'Cath',
    rollNo: 82,
    age: 21,
    email: 'cath@gmail.com',
    phNo: '8888877777'
  }
]

```

```

Atlas atlas-12eb3b-shard-0 [primary] MY_DB> db.Student.update({rollNo:80},
{$set:{email:"alice123@gmail.com"}});

```

DeprecationWarning: Collection.update() is deprecated. Use updateOne, updateMany, or bulkWrite.

```

{ acknowledged:
true, insertedId:
null,
matchedCount: 1,
modifiedCount: 1,
upsertedCount: 0
}

```

II. Perform the following DB operations using MongoDB.

1. Create a collection by name Customers with the following attributes.

Cust_id, Acc_Bal, Acc_Type

2. Insert at least 5 values into the table

3. Write a query to display those records whose total account balance is greater than 1200 of account type 'Z' for each customer_id.

4. Determine Minimum and Maximum account balance for each customer_i

```

Atlas atlas-12eb3b-shard-0 [primary] MY_DB> db.createCollection("
Customers");
{ ok: 1 }
Atlas atlas-12eb3b-shard-0 [primary] MY_DB>
db.Student.insertOne( {custId:1,accBal:10000,accType:"saving"});
{ acknowledged:
true,
  insertedId: ObjectId('660295b055dc2f3d86c4479f')
}
Atlas atlas-12eb3b-shard-0 [primary] MY_DB>
db.Customers.insertOne( {custId:1,accBal:10000,accType:"saving"});
{ acknowledged:
true,
  insertedId: ObjectId('660295c155dc2f3d86c447a0')
}
Atlas atlas-12eb3b-shard-0 [primary] MY_DB>
db.Customers.insertOne( {custId:2,accBal:50000,accType:"current"});
{ acknowledged:
true,
  insertedId: ObjectId('6602960055dc2f3d86c447a1')
}
Atlas atlas-12eb3b-shard-0 [primary] MY_DB>
db.Customers.insertOne( {custId:3,accBal:60000,accType:"current"});
{ acknowledged:
true,
  insertedId: ObjectId('6602960e55dc2f3d86c447a2')
}
Atlas atlas-12eb3b-shard-0 [primary] MY_DB>
db.Customers.insertOne( {custId:4,accBal:20000,accType:"savings"});
{ acknowledged:
true,
  insertedId: ObjectId('6602961c55dc2f3d86c447a3')
}
Atlas atlas-12eb3b-shard-0 [primary] MY_DB>
db.Customers.insertOne( {custId:5,accBal:200000,accType:"current"});
{ acknowledged:
true,
  insertedId: ObjectId('6602962955dc2f3d86c447a4')
}
Atlas atlas-12eb3b-shard-0 [primary] MY_DB> db.Customers.find();
[
  {
    _id: ObjectId('
660295c155dc2f3d86c447a0'),

```

```

    custId: 1,
    accBal: 10000,
    accType: 'savings'
  },
  {
    _id: ObjectId('6602960055dc2f3d86c447a1'),
    custId: 2,  accBal: 50000,
    accType: 'current'
  },
  {
    _id: ObjectId('6602960e55dc2f3d86c447a2'),
    custId: 3,  accBal: 60000,
    accType: 'current'
  },
  {
    _id: ObjectId('6602961c55dc2f3d86c447a3'),
    custId: 4,  accBal: 20000,  accType:
'savings'
  },
  {
    _id: ObjectId('6602962955dc2f3d86c447a4'),
    custId: 5,  accBal: 200000,
    accType: 'current'
  },
  {
    _id: ObjectId('6602980955dc2f3d86c447a5'),
    custId: 1,  accBal: 30000,
    accType: 'savings'
  },
  {
    _id: ObjectId('6602982f55dc2f3d86c447a6'),
    custId: 2,  accBal: 20000,  accType:
'current'
  }
]

```

```

Atlas atlas-12eb3b-shard-0 [primary] MY_DB> db.Customers.aggregate({$
match: {accType:'savings'}},{ $group: { _id: "$custId", TotalAccBal: { $sum: "$accBal" } } }, { $match: { TotalA
ccBal: { $gt: 20000 } } });

```

```

[ { _id: 1, TotalAccBal: 40000 } ]

```

```

Atlas atlas-12eb3b-shard-0 [primary] MY_DB>

```

```

db.Customers.aggregate({ $group: { _id: "$custId", minAccBal: { $min: "$accBal" }, maxAccBal: { $max: "accB
al" } } });

```

```

[
  { _id: 1, minAccBal: 10000, maxAccBal: 'accBal' },

```

```

    { _id: 4, minAccBal: 20000, maxAccBal: 'accBal' },
    { _id: 5, minAccBal: 200000, maxAccBal: 'accBal' },
    { _id: 2, minAccBal: 20000, maxAccBal: 'accBal' },
    { _id: 3, minAccBal: 60000, maxAccBal: 'accBal' }
  ]
Atlas atlas-12eb3b-shard-0 [primary] MY_DB>
db.Customers.aggregate({$group: {_id: "$custId", minAccBal: {$min: "$accBal"}, maxAccBal: {$max: "$accBal"}}});
[
  { _id: 3, minAccBal: 60000, maxAccBal: 60000 },
  { _id: 4, minAccBal: 20000, maxAccBal: 20000 },
  { _id: 5, minAccBal: 200000, maxAccBal: 200000 },
  { _id: 2, minAccBal: 20000, maxAccBal: 50000 },
  { _id: 1, minAccBal: 10000, maxAccBal: 30000 }
]

```



```

Atlas atlas-12eb3b-shard-0 [primary] MY_DB> db.Customers.find().sort({custId:1}).pretty();
[
  {
    _id: ObjectId('660295c155dc2f3d86c447a0'),
    custId: 1,
    accBal: 10000,
    accType: 'savings'
  },
  {
    _id: ObjectId('6602980955dc2f3d86c447a5'),
    custId: 1,
    accBal: 30000,
    accType: 'savings'
  },
  {
    _id: ObjectId('6602960055dc2f3d86c447a1'),
    custId: 2,
    accBal: 50000,
    accType: 'current'
  },
  {
    _id: ObjectId('6602982f55dc2f3d86c447a6'),
    custId: 2,
    accBal: 20000,
    accType: 'current'
  },
  {
    _id: ObjectId('6602960e55dc2f3d86c447a2'),
    custId: 3,
    accBal: 60000,
    accType: 'current'
  },
  {
    _id: ObjectId('6602961c55dc2f3d86c447a3'),
    custId: 4,
    accBal: 20000,
    accType: 'savings'
  },
  {
    _id: ObjectId('6602962955dc2f3d86c447a4'),
    custId: 5,
    accBal: 200000,
    accType: 'current'
  }
]
Atlas atlas-12eb3b-shard-0 [primary] MY_DB> 

```

```

Atlas atlas-12eb3b-shard-0 [primary] MY_DB> db.Customers.find().sort({accBal:-1}).pretty();
[
  {
    _id: ObjectId('6602962955dc2f3d86c447a4'),
    custId: 5,
    accBal: 200000,
    accType: 'current'
  },
  {
    _id: ObjectId('6602960e55dc2f3d86c447a2'),
    custId: 3,
    accBal: 60000,
    accType: 'current'
  },
  {
    _id: ObjectId('6602960055dc2f3d86c447a1'),
    custId: 2,
    accBal: 50000,
    accType: 'current'
  },
  {
    _id: ObjectId('6602980955dc2f3d86c447a5'),
    custId: 1,
    accBal: 30000,
    accType: 'savings'
  },
  {
    _id: ObjectId('6602961c55dc2f3d86c447a3'),
    custId: 4,
    accBal: 20000,
    accType: 'savings'
  },
  {
    _id: ObjectId('6602982f55dc2f3d86c447a6'),
    custId: 2,
    accBal: 20000,
    accType: 'current'
  },
  {
    _id: ObjectId('660295c155dc2f3d86c447a0'),
    custId: 1,
    accBal: 10000,
    accType: 'savings'
  }
]
Atlas atlas-12eb3b-shard-0 [primary] MY_DB> 

```

Create a collection by the name blogPosts and it has 3 fields id, title and comments.

In the collection the comments field is an array which consists of user details. Each collection consists of two user details inside the comments array- user name and text

Demonstrate the following

1. Adding an element into array
2. Display second element
3. Display size of the array
4. Display first two elements of the array
5. Update the document with id 4 and replace the element present in 1st index position of the array with another array

```

Atlas atlas-12eb3b-shard-0 [primary] MY_DB> db.blogPosts.insertOne({_id:1, title: "Introduction to MongoDB", comments: [ { userName: "Alice", text: "Great article!" }, { userName: "Bob", text: "Looking forward to more content." } ] })
{ acknowledged: true, insertedId: 1 }
Atlas atlas-12eb3b-shard-0 [primary] MY_DB> db.blogPosts.insertOne({_id:2, title: "Advanced MongoDB Techniques", comments: [ { userName: "Charlie", text: "Very Informative." }, { userName: "David", text: "Helped me a lot!" } ] })
{ acknowledged: true, insertedId: 2 }
Atlas atlas-12eb3b-shard-0 [primary] MY_DB> db.blogPosts.insertOne({_id:3, title: "MongoDB Performance Optimization", comments: [ { userName: "Eve", text: "I have a question." }, { userName: "Frank", text: "This is exactly what I needed!" } ] })
{ acknowledged: true, insertedId: 3 }

```

```
Atlas atlas-12eb3b-shard-0 [primary] MY_DB> db.blogPosts.update( { _id:1 }, { $push: { comments: { userName: "John", text: "This is a new comment." } } } )
DeprecationWarning: Collection.update() is deprecated. Use updateOne, updateMany, or bulkWrite.
{
  acknowledged: true,
  insertedId: null,
  matchedCount: 1,
  modifiedCount: 1,
  upsertedCount: 0
}
Atlas atlas-12eb3b-shard-0 [primary] MY_DB> □
```

```
Atlas atlas-12eb3b-shard-0 [primary] MY_DB> db.blogPosts.aggregate([
...   { $unwind: "$comments" }, // Unwind the comments array
...   { $project: { _id: 0, commentText: "$comments.text" } } // Project only the text field
... ])
[
  { commentText: 'Great article!' },
  { commentText: 'Looking forward to more content.' },
  { commentText: 'This is a new comment.' },
  { commentText: 'Very informative.' },
  { commentText: 'Helped me a lot!' },
  { commentText: 'I have a question.' },
  { commentText: 'This is exactly what I needed!' }
]
Atlas atlas-12eb3b-shard-0 [primary] MY_DB> □
```

```
Atlas atlas-12eb3b-shard-0 [primary] MY_DB> db.blogPosts.aggregate([
...   { $project: { commentCount: { $size: "$comments" } } }
... ])
[
  { _id: 1, commentCount: 3 },
  { _id: 2, commentCount: 2 },
  { _id: 3, commentCount: 2 }
]
Atlas atlas-12eb3b-shard-0 [primary] MY_DB> □
```

```
Atlas atlas-12eb3b-shard-0 [primary] MY_DB> db.blogPosts.aggregate([
...   { $project: { firstTwoComments: { $slice: ["$comments", 2] } } }
... ])
[
  {
    _id: 1,
    firstTwoComments: [
      { userName: 'Alice', text: 'Great article!' },
      { userName: 'Bob', text: 'Looking forward to more content.' }
    ]
  },
  {
    _id: 2,
    firstTwoComments: [
      { userName: 'Charlie', text: 'Very informative.' },
      { userName: 'David', text: 'Helped me a lot!' }
    ]
  },
  {
    _id: 3,
    firstTwoComments: [
      { userName: 'Eve', text: 'I have a question.' },
      { userName: 'Frank', text: 'This is exactly what I needed!' }
    ]
  }
]
Atlas atlas-12eb3b-shard-0 [primary] MY_DB> □
```

```
Atlas atlas-12eb3b-shard-0 [primary] MY_DB> db.blogPosts.update( { _id: 3 }, { $set: { "comments.1": { userName: "Alice", text: "Replaced comment." } } } )
{
  acknowledged: true,
  insertedId: null,
  matchedCount: 1,
  modifiedCount: 1,
  upsertedCount: 0
}
Atlas atlas-12eb3b-shard-0 [primary] MY_DB> 
```

2. Perform the following DB operations using Cassandra.

1. Create a keyspace by name 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
3. Insert the values into the table in batch
4. Update Employee name and Department of Emp-Id 121
5. Sort the details of Employee records based on salary
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.
7. Update the altered table to add project names.
8. Create a TTL of 15 seconds to display the values of Employees.

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

```
cqlsh> use Employee  
... ;
```

```
cqlsh:employee> create table Employee_info(  
... Name text,  
... Emp_Id int PRIMARY KEY,  
... Designation text,  
... DateofJoining timestamp,  
... Department text  
... ,Salary int  
... );
```

```
cqlsh:employee> begin batch insert into Employee_info(Name,Emp_Id,Designation,DateofJoining,Department,Salary) values('Raj',121,'Tester','2012-03-29','Testing',40000) insert into Employee_info(Name,Emp_Id,Designation,DateofJoining,Department,Salary) values('Anand',122,'Developer','2013-02-27','SE',60000) insert into Employee_info(Name,Emp_Id,Designation,DateofJoining,Department,Salary) values('Shanthi',123,'Developer','2014-04-12','SE',80000) insert into Employee_info(Name,Emp_Id,Designation,DateofJoining,Department,Salary) values('Priya',124,'Analyst','2012-05-29','Data',50000) apply batch;
```



```

2012-03-28 18:30:00.000000+0000; apply batch;
cqlsh:employee> update Employee_info set Name='Rajesh' where Emp_Id=121;
cqlsh:employee> select * from Employee_info;

```

emp_id	dateofjoining	department	designation	name	salary
123	2014-04-11 18:30:00.000000+0000	SE	Developer	Shanthi	80000
122	2013-02-26 18:30:00.000000+0000	SE	Developer	Anand	60000
121	2012-03-28 18:30:00.000000+0000	Testing	Tester	Rajesh	40000
124	2012-05-28 18:30:00.000000+0000	Data	Analyst	Priya	50000

(4 rows)

```

cqlsh:employee> update Employee_info set Department='Data' where Emp_Id=121;
cqlsh:employee> select * from Employee_info;

```

emp_id	dateofjoining	department	designation	name	salary
123	2014-04-11 18:30:00.000000+0000	SE	Developer	Shanthi	80000
122	2013-02-26 18:30:00.000000+0000	SE	Developer	Anand	60000
121	2012-03-28 18:30:00.000000+0000	Data	Tester	Rajesh	40000
124	2012-05-28 18:30:00.000000+0000	Data	Analyst	Priya	50000

(4 rows)

1. 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:employee> ALTER TABLE Employee_info ADD Projects text;
cqlsh:employee> select * from Employee_info;

```

emp_id	dateofjoining	department	designation	name	projects	salary
123	2014-04-11 18:30:00.000000+0000	SE	Developer	Shanthi	null	80000
122	2013-02-26 18:30:00.000000+0000	SE	Developer	Anand	null	60000
121	2012-03-28 18:30:00.000000+0000	Data	Tester	Rajesh	null	40000
124	2012-05-28 18:30:00.000000+0000	Data	Analyst	Priya	null	50000

2. Update the altered table to add project names.

```

cqlsh:employee> begin batch insert into Employee_info(Emp_id,Projects) values(121,'App development') insert into Employee_info(Emp_id,Projects) values(122,'Web development') insert into Employee_info(Emp_id,Projects) values(123,'App development') insert into Employee_info(Emp_id,Projects) values(124,'Stock data') apply batch;
cqlsh:employee> select * from Employee_info;

```

emp_id	dateofjoining	department	designation	name	projects	salary
123	2014-04-11 18:30:00.000000+0000	SE	Developer	Shanthi	App development	80000
122	2013-02-26 18:30:00.000000+0000	SE	Developer	Anand	Web development	60000
121	2012-03-28 18:30:00.000000+0000	Data	Tester	Rajesh	App development	40000
124	2012-05-28 18:30:00.000000+0000	Data	Analyst	Priya	Stock data	50000

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

```

cqlsh:employee> INSERT INTO Employee_Info (Emp_Id, name, designation, DateofJoining, Salary, Department,Projects) VALUES (125, 'Emily Johnson', 'Analyst', '2023-03-01', 45000, 'Finance','Stock Data') US
ING TTL 15;
cqlsh:employee> select * from Employee_Info;

```

emp_id	dateofjoining	department	designation	name	projects	salary
123	2014-04-11 18:30:00.000000+0000	SE	Developer	Shanthi	App development	80000
125	2023-02-28 18:30:00.000000+0000	Finance	Analyst	Emily Johnson	Stock Data	45000
122	2013-02-26 18:30:00.000000+0000	SE	Developer	Anand	Web development	60000
121	2012-03-28 18:30:00.000000+0000	Data	Tester	Rajesh	App development	40000
124	2012-05-28 18:30:00.000000+0000	Data	Analyst	Priya	Stock data	50000

```

(5 rows)
cqlsh:employee>

```

3. Perform the following DB operations using Cassandra.

1. Create a keyspace by name 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
3. Insert the values into the table in batch
4. Display the details of the table created and increase the value of the counter
5. Write a query to show that a student with id 112 has taken a book “BDA” 2 times.
6. Export the created column to a csv file
7. Import a given csv dataset from local file system into Cassandra column family

1. Create a keyspace by name Library

```
cqlsh> CREATE KEYSPACE IF NOT EXISTS Library
... WITH replication = {'class': 'SimpleStrategy', 'replication_factor': 1};
```

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:library> CREATE TABLE libraryinfo (BookValue COUNTER, Stud_Id INT, Stud_Name TEXT, Book_Name TEXT, Book_Id TEXT, Date_of_issue TIMESTAMP, PRIMARY KEY(Stud_Id, Stud_Name, Book_Name, Book_Id, Date_of_issue));
cqlsh:library> BEGIN BATCH
```

3. Insert the values into the table in batch

```
cqlsh:library> UPDATE libraryinfo SET bookvalue = bookvalue + 1 WHERE Stud_Id = 101 AND Stud_Name = 'Alice' AND Book_Name = 'History of India' AND Book_Id = '201' AND Date_of_issue = '2024-05-09';
cqlsh:library> UPDATE libraryinfo SET bookvalue = bookvalue + 1 WHERE Stud_Id = 102 AND Stud_Name = 'John' AND Book_Name = 'Python' AND Book_Id = '203' AND Date_of_issue = '2024-02-09';
cqlsh:library> UPDATE libraryinfo SET bookvalue = bookvalue + 1 WHERE Stud_Id = 103 AND Stud_Name = 'Priya' AND Book_Name = 'C Fundamentals' AND Book_Id = '206' AND Date_of_issue = '2024-02-18';
cqlsh:library> UPDATE libraryinfo SET bookvalue = bookvalue + 1 WHERE Stud_Id = 104 AND Stud_Name = 'Shreya' AND Book_Name = 'Mechanical Engineering' AND Book_Id = '205' AND Date_of_issue = '2024-01-18';
```

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

```
cqlsh:library> select * from libraryinfo;
```

stud_id	stud_name	book_name	book_id	date_of_issue	bookvalue
104	Shreya	Mechanical Engineering	205	2024-01-17 18:30:00.000000+0000	1
102	John	Python	203	2024-02-08 18:30:00.000000+0000	1
101	Alice	History of India	201	2024-05-08 18:30:00.000000+0000	1
103	Priya	C Fundamentals	206	2024-02-17 18:30:00.000000+0000	1

(4 rows)

```
cqlsh:library> UPDATE libraryinfo SET bookvalue = bookvalue + 1 WHERE Stud_Id = 112 AND Stud_Name = 'Ashok' AND Book_Name = 'BDA' AND Book_Id = '210' AND Date_of_issue = '2023-08-18';
```

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


```
(5 rows)
cqlsh:library> select * from libraryinfo where Stud_Id=112;
```

stud_id	stud_name	book_name	book_id	date_of_issue	bookvalue
112	Ashok	BDA	210	2023-08-17 18:30:00.000000+0000	2

```
(1 rows)
```

6. Export the created column to a csv file

```
(5 rows)
cqlsh:library> copy libraryinfo (bookvalue,stud_id,stud_name,book_name,book_id,date_of_issue) TO 'Documents:\\library.csv';
Using 16 child processes

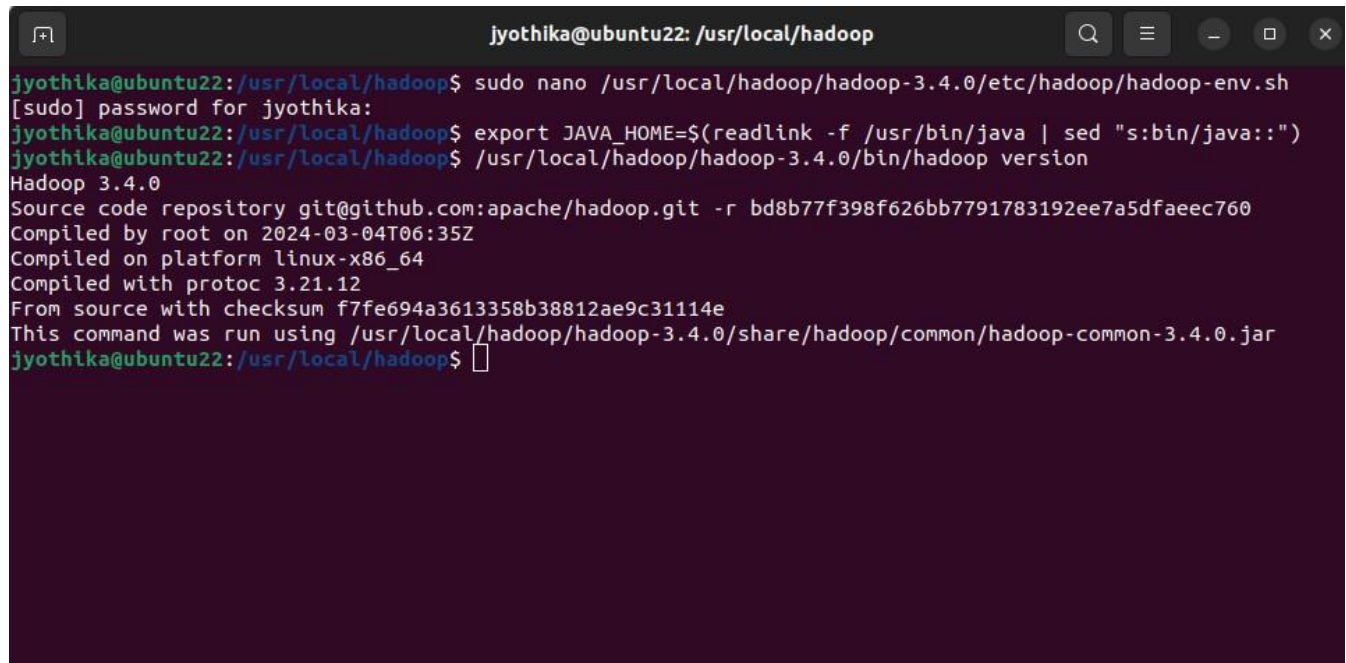
Starting copy of library.libraryinfo with columns [bookvalue, stud_id, stud_name, book_name, book_id, date_of_issue].
Processed: 5 rows; Rate: 76 rows/s; Avg. rate: 76 rows/s
5 rows exported to 1 files in 0.100 seconds.
cqlsh:library> []
```

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

```
cqlsh:library> copy libraryinfo (bookvalue,stud_id,stud_name,book_name,book_id,date_of_issue) FROM 'Documents:\\library.csv';
Using 16 child processes

Starting copy of library.libraryinfo with columns [bookvalue, stud_id, stud_name, book_name, book_id, date_of_issue].
```

4. Screenshot of Hadoop installed

A terminal window titled 'jyothika@ubuntu22: /usr/local/hadoop' showing the installation of Hadoop 3.4.0. The user runs 'sudo nano /usr/local/hadoop/hadoop-3.4.0/etc/hadoop/hadoop-env.sh', sets the JAVA_HOME, and then runs '/usr/local/hadoop/hadoop-3.4.0/bin/hadoop version'. The output displays the Hadoop version, source code repository, compilation details, and the command used to run the version check.

```
jyothika@ubuntu22: /usr/local/hadoop$ sudo nano /usr/local/hadoop/hadoop-3.4.0/etc/hadoop/hadoop-env.sh
[sudo] password for jyothika:
jyothika@ubuntu22: /usr/local/hadoop$ export JAVA_HOME=$(readlink -f /usr/bin/java | sed "s:bin/java::")
jyothika@ubuntu22: /usr/local/hadoop$ /usr/local/hadoop/hadoop-3.4.0/bin/hadoop version
Hadoop 3.4.0
Source code repository git@github.com:apache/hadoop.git -r bd8b77f398f626bb7791783192ee7a5dfaee760
Compiled by root on 2024-03-04T06:35Z
Compiled on platform linux-x86_64
Compiled with protoc 3.21.12
From source with checksum f7fe694a3613358b38812ae9c31114e
This command was run using /usr/local/hadoop/hadoop-3.4.0/share/hadoop/common/hadoop-common-3.4.0.jar
jyothika@ubuntu22: /usr/local/hadoop$
```

5 Execution of HDFS Commands for interaction with Hadoop Environment. (Minimum 10 commands to be executed)

to start hadoop services

start-all.sh jps

```
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ start-all.sh
```

make a new directory and display the directory contents

```
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hdfs dfs -mkdir /bda_hadoop
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -ls /
Found 2 items
drwxr-xr-x  - hadoop supergroup          0 2024-05-14 14:10 /abc
drwxr-xr-x  - hadoop supergroup          0 2024-05-14 14:30 /bda_hadoop
```

use put to copy files from local to bda_hadoop folder

```
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hdfs dfs -put /home/hadoop/Desktop/welcome.txt /bda_hadoop/file.txt
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hdfs dfs -cat /bda_hadoop/file.txt
hadoop is an open source platform
```

use copyFromLocal to copy files from local to bda_hadoop folder

```
hadoop is an open source platform
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hdfs dfs -copyFromLocal /home/hadoop/Desktop/welcome.txt /bda_hadoop/file_cp_local.txt
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hdfs dfs -cat /bda_hadoop/file_cp_local.txt
hadoop is an open source platform
```

use get to copy files from hadoop folder to local

```
hadoop is an open source platform
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hdfs dfs -get /bda_hadoop/file.txt /home/hadoop/Desktop/file_get.txt
```

make a merged file from hadoop and store it in local desktop

```
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hdfs dfs -getmerge /bda_hadoop/file.txt /bda_hadoop/file_cp_local.txt /home/hadoop/Desktop/merged_file.txt
```

use getfacl to show the access rights

```
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -getfacl /bda_hadoop/
# file: /bda_hadoop
# owner: hadoop
# group: supergroup
user::rwx
group::r-x
other::r-x
```

move the contents of a directory to another directory in hadoop

```
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -mv /bda_hadoop /abc
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -ls /abc
Found 1 items
drwxr-xr-x  - hadoop supergroup          0 2024-05-14 14:38 /abc/bda_hadoop
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -cp /abc/ /hadoop_lab
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -ls /hadoop_lab
Found 1 items
drwxr-xr-x  - hadoop supergroup          0 2024-05-14 14:46 /hadoop_lab/bda_hadoop
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$
```

6. Implement Wordcount Program on Hadoop framework

Mapper Code: You have to copy paste this program into the WCMapper Java Class file.

```
// Importing libraries 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.mapred.MapReduceBase; import
org.apache.hadoop.mapred.Mapper; import
org.apache.hadoop.mapred.OutputCollector; import
org.apache.hadoop.mapred.Reporter;
public class WCMapper extends MapReduceBase implements Mapper<LongWritable, Text,
Text,
```

```
IntWritable>; { //
Map function
public void map(LongWritable key, Text value, OutputCollector<Text,
IntWritable>; output, Reporter rep) throws IOException
```

```
{
String line = value.toString(); //
Splitting the line on spaces
for (String word : line.split(" "))
{
if (word.length() > 0)
{
output.collect(new Text(word), new IntWritable(1));
} } } }
```

Reducer Code: You have to copy paste this program into the WCReducer Java Class file

```
// Importing libraries import
java.io.IOException; import
java.util.Iterator;
import org.apache.hadoop.io.IntWritable; import
org.apache.hadoop.io.Text; import
org.apache.hadoop.mapred.MapReduceBase; import
org.apache.hadoop.mapred.OutputCollector; import
org.apache.hadoop.mapred.Reducer; import
org.apache.hadoop.mapred.Reporter;
public class WCReducer extends MapReduceBase implements Reducer<Text,
IntWritable, Text, IntWritable>; {
```

```
// Reduce function
public void reduce(Text key, Iterator<IntWritable>; value,
```

OutputCollector<Text, IntWritable> output,

Reporter rep) throws IOException

```
{
int count = 0;
// Counting the frequency of each words while
(value.hasNext())
{
IntWritable i = value.next(); count
+= i.get();
}
output.collect(key, new IntWritable(count));
} }
```

Driver Code: You have to copy paste this program into the WCDriver Java Class file.

```
// Importing libraries import java.io.IOException;
import org.apache.hadoop.conf.Configured; import
org.apache.hadoop.fs.Path; import
org.apache.hadoop.io.IntWritable; import
org.apache.hadoop.io.Text; import
org.apache.hadoop.mapred.FileInputFormat; import
org.apache.hadoop.mapred.FileOutputFormat; import
org.apache.hadoop.mapred.JobClient; import
org.apache.hadoop.mapred.JobConf; import
org.apache.hadoop.util.Tool; import
org.apache.hadoop.util.ToolRunner;
public class WCDriver extends Configured implements Tool {
public int run(String args[]) throws IOException
{
if (args.length < 2)
{
System.out.println("&quot;Please give valid inputs&quot;"); return
-1;
}
JobConf conf = new JobConf(WCDriver.class);
FileInputFormat.setInputPaths(conf, new Path(args[0])); FileOutputFormat.setOutputPath(conf,
new Path(args[1]));
conf.setMapperClass(WCMapper.class); conf.setReducerClass(WCReducer.class);
conf.setMapOutputKeyClass(Text.class);
conf.setMapOutputValueClass(IntWritable.class);
conf.setOutputKeyClass(Text.class);

conf.setOutputValueClass(IntWritable.class);
```

```

JobClient.runJob(conf);
return 0;
}
// Main Method
public static void main(String args[]) throws Exception
{
int exitCode = ToolRunner.run(new WCDriver(), args);
System.out.println(exitCode);
}
}

```

```

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
5504 Jps
4130 NameNode
4903 ResourceManager
4296 DataNode
4540 SecondaryNameNode
5084 NodeManager

```

```

hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ snap install eclipse --classic
eclipse 2024-03 from Snapcrafters* installed
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ java --version
openjdk 11.0.22 2024-01-16
OpenJDK Runtime Environment (build 11.0.22+7-post-Ubuntu-0ubuntu222.04.1)
OpenJDK 64-Bit Server VM (build 11.0.22+7-post-Ubuntu-0ubuntu222.04.1, mixed mode, sharing)

```

```

hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -mkdir /rgs
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -copyFromLocal D:/sample.txt /rgs/test.txt
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -copyFromLocal /home/hadoop/Desktop/sample.txt /rgs/test.txt
copyFromLocal: '/rgs/test.txt': File exists
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop jar /home/hadoop/Desktop/Word_Count.jar WCDriver /rgs/test.txt /output
2024-05-21 14:56:02,006 INFO impl.MetricsConfig: Loaded properties from hadoop-metrics2.properties
2024-05-21 14:56:02,044 INFO impl.MetricsSystemImpl: Scheduled Metric snapshot period at 10 second(s).
2024-05-21 14:56:02,044 INFO impl.MetricsSystemImpl: JobTracker metrics system started
2024-05-21 14:56:02,051 WARN impl.MetricsSystemImpl: JobTracker metrics system already initialized!
2024-05-21 14:56:02,110 WARN mapreduce.JobResourceUploader: Hadoop command-line option parsing not performed. Implement the Tool interface
2024-05-21 14:56:02,160 INFO mapred.FileInputFormat: Total input files to process : 1
2024-05-21 14:56:02,190 INFO mapreduce.JobSubmitter: number of splits:1
2024-05-21 14:56:02,252 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_local2100600485_0001
2024-05-21 14:56:02,252 INFO mapreduce.JobSubmitter: Executing with tokens: []
2024-05-21 14:56:02,307 INFO mapreduce.Job: The url to track the job: http://localhost:8080/
2024-05-21 14:56:02,308 INFO mapreduce.Job: Running job: job_local2100600485_0001

```

Output:


```
Subcommand 'fs' prints help when invoked w/o parameters or when invoked with an invalid parameter.  
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -cat /output/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:~$
```


7. From the following link extract the weather data

[https://github.com/tomwhite/hadoop-](https://github.com/tomwhite/hadoop-book/tree/master/input/ncdc/all)

book/tree/master/input/ncdc/all Create a Map

Reduce program to

a) find average temperature for each year from NCDC data set.

b) find the mean max temperature for every month

```
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.lib.input.FileInputFormat; import
org.apache.hadoop.mapreduce.lib.output.FileOutputFormat;
```

```
public class AvgTemp {          public static void main(String
args[])throws Exception {
    Configuration conf = new Configuration();
    Job job = Job.getInstance(conf, "Avg Temp");
    job.setJarByClass(AvgTemp.class);
    job.setMapperClass(AvgTempMapper.class);
    job.setCombinerClass(AvgTempReducer.class);
    job.setReducerClass(AvgTempReducer.class);
    job.setOutputKeyClass(Text.class);
    job.setOutputValueClass(IntWritable.class);
    FileInputFormat.addInputPath(job,new Path(args[0]));
    FileOutputFormat.setOutputPath(job, new Path(args[1]));
    System.exit(job.waitForCompletion(true) ? 0:1);
}
}
```

```
import java.io.*;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text; import
org.apache.commons.lang.StringUtils;
import org.apache.hadoop.mapreduce.Mapper;
```

```
public class AvgTempMapper
    extends Mapper<Object, Text, Text, IntWritable> {
```

```

        public void map(Object key, Text value, Context
                        context)throws IOException, InterruptedException{

                String[] line = value.toString().split(",");
                String datePart = line[1];
                String temp = line[10];
                if(StringUtils.isNumeric(temp))
                        context.write(new Text(datePart), new IntWritable(Integer.parseInt(temp)));
                }

        }

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

public class AvgTempReducer extends Reducer<Text, IntWritable, Text, IntWritable> {

    public void reduce(Text key, Iterable<IntWritable> values, Context context)throws IOException,
    InterruptedException {

        int sumTemps = 0; int numItems =
        0;

                for(IntWritable val : values) {
                        sumTemps += val.get();
                        numItems += 1;
                }
                context.write(key, new IntWritable(sumTemps/numItems));
        }

    }
}

```

Output:

01	4
02	0
03	7
04	44
05	100
06	168
07	219
08	198
09	141
10	100
11	19
12	3

8. For a given Text file, Create a Map Reduce program to sort the content in an alphabetic order listing only top 10 maximum occurrences of words.

```
import java.io.*; import
java.util.*;
import org.apache.hadoop.io.LongWritable; import
org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Mapper;

public class top_10_Movies_Mapper
    extends Mapper<Object, Text, Text, LongWritable> {

    private TreeMap<Long, String> tmap;

    @Override
    public void setup(Context context)
        throws IOException, InterruptedException
    {
        tmap = new TreeMap<Long, String>();
    }

    @Override
    public void map(Object key, Text value, Context context)
        throws IOException, InterruptedException
    {

        // input data format => movie_name
        // no_of_views (tab separated)
        // we split the input data
        String[] tokens = value.toString().split("\t");

        String movie_name = tokens[0];
        long no_of_views = Long.parseLong(tokens[1]);

        // insert data into treeMap,
        // we want top 10 viewed movies
        // so we pass no_of_views as key
        tmap.put(no_of_views, movie_name);

        // we remove the first key-value
        // if it's size increases 10 if
        (tmap.size() > 10) {
            tmap.remove(tmap.firstKey());
        }
```

```

    }

    @Override
    public void cleanup(Context context)
        throws IOException, InterruptedException
    {
        for (Map.Entry<Long, String> entry :
            tmap.entrySet()) {

            long count = entry.getKey();
            String name = entry.getValue();

            context.write(new Text(name),
                new LongWritable(count));
        }
    }
} import java.io.IOException; import
java.util.Map; import java.util.TreeMap;
import org.apache.hadoop.io.LongWritable;
import org.apache.hadoop.io.Text; import
org.apache.hadoop.mapreduce.Reducer;

public class top_10_Movies_Reducer extends
Reducer<Text, LongWritable, LongWritable,
    Text> {

    private TreeMap<Long, String> tmap2;

    @Override
    public void setup(Context context)
        throws IOException, InterruptedException
    {
        tmap2 = new TreeMap<Long, String>();
    }

    @Override
    public void reduce(Text key,
        Iterable<LongWritable> values,
        Context context)
        throws IOException, InterruptedException
    {

        // input data from mapper
        // key          values

```

```

        // movie_name          [ count ]
        String name = key.toString();
        long count = 0;

        for (LongWritable val : values) {
            count = val.get();
        }

        // insert data into treeMap,
        // we want top 10 viewed movies
        // so we pass count as key
        tmap2.put(count, name);

        // we remove the first key-value
        // if it's size increases 10
        if (tmap2.size() > 10) {
            tmap2.remove(tmap2.firstKey());
        }
    }

    @Override
    public void cleanup(Context context)
        throws IOException, InterruptedException
    {

        for (Map.Entry<Long, String> entry :
            tmap2.entrySet()) {

            long count = entry.getKey();
            String name = entry.getValue();
            context.write(new LongWritable(count),
                           new Text(name));
        }
    }

import org.apache.hadoop.conf.Configuration; import
import org.apache.hadoop.fs.Path; import
import org.apache.hadoop.io.LongWritable; import
import org.apache.hadoop.io.Text; import
import org.apache.hadoop.mapreduce.Job; import
import org.apache.hadoop.mapreduce.lib.input.FileInputFormat; import
import org.apache.hadoop.mapreduce.lib.output.FileOutputFormat;
import org.apache.hadoop.util.GenericOptionsParser;

```

```

public class Driver {

    public static void main(String[] args) throws Exception
    {
        Configuration conf = new Configuration();
        String[] otherArgs
            = new GenericOptionsParser(conf, args)
                .getRemainingArgs();

        // if less than two paths
        // provided will show error if
        (otherArgs.length < 2) {
            System.err.println(" Error
                                : please provide two paths
                                & quot;);

            System.exit(2);
        }

        Job job
            = Job.getInstance(conf, " top 10 & quot;);
        job.setJarByClass(Driver.class);

        job.setMapperClass(top_10_Movies_Mapper.class);
        job.setReducerClass(top_10_Movies_Reducer.class);

        job.setMapOutputKeyClass(Text.class);
        job.setMapOutputValueClass(LongWritable.class);

        job.setOutputKeyClass(LongWritable.class);
        job.setOutputValueClass(Text.class);

        FileInputFormat.addInputPath(
            job, new Path(otherArgs[0]));
        FileOutputFormat.setOutputPath(
            job, new Path(otherArgs[1]));

        System.exit(job.waitForCompletion(true) ? 0 : 1);
    }
}

```

Input:

she is a nice person
hadoop is a distributed master slave framework
java is required for hadoop

Output:

```
a      2
distributed  1
for     1
framework  1
hadoop  2
is      3
java    1
master  1
nice    1
person  1
```