

VISVESVARAYA TECHNOLOGICAL UNIVERSITY

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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
COMPUTER SCIENCE AND ENGINEERING



B.M.S. COLLEGE OF ENGINEERING

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CERTIFICATE

This is to certify that the Lab work entitled “LAB COURSE **Big Data Analytics**” carried out by **Mohammed Uzair Obaid(1BM22CS159)**, who is a bonafide student of **B. M. S. College of Engineering**. It is in partial fulfillment for the award of **Bachelor of Engineering in Computer Science and Engineering** of the Visvesvaraya Technological University, Belgaum during the year 2024. The Lab report has been approved as it satisfies the academic requirements in respect of a **Big Data Analytics - (23CS6PCBDA)** work prescribed for the said degree.

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github link: <https://github.com/uzairob/1BM22CS159-BDA>

Lab 1 MongoDB Part - 1

```
C:\Users\student>mongoimport
2025-03-04T15:04:25.938+0530    no collection specified
2025-03-04T15:04:25.938+0530    using filename '' as collection
2025-03-04T15:04:25.938+0530    error validating settings: invalid collection name: collection name cannot be an empty string

C:\Users\student>mongoexport
2025-03-04T15:04:49.930+0530    must specify a collection
2025-03-04T15:04:49.931+0530    try 'mongoexport --help' for more information

C:\Users\student>mongoexport mongodb+srv://uzairobaid:uzairobaid123@cluster0.pdibg.mongodb.net/DBMS_DEMO --collection=Student --out C:\Users\student\Downloads\output.json
2025-03-04T15:11:46.757+0530    connected to: mongodb+srv://[**REDACTED**]@cluster0.pdibg.mongodb.net/DBMS_DEMO
2025-03-04T15:11:46.979+0530    exported 6 records
```

```
Atlas atlas-herlbh-shard-0 [primary] DBMS_DEMO> db.New_Student.find()
```

```
[
  {
    _id: ObjectId('67c6c2b14b7503e62cfa4215'),
    RollNo: 2,
    Age: 22,
    Cont: 9976,
    email: 'anushka.de9@gmail.com'
  },
  {
    _id: ObjectId('67c6c2c04b7503e62cfa4216'),
    RollNo: 3,
    Age: 21,
    Cont: 5576,
    email: 'anubhav.de9@gmail.com'
  },
  {
    _id: ObjectId('67c6c2c74b7503e62cfa4217'),
    RollNo: 4,
    Age: 20,
    Cont: 4476,
    email: 'pani.de9@gmail.com'
  },
  {
    _id: ObjectId('67c6c2cd4b7503e62cfa4218'),
    RollNo: 10,
    Age: 23,
    Cont: 2276,
    email: 'Abhinav@gmail.com'
  },
  {
    _id: ObjectId('67c6c3ac4b7503e62cfa4219'),
    RollNo: 11,
    Age: 22,
    Name: 'FEM',
    Cont: 2276,
    email: 'rea.de9@gmail.com'
  },
  {
    _id: ObjectId('67c6c27b4b7503e62cfa4214'),
    RollNo: 1,
    Age: 21,
    Cont: 9876,
    email: 'antara.de9@gmail.com'
  }
]
```

I. CREATE DATABASE IN MONGODB.

use myDB;

Confirm the existence of your database

db;

To list all databases

show dbs;

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

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

db.createCollection("Student");

2. To drop a collection by the name "Student".

db.Student.drop();

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

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

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

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

5. FIND METHOD

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

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

B. To display only the StudName and Grade from all the documents of the Students collection. The identifier _id should be suppressed and NOT displayed.

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

C. To find those documents where the Grade is set to 'VII'

db.Student.find({Grade:{ \$eq:'VII'}}).pretty();

D. To find those documents from the Students collection where the Hobbies is set to either 'Chess' or is set to 'Skating'.

db.Student.find({Hobbies :{ \$in: ['Chess','Skating']}}).pretty ();

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

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

F. To find documents from the Students collection where the StudName has an "e" in any position.

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

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

db.Student.count();

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

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

III. Import data from a CSV file

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

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

IV. Export data to a CSV file

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

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

V. Save Method :

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

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

VI. Add a new field to existing Document:

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

VII. Remove the field in an existing Document

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

VIII. Finding Document based on search criteria suppressing few fields

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

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

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

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

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

IX. to set a particular field value to NULL

```
db.Students.update({_id:3},{ $set:{Location:null}})
```

X. Count the number of documents in Student Collections

```
db.Students.count()
```

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

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

retrieve first 3 documents

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

Sort the document in Ascending order

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

to Skip the 1st two documents from the Students Collections

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

XII. Create a collection by name “food” and add to each document add a “fruits” array

```
db.food.insert( { _id:1, fruits:['grapes','mango','apple'] } )
```

```
db.food.insert( { _id:2, fruits:['grapes','mango','cherry'] } )
```

```
db.food.insert( { _id:3, fruits:['banana','mango'] } )
```

To find those documents from the “food” collection which has the “fruits array” constitute of “grapes”, “mango” and “apple”.

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

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

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

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

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

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

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

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

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

update on Array:

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

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

insert new key value pairs in the fruits array

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

XII. Aggregate Function :

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

Now group on “custID” and compute the sum of “AccBal”.

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

match on AcctType:”S” then group on “CustID” and compute the sum of “AccBal”.

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

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

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

```
C:\Users\student>mongoimport mongodb+srv://uzairobaid:uzairobaid123@cluster0.pdibg.mongodb.net/DBMS_DEMO --collection=Ne  
w_Student --type json --file C:\Users\student\Downloads\output.json  
2025-03-04T15:19:31.071+0530 connected to: mongodb+srv://[**REDACTED**]@cluster0.pdibg.mongodb.net/DBMS_DEMO  
2025-03-04T15:19:31.168+0530 6 document(s) imported successfully. 0 document(s) failed to import.
```

```
C:\Users\student>mongoimport mongodb+srv://uzairobaid:uzairobaid123@cluster0.pdibg.mongodb.net/DBMS_DEMO --collection=Ne  
w_Student --type json --file C:\Users\student\Downloads\output.json  
2025-03-04T15:19:31.071+0530 connected to: mongodb+srv://[**REDACTED**]@cluster0.pdibg.mongodb.net/DBMS_DEMO  
2025-03-04T15:19:31.168+0530 6 document(s) imported successfully. 0 document(s) failed to import.
```

Lab 2 MongoDB Part - 2

```
bmscecse@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ mongosh
Current Mongosh Log ID: 67c7ff7c16bfaaa2811db83af
Connecting to:      mongodb://127.0.0.1:27017/?directConnection=true&serverSelectionTimeoutMS=2000&app
Name=mongosh+2.2.0
Using MongoDB:      7.0.6
Using Mongosh:      2.2.0

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

-----
  The server generated these startup warnings when booting
  2025-03-11T14:00:06.317+05:30: Using the XFS filesystem is strongly recommended with the WiredTiger sto
rage engine. See http://dochub.mongodb.org/core/prodnotes-filesystem
  2025-03-11T14:00:08.134+05:30: Access control is not enabled for the database. Read and write access to
data and configuration is unrestricted
-----

Enterprise test> use uzairDB
switched to db uzairDB
Enterprise uzairDB> db.createCollection('Student')
{ ok: 1 }

Enterprise uzairDB> db.Student.insert({_id: 1, StudName: "Michelle Jacintha", Grade: "VII", Hobbies: "
Internet Surfing"});
DeprecationWarning: Collection.insert() is deprecated. Use insertOne, insertMany, or bulkWrite.
{ acknowledged: true, insertedIds: { '0': 1 } }
Enterprise uzairDB> db.Student.update(
...   {_id: 3, StudName: "Aryan David", Grade: "VII"},
...   {$set: {Hobbies: "Skating"}},
...   {upsert: true}
... );
DeprecationWarning: Collection.update() is deprecated. Use updateOne, updateMany, or bulkWrite.
{
  acknowledged: true,
  insertedId: 3,
  matchedCount: 0,
  modifiedCount: 0,
  upsertedCount: 1
}
Enterprise uzairDB> db.Student.find({StudName: "Aryan David"});
[
  { _id: 3, StudName: 'Aryan David', Grade: 'VII', Hobbies: 'Skating' }
]
Enterprise uzairDB> db.Student.find({}, {StudName: 1, Grade: 1, _id: 0});
[
  { StudName: 'Michelle Jacintha', Grade: 'VII' },
  { StudName: 'Aryan David', Grade: 'VII' }
]
Enterprise uzairDB> db.Student.find({Grade: {$eq: 'VII'}}).pretty();
[
  {
    _id: 1,
    StudName: 'Michelle Jacintha',
    Grade: 'VII',
    Hobbies: 'Internet Surfing'
  },
  { _id: 3, StudName: 'Aryan David', Grade: 'VII', Hobbies: 'Skating' }
]
Enterprise uzairDB> db.Student.find({Hobbies: { $in: ['Chess', 'Skating']}}).pretty();
[
  { _id: 3, StudName: 'Aryan David', Grade: 'VII', Hobbies: 'Skating' }
]
```



```

]
Enterprise uzairDB> db.Student.find({StudName: /^M/}).pretty();
[
  {
    _id: 1,
    StudName: 'Michelle Jacintha',
    Grade: 'VII',
    Hobbies: 'Internet Surfing'
  }
]
Enterprise uzairDB> db.Student.find({StudName: /e/}).pretty();
[
  {
    _id: 1,
    StudName: 'Michelle Jacintha',
    Grade: 'VII',
    Hobbies: 'Internet Surfing'
  }
]
Enterprise uzairDB> db.Student.count();
DeprecationWarning: Collection.count() is deprecated. Use countDocuments or estimatedDocumentCount.
2
Enterprise uzairDB> db.Student.find().sort({StudName:-1}).pretty();
[
  {
    _id: 1,
    StudName: 'Michelle Jacintha',
    Grade: 'VII',
    Hobbies: 'Internet Surfing'
  },
  { _id: 3, StudName: 'Aryan David', Grade: 'VII', Hobbies: 'Skating' }
]

```

```

bmscecse@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ cd home
bash: cd: home: No such file or directory
bmscecse@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ cd Desktop
bmscecse@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ touch out.csv

```

```

bmscecse@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ mongoexport --host localhost --db uzairDB --collection Student --type csv --out /home/bmscecse/Desktop/out.csv --fields _id,StudName
2025-03-11T15:01:48.547+0530    connected to: mongodb://localhost/
2025-03-11T15:01:48.549+0530    exported 2 records

```

```

bmscecse@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ mongoimport --db uzairDB --collection Student --type csv --headerline --file /home/bmscecse/Desktop/out.csv --upsert
2025-03-11T15:08:12.504+0530    connected to: mongodb://localhost/
2025-03-11T15:08:12.514+0530    2 document(s) imported successfully. 0 document(s) failed to import.

```

```

Enterprise uzairDB> db.Student.find()
[
  { _id: 1, StudName: 'Michelle Jacintha' },
  { _id: 3, StudName: 'Aryan David' }
]

```

Lab 3 Neo4J

```
$ CREATE (s1:Student {name: 'Alice', age: 21, studentId: 'S1001'}); CREATE (s2:Student {name: 'Bob', age: 22, studentId: 'S1002'}); CR...
```

```
mydb$ CREATE (s1:Student {name: 'Alice', age: 21, studentId: 'S1001'}) ✓
```

```
mydb$ CREATE (s2:Student {name: 'Bob', age: 22, studentId: 'S1002'}) ✓
```

```
mydb$ CREATE (s3:Student {name: 'Charlie', age: 23, studentId: 'S1003'}) ✓
```

```
mydb$ create (p2:Professor {name:'Dr. Jonhson', department:'Mathematics'});
```

Table
Code

Added 1 label, created 1 node, set 2 properties, completed after 6 ms.

Added 1 label, created 1 node, set 2 properties, completed after 6 ms.

```
mydb$ create (p1:Professor {name:'Dr. Smith', department:'Computer Science'});
```

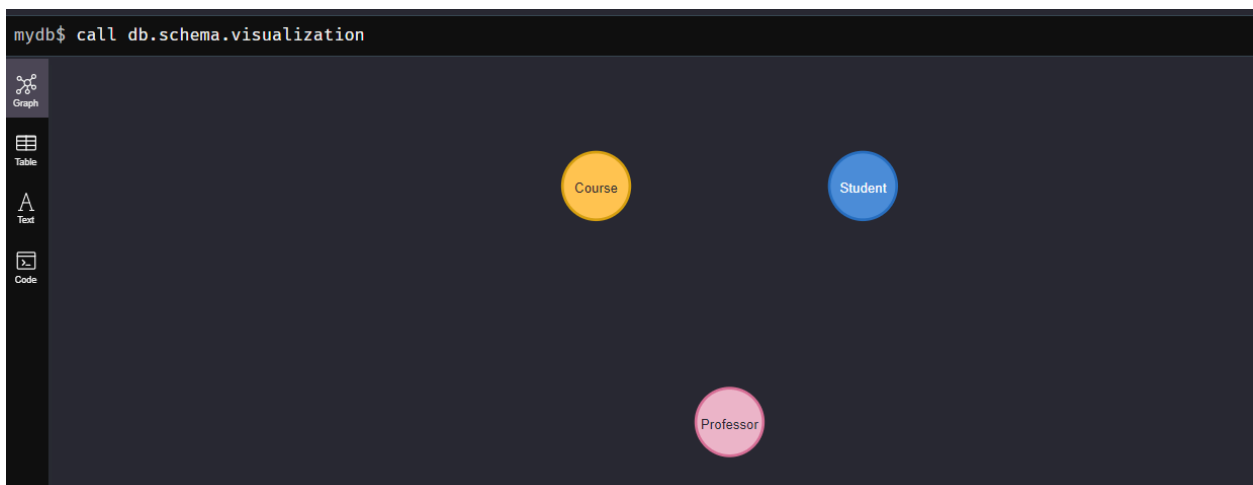
Table

Added 1 label, created 1 node, set 2 properties, completed after 16 ms.

```
mydb$ CREATE (c1:Course {title: 'Introduction to Programming', courseCode: 'CS101'}) ✓
```

```
mydb$ CREATE (c2:Course {title: 'Calculus I', courseCode: 'MATH101'}) ✓
```

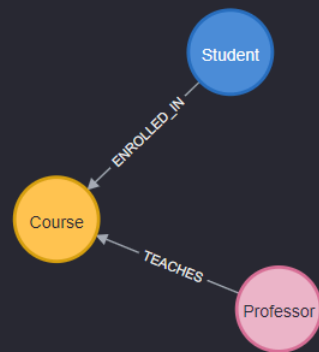
```
mydb$ CREATE (c3:Course {title: 'Data Structures', courseCode: 'CS102'}) ✓
```



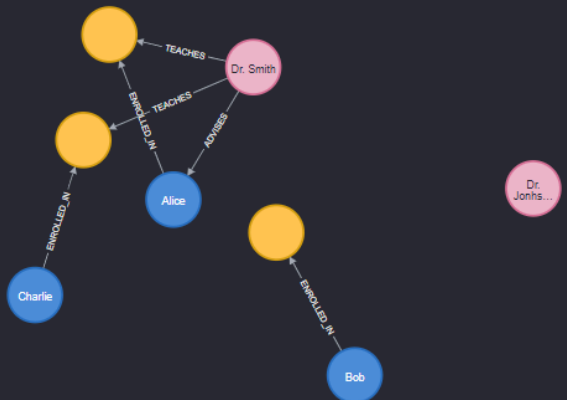
```
mydb$ MATCH (s:Student), (c:Course) WHERE s.name = 'Alice' AND c.title = 'Introduction to Programming' CREATE (s)-[:ENROLLED_IN]-(c) ✓
mydb$ MATCH (s:Student), (c:Course) WHERE s.name = 'Bob' AND c.title = 'Calculus I' CREATE (s)-[:ENROLLED_IN]→(c) ✓
mydb$ MATCH (s:Student), (c:Course) WHERE s.name = 'Charlie' AND c.title = 'Data Structures' CREATE (s)-[:ENROLLED_IN]→(c) ✓
```

```
mydb$ MATCH (p:Professor), (c:Course) WHERE p.name = 'Dr. Smith' AND c.title = 'Introduction to Programming' CREATE (p)-[:TEACHES]-(c) ✓
mydb$ MATCH (p:Professor), (c:Course) WHERE p.name = 'Dr. Johnson' AND c.title = 'Calculus I' CREATE (p)-[:TEACHES]→(c) ✓
mydb$ MATCH (p:Professor), (c:Course) WHERE p.name = 'Dr. Smith' AND c.title = 'Data Structures' CREATE (p)-[:TEACHES]→(c) ✓
```

```
mydb$ call db.schema.visualization
```



```
MATCH(n) RETURN n LIMIT 100
```



```
mydb$ MATCH (s:Student)-[:ENROLLED_IN]→(c:Course) RETURN s.name AS Student, COLLECT(c.title) AS Courses;
```

	Student	Courses
1	"Alice"	["Introduction to Programming"]
2	"Bob"	["Calculus I"]
3	"Charlie"	["Data Structures"]

```
mydb$ MATCH (p:Professor)-[:TEACHES]→(c:Course) WHERE p.name = 'Dr. Smith' RETURN p.name AS Professor, COLLECT(c.title) AS Courses;
```

	Professor	Courses
1	"Dr. Smith"	["Introduction to Programming", "Data Structures"]

```
mydb$ MATCH (s:Student)-[:ENROLLED_IN]→(c:Course)←[:TEACHES]-(p:Professor) RETURN s.name AS Student, COLLECT(p.name) AS Professors;
```

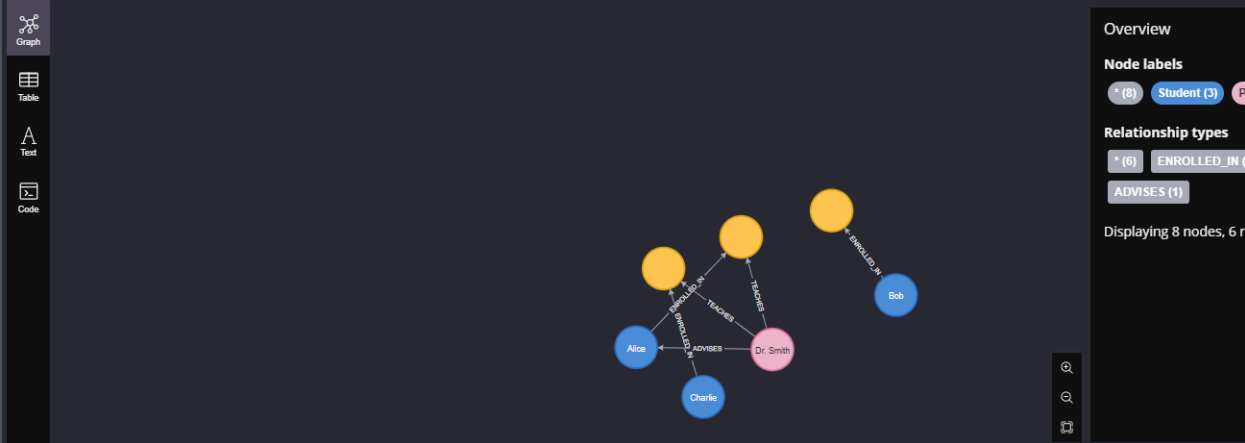
	Student	Professors
1	"Alice"	["Dr. Smith"]
2	"Charlie"	["Dr. Smith"]

Started streaming 2 records after 10 ms and completed after 11 ms.

```
mydb$ MATCH (p:Professor)-[:ADVISES]→(s:Student) RETURN p.name AS Professor, COLLECT(s.name) AS Students;
```

	Professor	Students
1	"Dr. Smith"	["Alice"]

```
mydb$ MATCH(n) RETURN n LIMIT 100
```



```
$ MATCH (p:Professor {name: 'Dr. Johnson'})-[r]→() DELETE r; MATCH (p:Professor {name: 'Dr. Johnson'}) DELETE p;
```

Ctrl+click to copy to main editor

```
mydb$ MATCH (p:Professor {name: 'Dr. Johnson'})-[r]→() DELETE r
```

```
mydb$ MATCH (p:Professor {name: 'Dr. Johnson'}) DELETE p
```

Lab 4 Cassandra Part - I

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

```
CREATE KEYSPACE Employee
```

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

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

```
CREATE TABLE Employee_Info (
```

```
    Emp_Id int PRIMARY KEY,
```

```
    Emp_Name text,
```

```
    Designation text,
```

```
    Date_of_Joining date,
```

```
    Salary float,
```

```
    Dept_Name text
```

```
);
```

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

```
BEGIN BATCH
```

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

```
VALUES (121, 'Anit', 'Manager', '2018-02-01', 70000.0, 'Sales');
```

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

```
VALUES (122, 'Priya', 'Developer', '2020-06-15', 50000.0, 'IT');
```

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

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

APPLY BATCH;

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

```
UPDATE Employee_Info
```

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

```
WHERE Emp_Id = 121;
```

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

```
SELECT * FROM Employee_Info
```

```
WHERE Salary > 0
```

```
ALLOW FILTERING;
```

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

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

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

```
UPDATE Employee_Info
```

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

```
WHERE Emp_Id = 121;
```

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

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

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

```
USING TTL 15;
```

```

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

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

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

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

(3 rows)

```


Lab 5 Cassandra Part - II

A. Table: library_student_info

B. Table: book_counter_info

C. Insert Data in Batch

```
bmscecse@bmscecse-HP-Elite-Tower-880-G9-Desktop-PC:~$ cqlsh
Connected to Test Cluster at 127.0.0.1:9042
[cqlsh 6.1.0 | Cassandra 4.1.4 | CQL spec 3.4.6 | Native protocol v5]
Use HELP for help.
cqlsh> CREATE KEYSPACE library_db WITH replication = {'class': 'SimpleStrategy', 'replication_factor': 1};
cqlsh> USE library_db;
cqlsh:library_db> CREATE TABLE library_student_info (
...     stud_id int PRIMARY KEY,
...     stud_name text,
...     book_name text,
...     book_id int,
...     date_of_issue date
... );
cqlsh:library_db> CREATE TABLE book_counter_info (
...     stud_id int,
...     book_name text,
...     counter_value counter,
...     PRIMARY KEY (stud_id, book_name)
... );
cqlsh:library_db> BEGIN BATCH
... INSERT INTO library_student_info (stud_id, stud_name, book_name, book_id, date_of_issue)
... VALUES (112, 'David', 'BDA', 401, '2024-03-12');
... UPDATE book_counter_info SET counter_value = counter_value + 1
... WHERE stud_id = 112 AND book_name = 'BDA';
... APPLY BATCH;
InvalidRequest: Error from server: code=2200 [Invalid query] message="Counter and non-counter mutations cannot exist in the same batch"
```

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

Display Table & Increase Counter

Query: Student 112 took "BDA" 2 times

```
cqlsh:library_db> -- First: Insert normal data (non-counter)
cqlsh:library_db> INSERT INTO library_student_info (stud_id, stud_name, book_name, book_id, date_of_issue)
... VALUES (112, 'David', 'BDA', 401, '2024-03-12');
cqlsh:library_db> -- Then: Update the counter table separately
cqlsh:library_db> UPDATE book_counter_info
... SET counter_value = counter_value + 1
... WHERE stud_id = 112 AND book_name = 'BDA';
cqlsh:library_db> -- Insert once (already done above)
cqlsh:library_db> -- Increment counter again
cqlsh:library_db> UPDATE book_counter_info
... SET counter_value = counter_value + 1
... WHERE stud_id = 112 AND book_name = 'BDA';
cqlsh:library_db> SELECT * FROM library_student_info;

stud_id | book_id | book_name | date_of_issue | stud_name
-----+-----+-----+-----+-----
112 | 401 | BDA | 2024-03-12 | David

(1 rows)
cqlsh:library_db> SELECT * FROM book_counter_info;

stud_id | book_name | counter_value
-----+-----+-----
112 | BDA | 2

(1 rows)
cqlsh:library_db> -- Increment counter again:
cqlsh:library_db> UPDATE book_counter_info SET counter_value = counter_value + 1
... WHERE stud_id = 112 AND book_name = 'BDA';
cqlsh:library_db> SELECT counter_value FROM book_counter_info
... WHERE stud_id = 112 AND book_name = 'BDA';

counter_value
-----
3
```

Lab 6 Hadoop HDFS

1. mkdir

Command: `hdfs dfs -mkdir /abc`

Description: Creates a directory /abc in HDFS.

2. ls

Command: `hadoop fs -ls /Hadoop`

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

3. put

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

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

To view the file contents in HDFS, use:

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

4. copyFromLocal

Command: `hdfs dfs -copyFromLocal /home/hduser/Desktop/Welcome.txt /abc/WC.txt`

Description: Similar to put, but only accepts local file paths as source.

To view the copied file's contents:

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

5. get

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

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

To merge multiple HDFS files into one local file:

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

To check ACLs of a directory:

Command: `hadoop fs -getfacl /abc/`

6. copyToLocal

Command: `hdfs dfs -copyToLocal /abc/WC.txt /home/hduser/Desktop`

Description: Similar to get, but destination must be a local file path.

7. cat

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

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

8. mv

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

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

9. cp

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

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

Screenshots

```
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ su hduser
su: user hduser does not exist or the user entry does not contain all the required fields
```

```
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ cd hadoop
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/hadoop$ cd sbin
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/hadoop/sbin$ ./start-dfs.sh
Starting namenodes on [localhost]
localhost: namenode is running as process 4678. Stop it first and ensure /tmp/hadoop-hadoop-namenode.pid file is empty before retry.
Starting datanodes
localhost: datanode is running as process 4865. Stop it first and ensure /tmp/hadoop-hadoop-datanode.pid file is empty before retry.
Starting secondary namenodes [bmscecse-HP-Elite-Tower-800-G9-Desktop-PC]
bmscecse-HP-Elite-Tower-800-G9-Desktop-PC: secondarynamenode is running as process 5097. Stop it first and ensure /tmp/hadoop-hadoop-secondarynamenode.pid file is empty before retry.
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/hadoop/sbin$ ./start-yarn.sh
Starting resourcemanager
resourcemanager is running as process 5424. Stop it first and ensure /tmp/hadoop-hadoop-resourcemanager.pid file is empty before retry.
Starting nodemanagers
localhost: nodemanager is running as process 5580. Stop it first and ensure /tmp/hadoop-hadoop-nodemanager.pid file is empty before retry.
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/hadoop/sbin$ jps
5424 ResourceManager
4865 DataNode
9410 Jps
4678 NameNode
5097 SecondaryNameNode
5580 NodeManager
```

```
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ cd Desktop
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ nano file.txt
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hadoop fs -ls /
Found 5 items
drwxr-xr-x - hadoop supergroup          0 2024-05-13 14:51 /Lab05
drwxr-xr-x - hadoop supergroup          0 2024-05-14 15:01 /abc
drwxr-xr-x - hadoop supergroup          0 2025-04-15 14:15 /clear
drwxr-xr-x - hadoop supergroup          0 2024-05-13 14:40 /test_Lab05
drwxr-xr-x - hadoop supergroup          0 2025-04-15 14:17 /xyz
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ cd ..
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ cd hadoop
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/hadoop$ cd ..
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -ls /
Found 5 items
drwxr-xr-x - hadoop supergroup          0 2024-05-13 14:51 /Lab05
drwxr-xr-x - hadoop supergroup          0 2024-05-14 15:01 /abc
drwxr-xr-x - hadoop supergroup          0 2025-04-15 14:15 /clear
drwxr-xr-x - hadoop supergroup          0 2024-05-13 14:40 /test_Lab05
drwxr-xr-x - hadoop supergroup          0 2025-04-15 14:17 /xyz
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -mkdir /uzairdir
```

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

Lab 7 Word Count using Map-Reduce

```
hadoop@bmscece-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 [bmscece-HP-Elite-Tower-800-G9-Desktop-PC]
Starting resourcemanager
Starting nodemanagers
```

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

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

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

```
hadoop@bmscece-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop jar Desktop/WordCount
.jar WCDriver /uzairdir/test.txt /uzairdir/out.txt
2025-04-29 15:19:10,972 INFO impl.MetricsConfig: Loaded properties from hadoop-m
etrics2.properties
2025-04-29 15:19:11,017 INFO impl.MetricsSystemImpl: Scheduled Metric snapshot p
eriod at 10 second(s).
2025-04-29 15:19:11,017 INFO impl.MetricsSystemImpl: JobTracker metrics system s
tarted
2025-04-29 15:19:11,024 WARN impl.MetricsSystemImpl: JobTracker metrics system a
lready initialized!
2025-04-29 15:19:11,081 WARN mapreduce.JobResourceUploader: Hadoop command-line
option parsing not performed. Implement the Tool interface and execute your appl
ication with ToolRunner to remedy this.
2025-04-29 15:19:11,135 INFO mapred.FileInputFormat: Total input files to proces
s : 1
2025-04-29 15:19:11,161 INFO mapreduce.JobSubmitter: number of splits:1
2025-04-29 15:19:11,203 INFO mapreduce.JobSubmitter: Submitting tokens for job:
job_local1348329959_0001
2025-04-29 15:19:11,203 INFO mapreduce.JobSubmitter: Executing with tokens: []
2025-04-29 15:19:11,263 INFO mapreduce.Job: The url to track the job: http://loc
alhost:8080/
2025-04-29 15:19:11,264 INFO mapred.LocalJobRunner: OutputCommitter set in confi
g null
```

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

```
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -cat /uzairdir/out
.txt/part-00000
-Uzair 1
are 1
family 1
hi 1
how 3
is 2
job 1
you 1
your 2
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$
```

The output of the MapReduce job is displayed using `hadoop fs -cat`, showing the word count of the input file.

```
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -cat /uzairdir/tes
t.txt
hi how are you
how is your job
how is your family
-Uzair
```

The contents of the input file `test.txt` are displayed using `hadoop fs -cat`, showing a text conversation.

Lab 8 Mean-Max Temperature using Map-Reduce

```
hadoop@bmscece-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 [bmscece-HP-Elite-Tower-800-G9-Desktop-PC]
Starting resourcemanager
Starting nodemanagers
hadoop@bmscece-HP-Elite-Tower-800-G9-Desktop-PC:~$ jps
5922 NameNode
4503 org.eclipse.equinox.launcher_1.6.1000.v20250227-1734.jar
6807 NodeManager
6312 SecondaryNameNode
6058 DataNode
7226 Jps
6653 ResourceManager
hadoop@bmscece-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -ls
Found 2 items
drwxr-xr-x - hadoop supergroup          0 2025-04-29 15:04 op.txt
drwxr-xr-x - hadoop supergroup          0 2025-04-29 15:11 out.txt
```

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

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

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

```
hadoop@bmscece-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -copyFromLocal /home/hadoop/Downloads/weather-data /uzairdir/wdata.txt
```

A local file weather-data.txt is copied to HDFS at /uzairdir/wdata.txt using the copyFromLocal command.

```
hadoop@bmscece-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop jar /home/hadoop/Desktop/Temp.jar AverageDriver /uzairdir/wdata.txt /uzair
dir/oxr
2025-05-06 15:16:20,395 INFO impl.MetricsConfig: Loaded properties from hadoop-metrics2.properties
2025-05-06 15:16:20,440 INFO impl.MetricsSystemImpl: Scheduled Metric snapshot period at 10 second(s).
2025-05-06 15:16:20,440 INFO impl.MetricsSystemImpl: JobTracker metrics system started
2025-05-06 15:16:20,500 WARN mapreduce.JobResourceUploader: Hadoop command-line option parsing not performed. Implement the Tool inte
rface and execute your application with ToolRunner to remedy this.
2025-05-06 15:16:20,553 INFO input.FileInputFormat: Total input files to process : 1
2025-05-06 15:16:20,583 INFO mapreduce.JobSubmitter: number of splits:1
2025-05-06 15:16:20,626 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_local1911472483_0001
2025-05-06 15:16:20,626 INFO mapreduce.JobSubmitter: Executing with tokens: []
2025-05-06 15:16:20,686 INFO mapreduce.Job: The url to track the job: http://localhost:8080/
2025-05-06 15:16:20,686 INFO mapreduce.Job: Running job: job_local1911472483_0001
2025-05-06 15:16:20,686 INFO mapred.LocalJobRunner: OutputCommitter set in config null
2025-05-06 15:16:20,689 INFO output.PathOutputCommitterFactory: No output committer factory defined, defaulting to FileOutputCommitte
rFactory
2025-05-06 15:16:20,689 INFO output.FileOutputCommitter: File Output Committer Algorithm version is 2
2025-05-06 15:16:20,689 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup _temporary folders under output directory:f
alse, ignore cleanup failures: false
2025-05-06 15:16:20,690 INFO mapred.LocalJobRunner: OutputCommitter is org.apache.hadoop.mapreduce.lib.output.FileOutputCommitter
2025-05-06 15:16:20,729 INFO mapred.LocalJobRunner: Waiting for map tasks
2025-05-06 15:16:20,729 INFO mapred.LocalJobRunner: Starting task: attempt_local1911472483_0001_m_000000_0
2025-05-06 15:16:20,740 INFO output.PathOutputCommitterFactory: No output committer factory defined, defaulting to FileOutputCommitte
rFactory
2025-05-06 15:16:20,740 INFO output.FileOutputCommitter: File Output Committer Algorithm version is 2
2025-05-06 15:16:20,740 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup _temporary folders under output directory:f
alse, ignore cleanup failures: false
2025-05-06 15:16:20,747 INFO mapred.Task: Using ResourceCalculatorProcessTree : [ ]
2025-05-06 15:16:20,749 INFO mapred.MapTask: Processing split: hdfs://localhost:9000/uzairdir/wdata.txt:0+888190
2025-05-06 15:16:20,784 INFO mapred.MapTask: (EQUATOR) 0 kvi 26214396(104857584)
2025-05-06 15:16:20,784 INFO mapred.MapTask: mapreduce.task.io.sort.mb: 100
2025-05-06 15:16:20,784 INFO mapred.MapTask: soft limit at 83886080
2025-05-06 15:16:20,784 INFO mapred.MapTask: bufstart = 0; bufvoid = 104857600
2025-05-06 15:16:20,784 INFO mapred.MapTask: kvstart = 26214396; length = 6553600
```


A MapReduce job is executed using the AverageDriver class to process wdata.txt and save results in oxt.

```
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -cat /uzairdir/oxt/part-r-000000  
1901      46
```

The output of the MapReduce job is viewed using `hadoop fs -cat`, showing results from the `oxt/part-r-000000` file.

Lab 9 Scala and pySpark

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

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

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

```
GNU nano 6.2 wordCount.py *  
from pyspark import SparkContext  
  
sc = SparkContext("local", "SimpleWordCount")  
  
rdd = sc.textFile("text1.txt")  
  
counts = (rdd.flatMap(lambda line: line.split())  
          .map(lambda word: (word.lower(), 1))  
          .reduceByKey(lambda a, b: a + b)  
          .filter(lambda x: x[1] > 4))  
  
for word, count in counts.collect():  
    print(word, count)  
  
sc.stop()
```

Spark Shell Execution Screenshots

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

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

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

```
bmscecse@bmscecse-HP-Elite-Tower-600-G9-Desktop-PC:~/pyspark-wordcount$ python3 wordcount.py
25/05/20 11:41:52 WARN Utils: Your hostname, bmscecse-HP-Elite-Tower-600-G9-Desktop-PC resolves to a loopback
25/05/20 11:41:52 WARN Utils: Set SPARK_LOCAL_IP if you need to bind to another address
WARNING: An illegal reflective access operation has occurred
WARNING: Illegal reflective access by org.apache.spark.unsafe.Platform (file:/opt/spark/jars/spark-unsafe_2.12-3.5.5.jar)
WARNING: Please consider reporting this to the maintainers of org.apache.spark.unsafe.Platform
WARNING: Use --illegal-access=warn to enable warnings of further illegal reflective access operations
WARNING: All illegal access operations will be denied in a future release
25/05/20 11:41:52 WARN NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin
Using Spark's default log4j profile: org/apache/spark/log4j-defaults.properties
Setting default log level to "WARN".
To adjust logging level use sc.setLogLevel(newLevel). For SparkR, use setLogLevel(newLevel).
scala 4
```

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

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

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

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

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

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

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

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

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

Installation of Natural Language Toolkit (nltk)

```

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

```

```

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

```

Executing the streaming_cleaner.py

```

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

```

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

```

-----
Time: 2025-05-20 12:05:55
-----
spark powerful fast big data processing
-----
Time: 2025-05-20 12:06:00

```

Output- cleaned data