VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"JnanaSangama", Belgaum -590014, Karnataka.

LAB REPORT
on

BIG DATAANALYTICS
(20CS6PEBDA)

Submitted by

Pranav Kumar (1BM19CS114)

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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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 DATAANALYTICS** " carried out by **Pranav Kumar (1BM19CS114),** who is bonafide student of **B. M. S. College of Engineering.** It is in partial fulfillment for the award of **Bachelor of Engineering in Computer Science and Engineering** of the Visvesvaraya Technological University, Belgaum during the year 2022. The Lab report has been approved as it satisfies the academic requirements in respect of a **BIG DATA ANALYTICS - (20CS6PEBDA)** work prescribed for the said degree.

Antara Roy Choudhury
Assistant Professor
Department of CSE
BMSCE, Bengaluru

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

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Course Outcome

CO1	Apply the concept of NoSQL, Hadoop or Spark for a given task.
CO2	Analyze the Big Data and obtain insight using data analytics mechanisms.
CO3	Design and implement Big data applications by applying NoSQL, Hadoop or Spark.

LAB PROGRAM 1: MongoDB- CRUD Demonstration

1) Using MongoDB

i) Create a database for Students and Create a Student Collection (_id,Name, USN,

Semester, Dept_Name, CGPA, Hobbies(Set)).

```
use myDB;
db.createCollection("Student");
```

ii) Insert required documents to the collection.

```
> db.Student.insert({_id:1,Name: "Pranav", sem:"VI",dept: "CSE",CGPA: 8.2,hobbies: ['cycling']});
WriteResult({ "nInserted" : 1 })

> db.Student.insert({_id:2,Name: "Anurag", sem:"VII",dept: "ECE",CGPA: 6.8,hobbies: ["Biking"]});
WriteResult({ "nInserted" : 1 })

> db.Student.insert({_id:3,Name: "Saurab", sem:"VI",dept:"Architecture",CGPA: 8.8,hobbies: ['Gaming']});
WriteResult({ "nInserted" : 1 })

> db.Student.insert({_id:4,Name: "Prateek", sem:"V",dept: "ISE",CGPA: 9.1,hobbies: ["Badminton"]});
WriteResult({ "nInserted" : 1 })
```

```
> db.Student.insert({_id:1,Name: "Pranav", sem:"VI",dept: "CSE",CGPA: 8.2,hobbies: ['cycling']});
WriteResult({ "nInserted" : 1 })
> db.Student.insert({_id:2,Name: "Anurag", sem:"VII",dept: "ECE",CGPA: 6.8,hobbies: ["Biking"]});
WriteResult({ "nInserted" : 1 })
> db.Student.insert({_id:3,Name: "Saurab", sem:"VI",dept:"Architecture",CGPA: 8.8,hobbies: ['Gaming']});
WriteResult({ "nInserted" : 1 })
> db.Student.insert({_id:4,Name: "Prateek", sem:"V",dept: "ISE",CGPA: 9.1,hobbies: ["Badminton"]});
WriteResult({ "nInserted" : 1 })
> db.Student.find()
{ "_id" : 1, "Name" : "Pranav", "sem" : "VI", "dept" : "CSE", "CGPA" : 8.2, "hobbies" : [ "cycling" ] }
{ "_id" : 2, "Name" : "Anurag", "sem" : "VII", "dept" : "ECE", "CGPA" : 6.8, "hobbies" : [ "Biking" ] }
{ "_id" : 3, "Name" : "Saurab", "sem" : "VI", "dept" : "Architecture", "CGPA" : 8.8, "hobbies" : [ "Gaming" ] }
{ "_id" : 4, "Name" : "Prateek", "sem" : "V", "dept" : "ISE", "CGPA" : 9.1, "hobbies" : [ "Badminton" ] }
>
```

iii) First Filter on “Dept_Name:CSE” and then group it on “Semester” and compute the Average CPGA for that semester and filter those documents where the “Avg_CPGA” is greater than 7.5.

>db.Student.aggregate({$match:{dept:"CSE"}},{$group:{_id:"$sem",AverageCGPA:{$avg:"$CGPA"}}},{$matc h:{AverageCGPA:{$gt:7.5}}});

```
> db.Student.aggregate({$match:{dept:"CSE"}},{$group:{_id:"$sem",AverageCGPA:{$avg:"$CGPA"}}},{$match:{AverageCGPA:{$gt:7.5}}});
{ "_id" : "VI", "AverageCGPA" : 8.2 }
>
```

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

>db.Student.update({_id:5},{$set:{"hobbies":"Cricket"}},{$upsert:true});

```
> db.Student.update({_id:5},{$set:{"hobbies":"Cricket"}},{$upsert:true});
WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })
> db.Student.find({_id:5});
{ "_id" : 5, "Name" : "Bhuvan", "sem" : "VI", "dept" : "CSE", "CGPA" : 9.5, "hobbies" : "Cricket" }
>
```

v)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({},{_id:0,"Name":1,"sem":1});

```
> db.Student.find({},{_id:0,"Name":1,"sem":1});
{ "Name" : "Pranav", "sem" : "VI" }
{ "Name" : "Anurag", "sem" : "VII" }
{ "Name" : "Saurab", "sem" : "VI" }
{ "Name" : "Prateek", "sem" : "V" }
{ "Name" : "Bhuvan", "sem" : "VI" }
```

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

> db.Student.find({"sem":"VII"});

```
> db.Student.find({"sem":"VII"});
{ "_id" : 2, "Name" : "Anurag", "sem" : "VII", "dept" : "ECE", "CGPA" : 6.8, "hobbies" : [ "Biking" ] }
>
```

vii)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:["Badminton","Gaming"]}});

```
> db.Student.find({"hobbies":{$in:["Badminton","Gaming"]}});
{ "_id" : 3, "Name" : "Saurab", "sem" : "VI", "dept" : "Architecture", "CGPA" : 8.8, "hobbies" : [ "Gaming" ] }
{ "_id" : 4, "Name" : "Prateek", "sem" : "V", "dept" : "ISE", "CGPA" : 9.1, "hobbies" : [ "Badminton" ] }
{ "_id" : 5, "Name" : "Bhuvan", "sem" : "VI", "dept" : "CSE", "CGPA" : 9.5, "hobbies" : [ "Cricket", "Badminton" ] }
```

viii)To find documents from the Students collection where the StudName begins with "B" .

> db.Student.find({"Name":/^A/});

```
> db.Student.find({"Name":/^A/});
{ "_id" : 2, "Name" : "Anurag", "sem" : "VII", "dept" : "ECE", "CGPA" : 6.8, "hobbies" : [ "Biking" ] }
```

ix) To find the number of documents in the Students collection.

> db.Student.count();

```
> db.Student.count();
5
```

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

> db.Student.find().sort({"Name":-1});

```
> db.Student.find().sort({"Name":-1});
{ "_id" : 3, "Name" : "Saurab", "sem" : "VI", "dept" : "Architecture", "CGPA" : 8.8, "hobbies" : [ "Gaming" ] }
{ "_id" : 4, "Name" : "Prateek", "sem" : "V", "dept" : "ISE", "CGPA" : 9.1, "hobbies" : [ "Badminton" ] }
{ "_id" : 1, "Name" : "Pranav", "sem" : "VI", "dept" : "CSE", "CGPA" : 8.2, "hobbies" : [ "cycling" ] }
{ "_id" : 5, "Name" : "Bhuvan", "sem" : "VI", "dept" : "CSE", "CGPA" : 9.5, "hobbies" : [ "Cricket", "Badminton" ] }
{ "_id" : 2, "Name" : "Anurag", "sem" : "VII", "dept" : "ECE", "CGPA" : 6.8, "hobbies" : [ "Biking" ] }
```

xi) Command used to export MongoDB JSON documents from “Student” Collection into the “Students” database into a CSV file “Output.txt”

> mongoexport --host localhost --db Student --collection Student --csv --out /Downloads/student.txt -fields "Name","sem";

```
> mongoexport --host localhost --db Student --collection Student --csv --out /Downloads/student.txt -fields "Name","sem";
uncaught exception: SyntaxError: unexpected token: identifier :
@(shell):1:14
```

LAB PROGRAM 2: Employee database using Cassandra

Program 1. Perform the following DB operations using Cassandra.

1. Create a key space by name Employee

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

```
bmsce@bmsce-Precision-T1700:~/cassandra/apache-cassandra-3.11.0/bin$ cqlsh
Connected to Test Cluster at 127.0.0.1:9042.
[cqlsh 5.0.1 | Cassandra 3.11.4 | CQL spec 3.4.4 | Native protocol v4]
Use HELP for help.
```

cqlsh> use Employee; cqlsh:employee> describe keyspaces;

students system_auth system_distributed system_traces system_schema system employee

```
cqlsh> describe keyspace employee;

CREATE KEYSPACE employee WITH replication = {'class': 'SimpleStrategy', 'replication_factor': '1'}  AND durable_writes = true;
```

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

cqlsh:employee> CREATE TABLE Employee_Info(... emp_id int PRIMARY KEY, ... emp_name text, ... designation text, ... date_of_joining timestamp, ... salary double, ... dept_name text ...);

cqlsh:employee> describe tables

employee_info

```
cqlsh:employee> describe table employee_info

CREATE TABLE employee.employee_info (
    emp_id int PRIMARY KEY,
    date_of_joining timestamp,
    dept_name text,
    designation text,
    emp_name text,
    salary double
) WITH additional_write_policy = '99p'
    AND bloom_filter_fp_chance = 0.01
    AND caching = {'keys': 'ALL', 'rows_per_partition': 'NONE'}
    AND cdc = false
    AND comment = ''
    AND compaction = {'class': 'org.apache.cassandra.db.compaction.SizeTieredCompactionStrategy', 'max_threshold': '32', 'min_threshold': '4'}
    AND compression = {'chunk_length_in_kb': '16', 'class': 'org.apache.cassandra.io.compress.LZ4Compressor'}
    AND crc_check_chance = 1.0
    AND default_time_to_live = 0
    AND extensions = {}
    AND gc_grace_seconds = 864000
    AND max_index_interval = 2048
    AND memtable_flush_period_in_ms = 0
    AND min_index_interval = 128
    AND read_repair = 'BLOCKING'
    AND speculative_retry = '99p';
```

3. Insert the values into the table in batch cqlsh:employee>BEGIN BATCH

cqlsh:employees> BEGIN BATCH

... INSERT INTO

... employee_info(emp_id,emp_name,designation,date_of_joining,salary,dept_name)

... values(124,'Pranav','Manager','2000-09-24',750000,'Export')

... employee_info(emp_id,emp_name,designation,date_of_joining,salary,dept_name)

... values(125,'Anurag','AsstManager','2000-01-04',550000,'Export')

... employee_info(emp_id,emp_name,designation,date_of_joining,salary,dept_name)

... values(126,'Prateek','HR','2000-05-04',650000,'HR')

... APPLY BATCH;

cqlsh:employee> select * from employee_info;

```
 emp_id | date_of_joining                 | dept_name | designation | emp_name  | salary
--------+---------------------------------+-----------+-------------+-----------+---------
    125 | 2000-01-03 18:30:00.000000+0000 |    Export | AsstManager |    Anurag | 5.5e+05
    126 | 2000-05-03 18:30:00.000000+0000 |        HR |          HR |    Prateek | 6.5e+05
    124 | 2000-09-23 18:30:00.000000+0000 |    Export |     Manager | Pranav | 7.5e+05
```

4. Update Employee name and Department of Emp-Id 125

cqlsh:employees> update employee_info set dept_name='import' where emp_id=125;

cqlsh:employees> SELECT* FROM employee_info;

```
 emp_id | date_of_joining                 | dept_name | designation | emp_name  | salary
--------+---------------------------------+-----------+-------------+-----------+---------
    125 | 2000-01-03 18:30:00.000000+0000 |    import | AsstManager |    Saurab | 5.5e+05
    126 | 2000-05-03 18:30:00.000000+0000 |        HR |          HR |    Prateek | 6.5e+05
    124 | 2000-09-23 18:30:00.000000+0000 |    Export |     Manager | Pranav | 7.5e+05
```

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

cqlsh:employee> alter table employee_info ... add project text; cqlsh:employee> select * from employee_info;

cqlsh:employees> ALTER TABLE employee_info add project set<text>;

cqlsh:employees> SELECT* FROM employee_info;

```
 emp_id | date_of_joining                 | dept_name | designation | emp_name  | project | salary
--------+---------------------------------+-----------+-------------+-----------+---------+---------
    125 | 2000-01-03 18:30:00.000000+0000 |    import | AsstManager |    Saurab | null | 5.5e+05
    126 | 2000-05-03 18:30:00.000000+0000 |        HR |          HR |    Prateek |    null | 6.5e+05
    124 | 2000-09-23 18:30:00.000000+0000 |    Export |     Manager | Pranav | null | 7.5e+05
```

7. Update the altered table to add project names.

cqlsh:employees> update employee_info set project={'pro4555','pro2566'} where emp_id=126;

cqlsh:employees> update employee_info set project={'pro45','pro25'} where emp_id=124;

cqlsh:employees> update employee_info set project={'pro1','pro2'} where emp_id=125;

cqlsh:employees> SELECT* FROM employee_info;

```
 emp_id | date_of_joining                 | dept_name | designation | emp_name  | project              | salary
```

--------+-------------------------------+----------+------------+----------+----------------------+---------

125 | 2000-01-03 18:30:00.000000+0000 | import | AsstManager | Saurab | {'pro1', 'pro2'} | 5.5e+05

126 | 2000-05-03 18:30:00.000000+0000 | HR | HR | Prateek | {'pro2566', 'pro4555'} | 6.5e+05

124 | 2000-09-23 18:30:00.000000+0000 | Export | Manager | Pranav | {'pro25', 'pro45'} | 7.5e+05

LAB PROGRAM 3: Library database using Cassandra

1 Create a key space by name Library

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

cqlsh> use libraries;
```

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:libraries> CREATE TABLE liberary_info(Stud_id int, Stud_name text,
Book_name text, Book_id int, Date_of_issue timestamp, counter_value counter,
PRIMARY KEY(Stud_id,Stud_name,Book_name,Book_id,Date_of_issue));
```

3. Insert the values into the table in batch cqlsh:library

```
cqlsh:libraries>  UPDATE liberary_info SET counter_value = counter_value + 1
WHERE Stud_id = 123 AND Stud_name = 'Anurag' AND Book_name = 'BDA' AND
Book_id = 455 AND Date_of_issue = '2000-09-24';

cqlsh:libraries>  UPDATE liberary_info SET counter_value = counter_value + 1
WHERE Stud_id = 123 AND Stud_name = 'Pranav' AND Book_name = 'ADS' AND
Book_id = 45 AND Date_of_issue = '2003-05-04';

cqlsh:libraries>  UPDATE liberary_info SET counter_value = counter_value + 1
WHERE Stud_id = 123 AND Stud_name = 'Saurab' AND Book_name = 'CHY' AND
Book_id = 245 AND Date_of_issue = '2003-05-07';

cqlsh:libraries>  UPDATE liberary_info SET counter_value = counter_value + 1
WHERE Stud_id = 123 AND Stud_name = 'Prateek' AND Book_name = 'CNS' AND
Book_id = 25 AND Date_of_issue = '2003-05-09';cqlsh:libraries> select* from
liberary_info;
```

```
 stud_id | stud_name | book_name | book_id | date_of_issue                | counter_value
---------+-----------+-----------+---------+---------------------------------+--------------
     123 |   Pranav |       ADS |      45 | 2003-05-03 18:30:00.000000+0000 |           1
     123 |    Anurag |       BDA |     455 | 2000-09-23 18:30:00.000000+0000 |           1
     123 |    Saurab |       CHY |     245 | 2003-05-06 18:30:00.000000+0000 |           1
     123 |    Prateek |       CNS |      25 | 2003-05-08 18:30:00.000000+0000 |           1


(4 rows)
```

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

```
cqlsh:libraries>  UPDATE liberary_info SET counter_value = counter_value + 1 WHERE Stud_id = 123 AND Stud_name = 'Prateek' AND Book_name = 'CNS' AND Book_id = 25 AND Date_of_issue = '2003-05-09';

cqlsh:libraries> select* from liberary_info;


 stud_id | stud_name | book_name | book_id | date_of_issue                | counter_value
---------+-----------+-----------+---------+---------------------------------+--------------
     123 |   Pranav |       ADS |      45 | 2003-05-03 18:30:00.000000+0000 |           1
     123 |    Anurag |       BDA |     455 | 2000-09-23 18:30:00.000000+0000 |           1
     123 |    Saurab |       CHY |     245 | 2003-05-06 18:30:00.000000+0000 |           1
```

123 | Prateek | CNS | 25 | 2003-05-08 18:30:00.000000+0000 |
2

(4 rows)

5. Write a query to show that a student with id 1 has taken a book “BDA” 2 times.

cqlsh:libraries> UPDATE liberary_info SET counter_value = counter_value + 1 WHERE Stud_id = 123 AND Stud_name = 'Anurag' AND Book_name = 'BDA' AND Book_id = 455 AND Date_of_issue = '2000-09-24';

cqlsh:libraries> select* from liberary_info;

stud_id | stud_name | book_name | book_id | date_of_issue | counter_value

---------+-----------+-----------+---------+---------------------------------+---------------

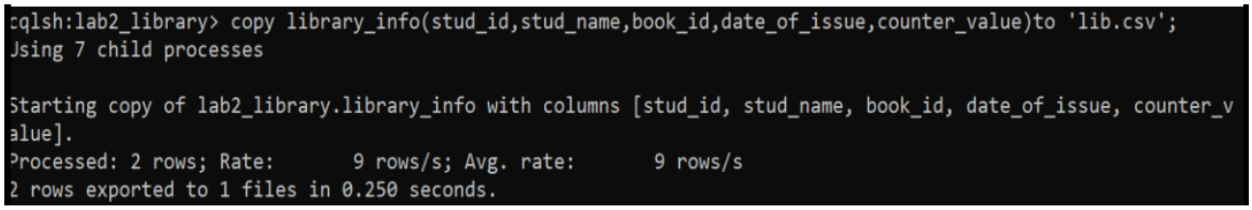
123 | Pranav | ADS | 45 | 2003-05-03 18:30:00.000000+0000 | 1

123 | Anurag | BDA | 455 | 2000-09-23 18:30:00.000000+0000 |
2

123 | Saurab | CHY | 245 | 2003-05-06 18:30:00.000000+0000 |
1

123 | Prateek | CNS | 25 | 2003-05-08 18:30:00.000000+0000 |
2

6. Export the created column to a csv file



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

cqlsh:library>truncate library_info; cqlsh:library>copy library_info(stud_id,stud_name,book_id,date_of_issue,counter_value) from 'lib.csv';