VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"JnanaSangama", Belgaum -590014, Karnataka.

LAB REPORT
On

BIG DATA ANALYTICS

Submitted by

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in partial fulfillment for the award of the degree of
BACHELOR OF ENGINEERING
in
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CERTIFICATE

This is to certify that the Lab work entitled **"BIG DATA ANALYTICS"** carried out by **KAUSHIK POTLURI (1BM21CS089)**, 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.

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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

```
/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/sh
ell

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 } }
Atlasatlas-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 ofaccount 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"}}},{$match:{TotalAccBal:{$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:{$max:"$acc Bal"}}});
[
  { _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>
```

III.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 consistsof 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 withanother 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 fo
rward 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>
```

```
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,Da
teofJoining,Department,Salary) values('Raj',121,'Tester','2012-03-29','Testing',
40000) insert into Employee_info(Name,Emp_Id,Designation,DateofJoining,Departmen
t,Salary) values('Anand',122,'Developer','2013-02-27','SE',60000) insert into Em
ployee_info(Name,Emp_Id,Designation,DateofJoining,Department,Salary) values('Sha
nthi',123,'Developer','2014-04-12','SE',80000) insert into Employee_info(Name,Em
p_Id,Designation,DateofJoining,Department,Salary) values('Priya',124,'Analyst','
2012-05-29','Data',50000) apply batch;
```

2. Perform the following DB operations using Cassandra.

1. Create a keyspace by name Employee
2. Create a column family by
nameEmployee-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 Projectsdone 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: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 Projectsdone 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_i
d,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 attributesStud_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 oftype 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));
```

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)
```

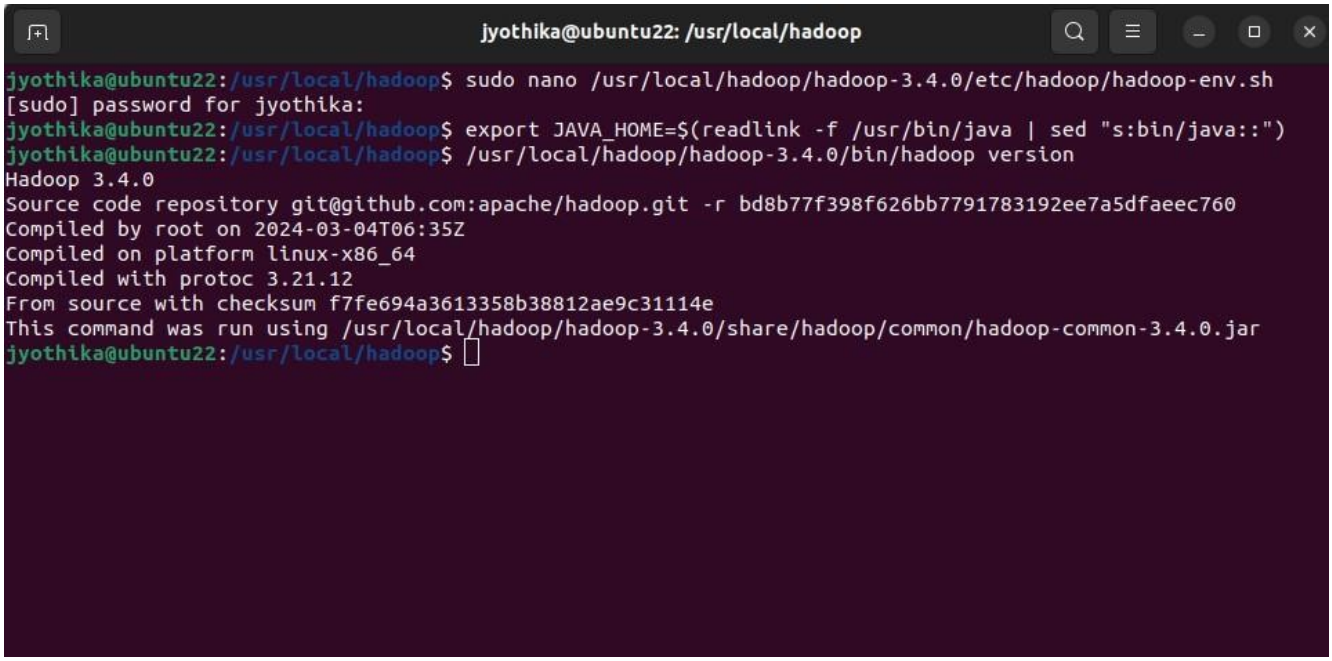
6. Export the created column to a csv file

```
(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



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 dierctory 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@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@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;
importorg.apache.hadoop.mapred.Mapper; import
org.apache.hadoop.mapred.OutputCollector; import
org.apache.hadoop.mapred.Reporter;
public class WCMapper extends MapReduceBase implements Mapper&lt;LongWritable, Text,
Text,

IntWritable&gt;
{ //Map function
public void map(LongWritable key, Text value, OutputCollector&lt;Text,
IntWritable&gt; output, Reporter rep) throws IOException

{
String line =
value.toString(); //Splitting the
line on spaces
for (String word : line.split(&quot; &quot;))
{
if (word.length() &gt; 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
importjava.io.IOException;
importjava.util.Iterator;
import org.apache.hadoop.io.IntWritable; import
org.apache.hadoop.io.Text; import
org.apache.hadoop.mapred.MapReduceBase;
importorg.apache.hadoop.mapred.OutputCollector;
import org.apache.hadoop.mapred.Reducer; import
org.apache.hadoop.mapred.Reporter;
public class WCReducer extends MapReduceBase implements Reducer&lt;Text,

IntWritable, Text, IntWritable&gt; {

// Reduce function
public void reduce(Text key, Iterator&lt;IntWritable&gt; value,
```

```
OutputCollector&lt;Text, IntWritable&gt;

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 &lt; 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
```

Output:

```
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. <u>From the following link extract the weather datahttps://github.com/tomwhite/hadoop-book/tree/master/input/ncdc/all Create a Map Reduce program to</u>

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(Stringargs[])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.*;
i         m         p         o         r         t
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;
importorg.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.*;
importjava.util.*;
import org.apache.hadoop.io.LongWritable;
importorg.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
keytmap.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
extendsReducer<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
10if (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
org.apache.hadoop.fs.Path; import
org.apache.hadoop.io.LongWritable; 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;
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 & lt; 2) {
			System.err.println(" Error

								: please provide two paths
		System.exit(2);                                 & quot;);

		}

		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
```