

VISVESVARAYA TECHNOLOGICAL UNIVERSITY

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LAB REPORT on

Big Data Analytics(23CS6PCBDA)

Submitted by

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in partial fulfillment for the award of the degree of
BACHELOR OF ENGINEERING
in
COMPUTER SCIENCE AND ENGINEERING



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CERTIFICATE

This is to certify that the Lab work entitled "**Big Data Analytics(23CS6PCBDA)**" carried out by **Prabhanjan Bhat(1BM22CS196)**, 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 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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Course Outcome

CO1	Apply the concept of NoSQL, Hadoop or Spark for a given task
CO2	Analyse big data analytics mechanisms that can be applied to obtain solution for a given problem.
CO3	Design and implement solutions using data analytics mechanisms for a given problem.

Lab 1: MongoDB- CRUD Demonstration

Question: Perform basic CRUD (Create, Read, Update, Delete) operations in MongoDB.

Code with Output:

```
Atlas atlas-wanmtx-shard-0 [primary] Student> use Students
switched to db Students
Atlas atlas-wanmtx-shard-0 [primary] Students> show collections

Atlas atlas-wanmtx-shard-0 [primary] Students> db.students.insertMany([
...   { "Rollno": 10, "Name": "John", "Age": 20, "ContactNo": "1234567890", "Email-Id": "john@example.com", "grade": "A", "hobby": "Reading" },
...   { "Rollno": 11, "Name": "Alice", "Age": 21, "ContactNo": "9876543210", "Email-Id": "alice@example.com", "grade": "B", "hobby": "Painting" },
...   { "Rollno": 12, "Name": "Bob", "Age": 22, "ContactNo": "2345678901", "Email-Id": "bob@example.com", "grade": "C", "hobby": "Cooking" },
...   { "Rollno": 13, "Name": "Eve", "Age": 23, "ContactNo": "3456789012", "Email-Id": "eve@example.com", "grade": "A" },
...   { "Rollno": 14, "Name": "Charlie", "Age": 24, "ContactNo": "4567890123", "Email-Id": "charlie@example.com", "hobby": "Gardening" }
... ])
{
  acknowledged: true,
  insertedIds: {
    '0': ObjectId("661ce9dc76a00ff8cc51dae1"),
    '1': ObjectId("661ce9dc76a00ff8cc51dae2"),
    '2': ObjectId("661ce9dc76a00ff8cc51dae3"),
    '3': ObjectId("661ce9dc76a00ff8cc51dae4"),
    '4': ObjectId("661ce9dc76a00ff8cc51dae5")
  }
}
```

1. Write query to update Email-Id of a student with rollno 10.

```
db.students.updateOne(
  { "Rollno": 10 },
  { $set: { "Email-Id": "john.doe@example.com" } }
)

Atlas atlas-wanmtx-shard-0 [primary] Students> db.students.updateOne(
...   { "Rollno": 10 },
...   { $set: { "Email-Id": "john.doe@example.com" } }
...
{
  acknowledged: true,
  insertedId: null,
  matchedCount: 1,
  modifiedCount: 1,
  upsertedCount: 0
}
```

2. Replace the student name from “Alice” to “Alicee” of rollno 11

```
db.students.updateOne(
  { "Rollno": 11 },
```

```

{ $set: { "Name": "Alicee" } }

)

Atlas atlas-wanmtx-shard-0 [primary] Students> db.students.updateOne(
...   { "Rollno": 11 },
...   { $set: { "Name": "Alicee" } }
... )
{
  acknowledged: true,
  insertedId: null,
  matchedCount: 1,
  modifiedCount: 1,
  upsertedCount: 0
}

```

3. Display Student Name and grade(Add if grade is not present)where the _id column is 1.

```
db.students.find({}, { "Name": 1, "grade": { $ifNull: ["$grade", "Not available"] }, "_id": 0 })
```

```

Atlas atlas-wanmtx-shard-0 [primary] Students> db.students.find({}, { "Name": 1, "grade": 
{ $ifNull: ["$grade", "Not available"] }, "_id": 0 })
[
  { Name: 'John', grade: 'A' },
  { Name: 'Alicee', grade: 'B' },
  { Name: 'Bob', grade: 'C' },
  { Name: 'Eve', grade: 'A' },
  { Name: 'Charlie', grade: 'Not available' }
]

```

4. Update to add hobbies

```

db.students.updateMany(
  { "Name": "Eve" },
  { $set: { "hobby": "Dancing" } }
)

```

```

Atlas atlas-wanmtx-shard-0 [primary] Students> db.students.updateMany(
...   { "Name": "Eve" },
...   { $set: { "hobby": "Dancing" } }
... )
{
  acknowledged: true,
  insertedId: null,
  matchedCount: 1,
  modifiedCount: 1,
  upsertedCount: 0
}

```

5. Find documents where hobbies is set neither to Chess nor to Skating

```
db.students.find({ "hobby": { $nin: ["Chess", "Skating"] } })
```

```
Atlas atlas-wanmtx-shard-0 [primary] Students> db.students.find({ "hobby": { $nin: ["Chess", "Skating"] } })
[
  {
    _id: ObjectId("661ce9dc76a00ff8cc51dae1"),
    Rollno: 10,
    Name: 'John',
    Age: 20,
    ContactNo: '1234567890',
    'Email-Id': 'john.doe@example.com',
    grade: 'A',
    hobby: 'Reading'
  },
  {
    _id: ObjectId("661ce9dc76a00ff8cc51dae2"),
    Rollno: 11,
    Name: 'Alicee',
    Age: 21,
    ContactNo: '9876543210',
    'Email-Id': 'alice@example.com',
    grade: 'B',
    hobby: 'Painting'
  },
  {
    _id: ObjectId("661ce9dc76a00ff8cc51dae3"),
    Rollno: 12,
    Name: 'Bob',
    Age: 22,
    ContactNo: '2345678901',
    'Email-Id': 'bob@example.com',
    grade: 'C',
    hobby: 'Cooking'
  }
]
```

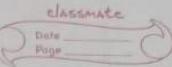
6. Find documents whose name begins with A

```
db.students.find({ "Name": /^A/ })
```

```
Atlas atlas-wanmtx-shard-0 [primary] Students> db.students.find({ "Name": /^A/ })
[
  {
    _id: ObjectId("661ce9dc76a00ff8cc51dae2"),
    Rollno: 11,
    Name: 'Alicee',
    Age: 21,
    ContactNo: '9876543210',
    'Email-Id': 'alice@example.com',
    grade: 'B',
    hobby: 'Painting'
  }
]
```

Lab-1

Working with MONGODB



- I. use myDB;
Confirm the existence of your database
db;
- To list all databases
show dbs;

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

db.createCollection("student");
To create a collection by the name "Student"

db.Student.drop();
To drop a collection by the name "Student"

db.Student.insert({ _id: 1, StudName: "Michelle", Grade: "VII", Hobbies: "Internetsurfing" })

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

db.Student.find({ StudName: "AryanDavid" })

db.Student.find({ StudName: "AryanDavid" })

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

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

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

<pre>db.Student.count()</pre>	IX to set a particular field value to null <pre>db.Students.update({ _id: 3 }, { \$set: { Location: null } })</pre>
X Count the number of documents in Student Collections <pre>db.Students.count()</pre>	X Count the number of documents in Student Collections <pre>db.Students.count({ \$grade: "VII" })</pre>
XI Aggregate Function: <pre>db.Customers.aggregate({ \$group: { _id: "FaciID", TotAcBal: { \$sum: "\$AcBal" } } })</pre>	XI Count the number of documents in Student Collections with grade : VII <pre>db.Students.count({ \$grade: "VII" })</pre>
VI Save Method: <pre>db.Students.save({ StudName: "Vamsi", Grade: "VI" })</pre>	XII Create a collection Customers with fields custID, AcBal, <pre>db.Customers.aggregate({ \$group: { _id: "FaciID", TotAcBal: { \$sum: "\$AcBal" } } })</pre>
VII Add a new field to existing Document <pre>db.Students.update({ _id: 4 }, { \$set: { Location: "Network" } })</pre>	XIII Remove the field in an existing Document <pre>db.Student.find({ _id: 13 }, { StudName: 1, Grade: 1, _id: 0 })</pre>
VIII To find those documents where the Grade is not set to 'VII' <pre>To find documents from the Students collection where the StudName ends with S. db.Student.find({ StudName: /s\$/ }).pretty();</pre>	XIV 880 113125 db.Customers.aggregate({ \$match: { AcType: "S" } }, { \$group: { _id: "FaciID", TotAcBal: { \$sum: "\$AcBal" } } }, { \$match: { TotAcBal: { \$gt: 1000 } } })

Lab 2: Cassandra

Question: Perform the following DB operations using Cassandra.

1. Create a keyspace by name Employee
2. Create a column family by name Employee-Info with attributes Emp_Id Primary Key, Emp_Name, Designation, Date_of_Joining, Salary, Dept_Name
3. Insert the values into the table in batch
4. Update Employee name and Department of Emp-Id 121
5. Sort the details of Employee records based on salary
6. Alter the schema of the table Employee_Info to add a column Projects which stores a set of Projects done by the corresponding Employee.
7. Update the altered table to add project names.
8. Create a TTL of 15 seconds to display the values of Employees.

Code with Output:

```
cqlsh> CREATE KEYSPACE Employee WITH REPLICATION = { 'class' : 'SimpleStrategy', 'replication_factor' : 1 };
cqlsh> CREATE TABLE Employee.Employee_Info (
...     Emp_Id int,
...     Salary DECIMAL,
...     Emp_Name TEXT,
...     Designation TEXT,
...     Date_of_Joining DATE,
...     Dept_Name TEXT,
...     PRIMARY KEY (Emp_Id, Salary)
... ) WITH CLUSTERING ORDER BY (Salary ASC);
cqlsh> BEGIN BATCH
...     INSERT INTO Employee.Employee_Info (Emp_Id, Salary, Emp_Name, Designation, Date_of_Joining, Dept_Name) VALUES (121, 60000, 'John Doe', 'Developer', '2023-01-15
', 'IT');
...     INSERT INTO Employee.Employee_Info (Emp_Id, Salary, Emp_Name, Designation, Date_of_Joining, Dept_Name) VALUES (122, 80000, 'Jane Smith', 'Manager', '2022-05-20
', 'HR');
...     INSERT INTO Employee.Employee_Info (Emp_Id, Salary, Emp_Name, Designation, Date_of_Joining, Dept_Name) VALUES (123, 55000, 'Alice Johnson', 'Analyst', '2021-11-10
', 'Finance');
...     APPLY BATCH;
cqlsh> UPDATE Employee.Employee_Info SET Emp_Name = 'Johnathan Doe', Dept_Name = 'Engineering' WHERE Emp_Id = 121 AND Salary = 60000;
cqlsh> SELECT * FROM Employee.Employee_Info WHERE Emp_Id = 121 ORDER BY Salary;
+-----+-----+-----+-----+-----+
| emp_id | salary | date_of_joining | dept_name | designation | emp_name |
+-----+-----+-----+-----+-----+
| 121 | 60000 | 2023-01-15 | Engineering | Developer | Johnathan Doe |
+-----+-----+-----+-----+-----+
(1 rows)
cqlsh> ALTER TABLE Employee.Employee_Info ADD Projects SET<TEXT>;
cqlsh> UPDATE Employee.Employee_Info SET Projects = {'Project A', 'Project B'} WHERE Emp_Id = 121 AND Salary = 60000;
cqlsh> INSERT INTO Employee.Employee_Info (Emp_Id, Salary, Emp_Name, Designation, Date_of_Joining, Dept_Name) VALUES (124, 30000, 'Temp Employee', 'Intern', '2023-10-01
', 'Temp Dept') USING TTL 15;
cqlsh> SELECT * FROM Employee.Employee_Info;
+-----+-----+-----+-----+-----+-----+-----+
| emp_id | salary | date_of_joining | dept_name | designation | emp_name | projects |
+-----+-----+-----+-----+-----+-----+-----+
| 123 | 55000 | 2021-11-10 | Finance | Analyst | Alice Johnson | null |
| 122 | 80000 | 2022-05-20 | HR | Manager | Jane Smith | null |
| 121 | 60000 | 2023-01-15 | Engineering | Developer | Johnathan Doe | {'Project A', 'Project B'} |
+-----+-----+-----+-----+-----+-----+-----+
(3 rows)
cqlsh> □
```

Lab-2

MongoDB exercise

1. Create a collection named `Customers` with the specified attributes (`Cust_id`, `Acc_Bal`, `Acc_Type`):

use myDB;

```
db.createCollection("Customers");
```

2. Insert at least 5 records into the `Customers` collection:

```
db.Customers.insertMany [
```

```
    { "Cust_id": 1, "Acc_Bal": 1500, "Acc_Type": "Z" },  
    { "Cust_id": 2, "Acc_Bal": 1200, "Acc_Type": "Z" },  
    { "Cust_id": 3, "Acc_Bal": 1300, "Acc_Type": "X" },  
    { "Cust_id": 4, "Acc_Bal": 800, "Acc_Type": "Z" },  
    { "Cust_id": 5, "Acc_Bal": 2000, "Acc_Type": "Z" }
```

],

3. Write a query to display records where the total account balance is greater than 1200 for account type Z for each Cust_id:

```
db.Customers.find( {
```

```
    "Acc_Bal": { $gt: 1200 },  
    "Acc_Type": "Z"  
},
```

),

4. Determine Minimum and Maximum account balance for each Cust_id:

```
db.Customers.aggregate( [
```

```
    { $group: {  
        _id: { $Cust_id: 1,  
               min_balance: { $min: "$Acc_Bal" },  
               max_balance: { $max: "$Acc_Bal" }  
            }  
    } ] ).
```

Output: [{
 _id: 3, min_balance: 1300, max_balance: 2000
},

{
 _id: 1, min_balance: 1500, max_balance: 1500
},

{
 _id: 2, min_balance: 1200, max_balance: 1200
},

{
 _id: 5, min_balance: 2000, max_balance: 2000
},

{
 _id: 4, min_balance: 800, max_balance: 800
},

]

IV

Create the Products collection

use ecommerce;

```
db.createCollection("Products");
```

```
db.Products.insertMany [
```

```
    { product_id: "prod123",  
      name: "Smartphone",  
      category: "Electronics",  
      price: 499,  
      quantity: 50  
},
```

],

1. product_id: "prod124",
 name: "Laptop",
 category: "Electronics",
 price: 899,
 quantity: 30

2. product_id: "prod125",
 name: "Headphones",
 category: "Electronics",
 price: 39,
 quantity: 100

3. Create the Orders Collection
 db.createCollection("Orders")

db.Orders.insertMany([
 { user_id: "123abc",
 products: [
 { product_id: "prod123", quantity: 2, price: 499},
 { product_id: "prod125", quantity: 1, price: 799}],
 total_price: 1079,
 status: "Placed",
 order_date: ISODate("2023-3-11T15:00:00Z")}]

1. Create Carts Collection:
 db.createCollection("Carts");

db.Carts.insertMany([
 { user_id: "789ghi",
 products: [
 { product_id: "prod123", quantity: 2},
 { product_id: "prod124", quantity: 1}],
 user_id: "456xyz",
 products: [
 { product_id: "prod124", quantity: 1},
 { product_id: "prod125", quantity: 3}]]

2. Retrieved All Products
 db.Products.find({})

3. Retrieved Products in a specific Category
 db.Products.find({category: "Electronics"})

4. Retrieved Products with Quantity Greater Than 0
 db.Products.find({quantity: {\$gt: 0}})

5. Retrieved Products Sorted by Price in Ascending Order
 db.Products.find({}).sort({price: 1})

6. Retrieved Products with Price Less Than or Equal to \$100
 db.Products.find({price: {\$le: 100}})

6. Retrieve orders placed by a user (User ID with "123abc")
 db.Orders.find({user_id: "123abc"});

7. Retrieve total Price of Orders Placed by a User (User with ID: "123abc")
 db.Orders.aggregate([{\$match: {user_id: "123abc"}}, {\$group: {_id: "\$user_id", total_order_price: {\$sum: "\$orders.total_price"}}}]);

Aggregation Queries

1. db.products.aggregate([{\$group: {_id: "\$category", total_products: {\$sum: 1}}}]

2. db.products.aggregate([{\$group: {_id: "\$category", total_price: {\$sum: {\$multiple: [{\$price}, {"\$sum": 1}]}}, quantity: {\$sum: 1}}}]

Solved

Lab 3: Cassandra

Question: Perform the following DB operations using Cassandra.

1. Create a keyspace by name Library
2. Create a column family by name Library-Info with attributes Stud_Id Primary Key, Counter_value of type Counter, Stud_Name, Book-Name, Book-Id, Date_of_issue
3. Insert the values into the table in batch
4. Display the details of the table created and increase the value of the counter
5. Write a query to show that a student with id 112 has taken a book “BDA” 2 times.
6. Export the created column to a csv file
7. Import a given csv dataset from local file system into Cassandra column family

Code with Output:

```
cqlsh> CREATE KEYSPACE Library WITH REPLICATION = { 'class' : 'SimpleStrategy', 'replication_factor' : 1 };
cqlsh> CREATE TABLE Library.Library_Info (
...     Stud_Id int,
...     Book_Name TEXT,
...     Book_Id int,
...     Date_of_issue DATE,
...     PRIMARY KEY (Stud_Id, Book_Name, Date_of_issue)
... );
cqlsh> BEGIN BATCH
...     INSERT INTO Library.Library_Info (Stud_Id, Book_Name, Book_Id, Date_of_issue) VALUES (112, 'BDA', 1, '2023-09-01');
...     INSERT INTO Library.Library_Info (Stud_Id, Book_Name, Book_Id, Date_of_issue) VALUES (112, 'BDA', 1, '2023-09-05');
...     INSERT INTO Library.Library_Info (Stud_Id, Book_Name, Book_Id, Date_of_issue) VALUES (113, 'ML', 2, '2023-09-02');
...     INSERT INTO Library.Library_Info (Stud_Id, Book_Name, Book_Id, Date_of_issue) VALUES (114, 'AI', 3, '2023-09-03');
...     INSERT INTO Library.Library_Info (Stud_Id, Book_Name, Book_Id, Date_of_issue) VALUES (115, 'DBMS', 4, '2023-09-04');
...     APPLY BATCH;
cqlsh> SELECT * FROM Library.Library_Info;
stud_id | book_name | date_of_issue | book_id
-----+-----+-----+-----+
  114 |      AI | 2023-09-03 |      3
  113 |      ML | 2023-09-02 |      2
  112 |      BDA | 2023-09-01 |      1
  112 |      BDA | 2023-09-05 |      1
  115 |    DBMS | 2023-09-04 |      4
(5 rows)
cqlsh> SELECT COUNT(*) FROM Library.Library_Info WHERE Stud_Id = 112 AND Book_Name = 'BDA';
count
-----
  2
(1 rows)
```

```

cqlsh> COPY Library.Library_Info TO 'library_info.csv' WITH HEADER = TRUE;
Using 16 child processes

Starting copy of library.library_info with columns [stud_id, book_name, date_of_issue, book_id].
Processed: 5 rows; Rate: 96 rows/s; Avg. rate: 96 rows/s
5 rows exported to 1 files in 0.089 seconds.
cqlsh> COPY Library.Library_Info FROM 'library_info.csv' WITH HEADER = TRUE;
Using 16 child processes

Starting copy of library.library_info with columns [stud_id, book_name, date_of_issue, book_id].
Processed: 5 rows; Rate: 9 rows/s; Avg. rate: 13 rows/s
5 rows imported from 1 files in 0.375 seconds (0 skipped).
cqlsh> 

```

Lab-4

14/25

Create Keyspace:

```
CREATE KEYSPACE Students WITH REPLICATION = 'SimpleStrategy' , 'replication_factor':3;
```

DESCRIBE KEYSPACES;

```
SELECT * FROM system.schema.keyspaces;
```

USE Students;

```
CREATE TABLE Students_Info(Roll_No int PRIMARY KEY, StudName text, DateOfJoining timestamp, last_exam_percent double);
```

DESCRIBE TABLES;

```
DESCRIBE TABLE <table> Students_Info;
```

Insert:

```
BEGIN BATCH
INSERT INTO Students_Info(Roll_No, StudName, DateOfJoining, last_exam_percent)
VALUES (1, 'Asha', '2012-03-12', 79.9)
INSERT INTO Students_Info(Roll_No, StudName, DateOfJoining, last_exam_percent) VALUES(2, 'Smith', '2012-03-12', 90.9)
INSERT INTO Students_Info(Roll_No, StudName, DateOfJoining, last_exam_percent) VALUES(3, 'Smitha', '2012-03-12', 89.9)
APPLY BATCH;
```

(1) SELECT * FROM Students_Info;

(2) SELECT * FROM Students_Info WHERE Roll_No IN (1,2,3),
select * from students_info where Studname='Asha',
CREATE INDEX ON Students_Info (StudName),
select Roll_No, StudName from students_info LIMIT 2,
select Roll_No as "USN" from students_info;
UPDATE Students_Info SET StudName='David Shein'
WHERE RollNo=2;

(1) Output :

roll_no	dateOfjoining	last_exam_percent	Studname
1	2012-03-11 18:30	90.9	Tara

(2)

roll_no	dateOfjoining	last_exam_percent	Studname
2	2012-03-11	90.9	Tara

(3)

roll_no	dateOfjoining	last_exam_percent	Studname
3	2012-03-12 18:30	89.9	Asha

UPDATE Students_Info SET roll_no=6 where rollno=3;

Ans: 11/15

Lab 4: Cassandra

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

Code with Output:

```
hadoop@bmscsecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ cd ./Desktop/
hadoop@bmscsecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ 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 [bmscsecse-HP-Elite-Tower-800-G9-Desktop-PC]
Starting resourcemanager
Starting nodemanagers
hadoop@bmscsecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -mkdir /Lab05
```

```
hadoop@bmscsecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hadoop fs -ls /Hadoop
ls: '/Hadoop': No such file or directory
hadoop@bmscsecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hadoop fs -ls /Lab05
```

```
hadoop@bmscsecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ touch test.txt
hadoop@bmscsecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ nano text.txt
hadoop@bmscsecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -put ./text.txt /Lab05/text.txt
hadoop@bmscsecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hadoop fs -ls /Lab05
Found 1 items
-rw-r--r-- 1 hadoop supergroup 19 2024-05-13 14:33 /Lab05/text.txt
hadoop@bmscsecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -cat /Lab05/text.txt
Hello
How are you?
```

```
hadoop@bmscsecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hadoop fs -ls /Lab05
Found 2 items
-rw-r--r-- 1 hadoop supergroup 15 2024-05-13 14:40 /Lab05/test.txt
-rw-r--r-- 1 hadoop supergroup 19 2024-05-13 14:33 /Lab05/text.txt
hadoop@bmscsecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -getmerge /Lab05 /text.txt /Lab05 /test.txt ../Downloads/Merged.txt
getmerge: '/text.txt': No such file or directory
getmerge: '/test.txt': No such file or directory
hadoop@bmscsecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -getmerge /Lab05/text.txt /Lab05/test.txt ../Downloads/Merged.txt
hadoop@bmscsecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hadoop fs -getfacl /Lab05
# file: /Lab05
# owner: hadoop
# group: supergroup
user::rwx
group::r-x
other::r-x
```

```
hadoop@bmscsecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -copyToLocal /Lab05/text.txt ..//Documents
hadoop@bmscsecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -copyToLocal /Lab05/test.txt ..//Documents
```

```
hadoop@bmscsecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -cat /Lab05/text.txt
Hello
How are you?
hadoop@bmscsecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -mv /Lab05 /test_Lab05
```

```
hadoop@bmscsecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -ls /test_Lab05
Found 2 items
-rw-r--r-- 1 hadoop supergroup 15 2024-05-13 14:40 /test_Lab05/test.txt
-rw-r--r-- 1 hadoop supergroup 19 2024-05-13 14:33 /test_Lab05/text.txt
hadoop@bmscsecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -cp /test_Lab05/ /Lab05
hadoop@bmscsecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -ls /Lab05
Found 2 items
-rw-r--r-- 1 hadoop supergroup 15 2024-05-13 14:51 /Lab05/test.txt
-rw-r--r-- 1 hadoop supergroup 19 2024-05-13 14:51 /Lab05/text.txt
hadoop@bmscsecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -ls /test_Lab05
Found 2 items
-rw-r--r-- 1 hadoop supergroup 15 2024-05-13 14:40 /test_Lab05/test.txt
-rw-r--r-- 1 hadoop supergroup 19 2024-05-13 14:33 /test_Lab05/text.txt
```

Lab 5 Counter in Cassandra

Creating keyspace and table:

- > Create keyspace library with replication = 2 'class': 'SimpleStrategy', 'replication_factor': 1;
- > use library;
- > create table library_info (stud_id int, stud_name text, book_id int, book_name text, counter_val counter, issue_date date, primary key ((stud_id, book_id), stud_name, book_name, issue_date));
- > describe library_info;


```
CREATE TABLE library.library_info(
        stud_id int,
        book_id int,
        stud_name text,
        book_name text,
        issue_date date,
        counter_value counter,
        primary key ((stud_id, book_id), stud_name,
        bookname, issue_date)
      ) with clustering_order_by (stud_name asc,
      book_name asc, issue_date asc)
```

→ Batch insertion using update

- > begin counter batch


```
update library_info set counter_val
      = counter_val + 1 where stud_id = 1 and
      book_id = 1 and stud_name = "S1" and
```

book_name = 'B1' and issue_date = '2024-01-01'

update library_info set counter_val = counter_val - 1
where stud_id = 1 and book_id = 2 and
stud_name = 'S1' and book_name = 'B2' and
issue_date = '2024-01-01'
apply batch;

> select * from library_info;

stud_id	book_id	stud_name	book_name	issue_date	counter_val
1	1	S1	B1	2024-01-01	1
1	2	S1	B2	2024-01-01	0

→ To indicate that student 112 has taken ADA book twice:

> update library_info set counter_val = counter_val - 1
where stud_id = 112 and book_id = 11
and stud_name = 'S112' and book_name = 'ADA'
and issue_date = '2024-01-02'

> select * from library_info;

stud_id	book_id	stud_name	book_name	issue_date	counter_val
1	1	S1	B1	2024-01-01	1
1	2	S1	B2	2024-01-01	1
112	11	S112	ADA	2024-01-02	2

→ Import and Export to CSV

> copy library_info to 'sample.csv'; //Export

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cat sample.csv	
1, 1, S1, B1, 2024-01-01, 1	1.
1, 2, S1, B2, 2024-01-01, 1	
112, 11, S112, BDA, 2024-01-02, 2	
]	
:	
> & truncate library_info;	
> copy library_info from sample 'sample.csv';	2.
> select * from table where stud_id = 112 allow filtering;	3.
1 Stud-id book-id Stud-name Book-name Issue-date Cnterval	
112 11 S112 BDA 2024-01-02 2	
15/4	4

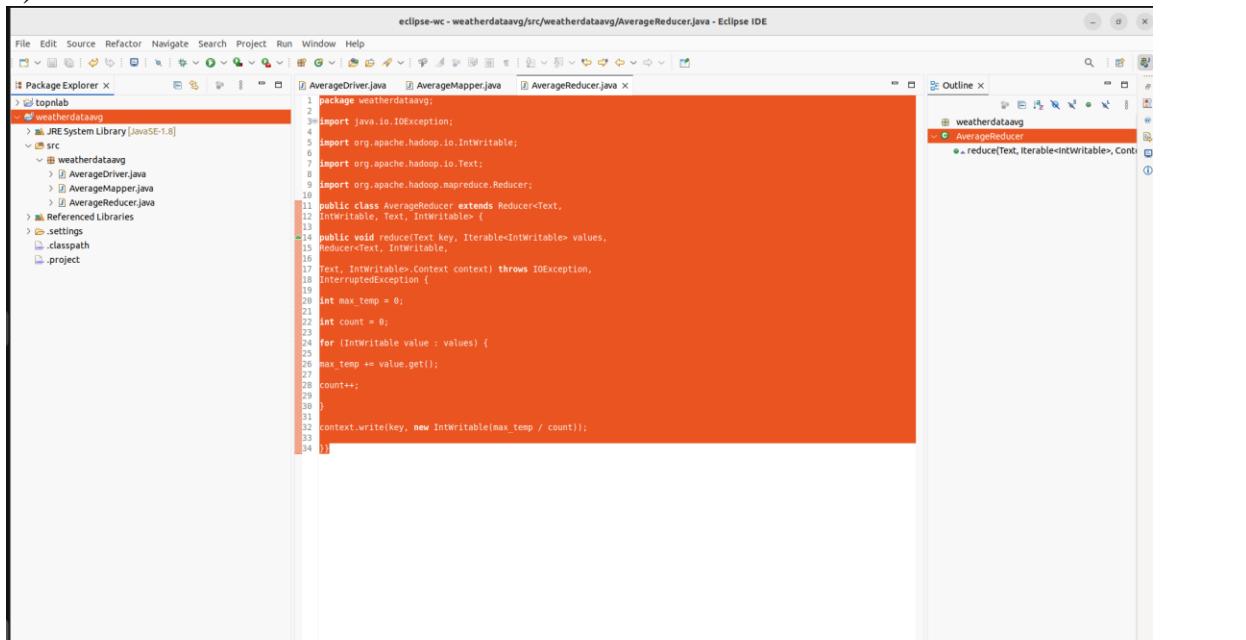
Lab 5: Hadoop

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

- find average temperature for each year from NCDC data set.
- find the mean max temperature for every month

Code with Output:

a)



The screenshot shows the Eclipse IDE interface with the project 'weatherdataavg' selected in the Package Explorer. The AverageReducer.java file is open in the editor. The code implements a MapReduce job to calculate the average temperature for each year. It uses Text objects for keys and IntWritable objects for values. The reduce function iterates over all values for a given key, sums them up, and then divides by the count of values to find the average. The code is annotated with line numbers from 1 to 34.

```
1 package weatherdataavg;
2
3 import java.io.IOException;
4 import org.apache.hadoop.io.IntWritable;
5 import org.apache.hadoop.io.Text;
6 import org.apache.hadoop.mapreduce.Reducer;
7
8 public class AverageReducer extends Reducer<Text, IntWritable, Text, IntWritable> {
9
10    public void reduce(Text key, Iterable<IntWritable> values,
11                      Reducer<Text, IntWritable, Text, IntWritable>.Context context) throws IOException,
12                                      InterruptedException {
13
14        int max_temp = 0;
15
16        int count = 0;
17
18        for (IntWritable value : values) {
19            max_temp += value.get();
20
21            count++;
22
23        }
24
25        max_temp /= count;
26
27
28        context.write(key, new IntWritable(max_temp / count));
29
30    }
31
32 }
33
34 }
```




The terminal window shows the execution of a Hadoop job. The user starts the Hadoop cluster with 'start-all.sh'. Then, they run a MapReduce job named 'weatherdataavg' using the 'weatherdataavg.jar' file located at '/hadoop/Desktop/weatherdataavg/AverageDriver'. The job copies files from the local machine to the HDFS ('copyFromLocal'), runs the driver ('jar'), and then removes the temporary files ('rm -r'). Finally, they check the contents of the '/wordcount' directory in HDFS with 'hadoop fs -ls /wordcount'.

```
hadoop@bmscse-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 recommended production deployment configuration.
INFO: Using CATALINA_HOME to absolve environment variable.
Starting namenodes on [localhost]
localhost: namenode is running as process 9745. Stop it first and ensure /tmp/hadoop-hadoop-namenode.pid file is empty before retry.
Starting datanodes
localhost: datanode is running as process 9928. Stop it first and ensure /tmp/hadoop-hadoop-datanode.pid file is empty before retry.
Starting secondary namenodes [bmscse-HP-Elite-Tower-800-G9-Desktop-PC]
bmscse-HP-Elite-Tower-800-G9-Desktop-PC: secondarynamenode is running as process 10221. Stop it first and ensure /tmp/hadoop-hadoop-secondarynamenode.pid file is empty before retry.
Starting Job resourcemanager
resourcemanager is running as process 10513. Stop it first and ensure /tmp/hadoop-hadoop-resourcemanager.pid file is empty before retry.
Starting nodemanagers
localhost: nodemanager is running as process 10664. Stop it first and ensure /tmp/hadoop-hadoop-nodemanager.pid file is empty before retry.
hadoop@bmscse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -mkdir /km
hadoop@bmscse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -copyFromLocal /home/hadoop/Desktop/1901 /km/1901
hadoop@bmscse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop jar /home/hadoop/Desktop/weatherdataavg.jar weatherdataavg.AverageDriver /km/1901/rem
Please enter the input and output parameters
hadoop@bmscse-HP-Elite-Tower-800-G9-Desktop-PC:~$ ^
hadoop@bmscse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -rm -r /remout
rm: /remout: No such file or directory
hadoop@bmscse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -ls /
Found 9 items
drwxr-xr-x - hadoop supergroup          0 2025-04-15 15:11 /CSE
drwxr-xr-x - hadoop supergroup          0 2025-04-15 15:11 /LLL
drwxr-xr-x - hadoop supergroup          0 2024-05-14 15:39 /abc
drwxr-xr-x - hadoop supergroup          0 2025-05-20 14:30 /km
drwxr-xr-x - hadoop supergroup          0 2025-05-20 13:52 /mno
drwxr-xr-x - hadoop supergroup          0 2025-05-20 13:58 /res
drwxr-xr-x - hadoop supergroup          0 2025-04-29 15:38 /rgs
drwxr-xr-x - hadoop supergroup          0 2024-05-21 15:37 /wordcount
hadoop@bmscse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -ls /km/
Found 1 item
-rw-r--r-- 1 hadoop supergroup 888190 2025-05-20 14:30 /km/1901
hadoop@bmscse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -cat /km/1901
```

```

hadoop@bmseccse-HP-Elite-Tower-800-GP-Desktop-PC:~$ hadoop jar /home/hadoop/Desktop/weatherdataavg.jar weatherdataavg.AverageDriver /kln/1901 /rem
2025-05-20 14:34:21,074 INFO impl.MetricsConfig: Loaded properties from hadoop-metrics2.properties
2025-05-20 14:34:21,116 INFO impl.MetricsSystemImpl: Scheduled Metric snapshot period at 10 second(s).
2025-05-20 14:34:21,176 WARN mapreduce.JobResourceUploader: Hadoop command-line option parsing not performed. Implement the Tool interface and execute your application with ToolRunner to remedy this.
2025-05-20 14:34:21,230 INFO input.FileInputFormat: Total input files to process : 1
2025-05-20 14:34:21,230 INFO input.FileInputFormat: Input split number of splits=1
2025-05-20 14:34:21,334 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_local261815800_0001
2025-05-20 14:34:21,400 INFO mapreduce.Job: The url to track the job: http://localhost:8080/
2025-05-20 14:34:21,401 INFO mapreduce.Job: Running job: job_local261815800_0001
2025-05-20 14:34:21,402 INFO mapred.LocalJobRunner: OutputCommitter set in config null
2025-05-20 14:34:21,405 INFO output.PathOutputCommitterFactory: No output committer factory defined, defaulting to FileOutputCommitterFactory
2025-05-20 14:34:21,406 INFO output.PathOutputCommitter: FileOutputCommitter Algorithm version is 2
2025-05-20 14:34:21,406 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup _temporary folders under output directory:false, ignore cleanup failures: false
2025-05-20 14:34:21,406 INFO mapred.LocalJobRunner: org.apache.hadoop.mapred.FileOutputCommitter
2025-05-20 14:34:21,440 INFO mapred.LocalJobRunner: Waiting for map tasks
2025-05-20 14:34:21,447 INFO mapred.LocalJobRunner: Starting task: attempt_local261815800_0001_m_000000_0
2025-05-20 14:34:21,459 INFO output.PathOutputCommitterFactory: No output committer factory defined, defaulting to FileOutputCommitterFactory
2025-05-20 14:34:21,460 INFO output.FileOutputCommitter: FileOutputCommitter Algorithm version is 2
2025-05-20 14:34:21,460 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup _temporary folders under output directory:false, ignore cleanup failures: false
2025-05-20 14:34:21,460 INFO mapred.LocalJobRunner: org.apache.hadoop.mapred.FileOutputCommitter
2025-05-20 14:34:21,460 INFO mapred.LocalJobRunner: Waiting for map tasks
2025-05-20 14:34:21,472 INFO mapred.MapTask: Processing split: hdfs://localhost:9000/kln/1901+0+888190
2025-05-20 14:34:21,511 INFO mapred.MapTask: (EQUATOR) 0 kvl 26214396(104857584)
2025-05-20 14:34:21,511 INFO mapred.MapTask: mapreduce.task.io.sort.mb: 100
2025-05-20 14:34:21,511 INFO mapred.MapTask: soft limit at 83886080
2025-05-20 14:34:21,511 INFO mapred.MapTask: bufstart = 0; bufvoid = 104857600
2025-05-20 14:34:21,511 INFO mapred.MapTask: kvstart = 26214396; length = 6553600
2025-05-20 14:34:21,511 INFO mapred.MapTask: mapreduce.map.output.collector.class = org.apache.hadoop.mapred.MapTask$MapOutputBuffer
2025-05-20 14:34:21,586 INFO mapred.LocalJobRunner:
2025-05-20 14:34:21,587 INFO mapred.MapTask: Starting flush of map output
2025-05-20 14:34:21,587 INFO mapred.MapTask: Spilling map output
2025-05-20 14:34:21,587 INFO mapred.MapTask: bufstart = 0; bufend = 59076; bufvoid = 104857600
2025-05-20 14:34:21,595 INFO mapred.MapTask: Finished spill 0
2025-05-20 14:34:21,595 INFO mapred.MapTask: attempt_local261815800_0001_m_000000_0 is done. And is in the process of committing
2025-05-20 14:34:21,602 INFO mapred.LocalJobRunner: map
2025-05-20 14:34:21,602 INFO mapred.Task: Task 'attempt_local261815800_0001_m_000000_0' done.
2025-05-20 14:34:21,605 INFO mapred.Task: Final Counters for attempt_local261815800_0001_m_000000_0: Counters: 23
File System Counters
FILE: Number of bytes read=4430
FILE: Number of bytes written=713998
FILE: Number of small read operations=0
FILE: Number of large read operations=0
FILE: Number of write operations=0
HDFS: Number of bytes read=888190
HDFS: Number of bytes written=0
HDFS: Number of read operations=5
HDFS: Number of write operations=1
HDFS: Number of bytes read erasure-coded=0
Map-Reduce Framework
Map Input records=6565
Map output records=6564
HDFS: Number of bytes written=8
HDFS: Number of read operations=10
HDFS: Number of large read operations=0
HDFS: Number of write operations=3
HDFS: Number of bytes read erasure-coded=0
Map-Reduce Framework
Combine input records=0
Combine output records=0
Reduce input records=1
Reduce shuffle bytes=72210
Reduce input records=6564
Reduce output records=1
Spilled Records=6564
Shuffled Maps =1
Failed Shuffles=0
Merged Map outputs=1
GC time elapsed (ms)=0
Total committed heap usage (bytes)=633339904
Shuffle Errors
BAD_ID=0
CONNECTION=0
IO_ERROR=0
WRONG_LENGTH=0
WRONG_TYPE=0
WRONG_REDUCE=0
File Output Format Counters
Bytes Written=8
2025-05-20 14:34:21,803 INFO mapred.LocalJobRunner: Finishing task: attempt_local261815800_0001_r_000000_0
2025-05-20 14:34:21,803 INFO mapred.LocalJobRunner: reduce task executor complete.
2025-05-20 14:34:22,001 INFO mapred.LocalJobRunner: Job attempt_local261815800_0001 running in uber mode : false
2025-05-20 14:34:22,405 INFO mapred.Job: map 100% reduce 100%
2025-05-20 14:34:22,407 INFO mapred.Job: Job job_local261815800_0001 completed successfully
2025-05-20 14:34:22,416 INFO mapred.Job: Counters: 36
File System Counters
FILE: Number of bytes read=153112
FILE: Number of bytes written=1500206
FILE: Number of small read operations=0
FILE: Number of large read operations=0
FILE: Number of write operations=0
HDFS: Number of bytes read=1776380
HDFS: Number of bytes written=8
HDFS: Number of read operations=15
HDFS: Number of large read operations=0
HDFS: Number of write operations=4
HDFS: Number of bytes read erasure-coded=0
Map-Reduce Framework
Map Input records=6565
Map output records=6564
Map output bytes=59076
Map output materialized bytes=72210
Input split bytes=95
Combine input records=0
Combine output records=0
Reduce input groups=1
Reduce shuffle bytes=72210
Reduce input records=6564

```

```

Map input records=6565
Map output records=6564
Map output bytes=59076
Map output materialized bytes=72210
Input split bytes=95
Combine output records=0
Spilled Records=6564
Failed Shuffles=0
Merged Map outputs=0
GC time elapsed (ms)=0
Total committed heap usage (bytes)=633339904

File Input Format Counters
File Output Format Counters
2025-05-20 14:34:21,605 INFO mapred.LocalJobRunner: Finishing task: attempt_local261815800_0001_m_000000_0
2025-05-20 14:34:21,606 INFO mapred.LocalJobRunner: map task executor complete.
2025-05-20 14:34:21,607 INFO mapred.LocalJobRunner: Waiting for reduce tasks.
2025-05-20 14:34:21,608 INFO mapred.LocalJobRunner: Starting task: attempt_local261815800_0001_r_000000_0
2025-05-20 14:34:21,612 INFO output.PathOutputCommitterFactory: output committer factory defined, defaulting to FileOutputCommitterFactory
2025-05-20 14:34:21,612 INFO output.FileOutputCommitter: FileOutputCommitter Algorithm version is 2
2025-05-20 14:34:21,612 INFO output.FileOutputCommitter: Using ResourceCalculatorProcessTree
2025-05-20 14:34:21,612 INFO mapred.Task: Using ResourceCalculatorProcessTree
2025-05-20 14:34:21,612 INFO mapred.ReduceTasks: Using ShuffleConsumerPlugin: org.apache.hadoop.mapreduce.task.reduce.Shuffle@cd4d167
2025-05-20 14:34:21,614 WARN Impl.MetricsSystemImpl: Jobtracker metrics system already initialized!
2025-05-20 14:34:21,622 INFO reduce.MergeManagerImpl: MergerManager: memoryLimit=5829453312, maxSingleShuffleLimit=1457363328, mergeThreshold=3847439360, ioSortFactor=10, memToMemMergeOutputsThreshold=10
2025-05-20 14:34:21,623 INFO reduce.MergeManagerImpl: MergerManager: memoryLimit=5829453312, maxSingleShuffleLimit=1457363328, mergeThreshold=3847439360, ioSortFactor=10, memToMemMergeOutputsThreshold=10 Thread started: EventFetcher for fetching Map Completion Events
2025-05-20 14:34:21,635 INFO reduce.LocalFetcher: localfetcher#1 about to shuffle output of map attempt_local261815800_0001_m_000000_0 decompt: 72206 len: 72210 to MEMORY
2025-05-20 14:34:21,637 INFO reduce.LocalFetcher: localfetcher#1 about to shuffle output of map attempt_local261815800_0001_m_000000_0 decompt: 72206 len: 72206 to MEMORY
2025-05-20 14:34:21,638 INFO reduce.EventFetcher: EventFetcher is interrupted.. Returning
2025-05-20 14:34:21,638 INFO mapred.LocalJobRunner: LocalJobRunner is interrupted.. Returning
2025-05-20 14:34:21,638 INFO reduce.MergeManagerImpl: Jobtracker metrics system already initialized!
2025-05-20 14:34:21,641 INFO mapred.Merger: Merging 1 sorted segments
2025-05-20 14:34:21,641 INFO mapred.Merger: Down to the last merge-pass, with 1 segments left of total size: 72199 bytes
2025-05-20 14:34:21,641 INFO reduce.MergeManagerImpl: MergerManager: memoryLimit=5829453312, maxSingleShuffleLimit=1457363328, mergeThreshold=3847439360, ioSortFactor=10, memToMemMergeOutputsThreshold=10 Thread started: EventFetcher for fetching Map Completion Events
2025-05-20 14:34:21,643 INFO reduce.MergeManagerImpl: MergerManager: memoryLimit=5829453312, maxSingleShuffleLimit=1457363328, mergeThreshold=3847439360, ioSortFactor=10, memToMemMergeOutputsThreshold=10
2025-05-20 14:34:21,645 INFO mapred.Merger: Merging 0 segments, 72206 bytes from disk
2025-05-20 14:34:21,645 INFO mapred.Merger: Merging 0 segments, 0 bytes from memory into reduce
2025-05-20 14:34:21,645 INFO mapred.Merger: Merging 1 sorted segments
2025-05-20 14:34:21,645 INFO mapred.Merger: Down to the last merge-pass, with 1 segments left of total size: 72199 bytes
2025-05-20 14:34:21,646 INFO mapred.LocalJobRunner: 1 / 1 copied.
2025-05-20 14:34:21,679 INFO Configuration.deprecation: mapred.skip.ls deprecated. Instead, use mapreduce.job.skipped
2025-05-20 14:34:21,679 INFO mapred.Task: attempt_local261815800_0001_r_000000_0 is done. And is in the process of committing
2025-05-20 14:34:21,680 INFO mapred.Task: attempt_local261815800_0001_r_000000_0 is committed.
2025-05-20 14:34:21,771 INFO mapred.Task: Task attempt_local261815800_0001_r_000000_0 is allowed to commit now
2025-05-20 14:34:21,800 INFO output.FileOutputCommitter: Saved output of task 'attempt_local261815800_0001_r_000000_0' to hdfs://localhost:9000/...
2025-05-20 14:34:21,802 INFO mapred.LocalJobRunner: reduce > reduce
2025-05-20 14:34:21,802 INFO mapred.Task: Task 'attempt_local261815800_0001_r_000000_0' done.
2025-05-20 14:34:21,803 INFO mapred.Task: Final Counters for attempt_local261815800_0001_r_000000_0: Counters: 30
File System Counters
FILE: Number of bytes read=148882
FILE: Number of bytes written=706208
FILE: Number of read operations=0
FILE: Number of large read operations=0
FILE: Number of write operations=0
HDFS: Number of bytes read=888190
HDFS: Number of bytes written=8
HDFS: Number of read operations=10
Reduce shuffle bytes=7210
Reduce input records=6564
Reduce output records=1
Spilled Records=13128
Shuffled Maps =1
Failed Shuffles=0
Merged Map outputs=1
GC time elapsed (ms)=0
Total committed heap usage (bytes)=1266679888

Shuffle Errors
BAD_ID=0
CONNECTION=0
IO_ERROR=0
MOVED_PARTITION=0
WRONG_MAP=0
WRONG_REDUCE=0

File Input Format Counters
Bytes Read=888190
File Output Format Counters
Bytes Written=8
hadoop@bmseccse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -cat /rem/part-00000
cat: '/rem/part-00000': No such file or directory
hadoop@bmseccse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -cat /rem/part-r-00000
1901      46
hadoop@bmseccse-HP-Elite-Tower-800-G9-Desktop-PC:~$ package weatherdataavg;

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


```

b)

The screenshot shows the Eclipse IDE interface with the following details:

- Eclipse IDE Title Bar:** eclipse-wc - weatherdatameanmax/src/weatherdatameanmax/MeanMaxReducer.java - Eclipse IDE
- Package Explorer:** Shows the project structure for "weatherdatameanmax".
- MeanMaxReducer.java Content:** A Java class extending Reducer<Text, IntWritable, Text, IntWritable>. The code implements the reduce method to calculate the mean and maximum temperature over a 3-day window.
- Outline View:** Shows the class structure and the reduce method implementation.
- Terminal Window:** A terminal session titled "hadoop@bmsecece-HP-Elite-Tower-800-G9-Desktop-PC:~" displaying the Hadoop command-line help. It includes sections for Admin Commands, Client Commands, and various subcommands like archive, checksum, classpath, conftest, etc.

```

hadoop@bmsccse-HP-Elite-Tower-800-G9-Desktop-PC:~
```

applications, not this command.
jnpipath prints the java.library.path
kdiag Diagnose Kerberos Problems
kerbname show auth_to_local principal conversion
key name keys via the KeyProvider
runefolder scale a given input trace
runertrace convert logs into a runen trace
siguard 53 Commands
trace view and modify Hadoop tracing settings
version print the version

Daemon Commands:

kns run KMS, the Key Management Server
registrydns run the registry DNS server

SUBCOMMAND may print help when invoked w/o parameters or with -h.

```

hadoop@bmsccse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -mkdir /omn
hadoop@bmsccse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -copyFromLocal /home/hadoop/Desktop/1901 /omn/1901
hadoop@bmsccse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop jar /home/hadoop/Desktop/weatherdatamax.jar weatherdatamax.MeanMaxDriver /omn/1901 /ren
2025-05-20 14:53:15,576 INFO Impl.MetricsConfig: Loaded properties from hadoop-metrics2.properties
2025-05-20 14:53:15,615 INFO Impl.MetricsSystemImpl: Scheduled Metric snapshot period at 10 second(s).
2025-05-20 14:53:15,615 INFO Impl.MetricsSystemImpl: Jobtracker metrics system started
2025-05-20 14:53:15,679 WARN MapreduceJobResourceUploader: Hadoop command-line option parsing not performed. Implement the Tool interface and execute your application with ToolRunner to remedy this.
2025-05-20 14:53:15,737 INFO Input.FileInputFormat: Total input files to process: 1
2025-05-20 14:53:15,764 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_local2143084439_0001
2025-05-20 14:53:15,830 INFO mapreduce.JobSubmitter: Submitting token for job: job_local2143084439_0001
2025-05-20 14:53:15,891 INFO mapreduce.Job: The url to track the job: http://localhost:8880/
2025-05-20 14:53:15,891 INFO mapreduce.Job: Running job: job_local2143084439_0001
2025-05-20 14:53:15,895 INFO output.PathOutputCommitterFactory: output committer set in config null
2025-05-20 14:53:15,895 INFO output.FileOutputCommitter: output committer factory defined, defaulting to FileOutputCommitterFactory
2025-05-20 14:53:15,895 INFO output.FileOutputCommitter: FileOutputCommitter Algorithm version is 2
2025-05-20 14:53:15,895 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup _temporary folders under output directory:false, ignore cleanup failures: false
2025-05-20 14:53:15,896 INFO mapred.LocalJobRunner: OutputCommitter is org.apache.hadoop.mapred.FileOutputCommitter
2025-05-20 14:53:15,981 INFO mapred.LocalJobRunner: Waiting for map tasks
2025-05-20 14:53:15,982 INFO mapred.LocalJobRunner: Starting task: attempt_local2143084439_0001_m_000000_0
2025-05-20 14:53:15,996 INFO output.PathOutputCommitter: No output committer factory defined, defaulting to FileOutputCommitterFactory
2025-05-20 14:53:15,996 INFO output.FileOutputCommitter: FileOutputCommitter Algorithm version is 2
2025-05-20 14:53:15,996 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup _temporary folders under output directory:false, ignore cleanup failures: false
2025-05-20 14:53:16,007 INFO mapred.MapTask: Processing split: hdfs://localhost:9800/omn/1901:0+888190
2025-05-20 14:53:16,044 INFO mapred.MapTask: (EQUATOR) @ kvl 26214396(104857584)
2025-05-20 14:53:16,044 INFO mapred.MapTask: mapreduce.task.io.sort.mb: 100
2025-05-20 14:53:16,044 INFO mapred.MapTask: soft limit at 83886080
2025-05-20 14:53:16,044 INFO mapred.MapTask: bufstart = 0; bufvold = 104857600
2025-05-20 14:53:16,044 INFO mapred.MapTask: kvtstart = 26214396; length = 6553600
2025-05-20 14:53:16,044 INFO mapred.MapTask: Reducer buffer size: 131072
2025-05-20 14:53:16,110 INFO mapred.LocalJobRunner: OutputCollector class = org.apache.hadoop.mapred.MapTask$MapOutputBuffer
2025-05-20 14:53:16,110 INFO mapred.MapTask: Starting flush of map output
2025-05-20 14:53:16,110 INFO mapred.MapTask: Spilling map output
2025-05-20 14:53:16,119 INFO mapred.MapTask: bufstart = 0; bufend = 45948; bufvold = 104857600
2025-05-20 14:53:16,119 INFO mapred.MapTask: bufstart = 26214396(104857584); kvend = 26188144(104752576); length = 26253/6553600
2025-05-20 14:53:16,133 INFO mapred.Task: Task:attempt_local2143084439_0001_m_000000_0 is done. And is in the process of committing
2025-05-20 14:53:16,133 INFO mapred.LocalJobRunner: Done
```

```

hadoop@bmsccse-HP-Elite-Tower-800-G9-Desktop-PC:~
```

INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup _temporary folders under output directory:false, ignore cleanup failures: false

2025-05-20 14:53:16,140 INFO mapred.Task: Using ResourceCalculatorProcessTree

2025-05-20 14:53:16,146 INFO mapred.ReduceTask: Using ShuffleConsumerPlugin: org.apache.hadoop.mapreduce.task.reduce.Shuffle@b64ffe0

2025-05-20 14:53:16,147 WARN Impl.MetricsSystemImpl: Jobtracker metrics system already initialized!

2025-05-20 14:53:16,156 INFO reduce.EventFetcher: attempt_local2143084439_0001_r_000000_0 Thread started: EventFetcher for fetching Map Completion Events

2025-05-20 14:53:16,156 INFO reduce.LocalFetcher: localfetcher#1 about to shuffle output of map_attempt_local2143084439_0001_r_000000_0 decomp: 59078 len: 59082 to MEMORY

2025-05-20 14:53:16,172 INFO reduce.InMemoryMapOutput: Read 59078 bytes from map-output for attempt_local2143084439_0001_r_000000_0

2025-05-20 14:53:16,172 INFO reduce.InMemoryMapOutput: cleanupTemporaryFile -> map-output of size: 59078, lnMemoryOutputs.size() -> 1, commitMemory -> 0, usedMemory -> 59078

2025-05-20 14:53:16,173 INFO reduce.EventFetcher: EventFetcher is interrupted.. Returning

2025-05-20 14:53:16,174 INFO mapred.LocalJobRunner: 1 / 1 copied

2025-05-20 14:53:16,174 INFO reduce.MergeManagerImpl: finalMerge called with 1 in-memory map-outputs and 0 on-disk map-outputs

2025-05-20 14:53:16,176 INFO mapred.Merger: Merging 1 sorted segments

2025-05-20 14:53:16,176 INFO mapred.Merger: Down to the last merge-pass, with 1 segments left of total size: 59073 bytes

2025-05-20 14:53:16,180 INFO reduce.MergeManagerImpl: Merged 1 segments, 59078 bytes to disk to satisfy reduce memory limit

2025-05-20 14:53:16,180 INFO reduce.MergeManagerImpl: 1 file, 59082 bytes from disk

2025-05-20 14:53:16,181 INFO mapred.Merger: Merging 0 segments, 0 bytes from memory into reduce

2025-05-20 14:53:16,181 INFO mapred.Merger: Merging 1 sorted segments

2025-05-20 14:53:16,182 INFO mapred.Merger: Down to the last merge-pass, with 1 segments left of total size: 59073 bytes

2025-05-20 14:53:16,182 INFO mapred.LocalJobRunner: 1 / 1 copied.

2025-05-20 14:53:16,182 INFO Configuration.deprecation: mapred.skip.on.ls deprecated. Instead, use mapreduce.job.skippedrecords

2025-05-20 14:53:16,273 INFO mapred.Task: Task:attempt_local2143084439_0001_r_000000_0 is done. And is in the process of committing

2025-05-20 14:53:16,273 INFO mapred.Task: Task:attempt_local2143084439_0001_r_000000_0 is done. And is in the process of committing

2025-05-20 14:53:16,273 INFO mapred.Task: Task attempt_local2143084439_0001_r_000000_0 is allowed to commit now

2025-05-20 14:53:16,298 INFO output.FileOutputCommitter: Saved output of task 'attempt_local2143084439_0001_r_000000_0' to hdfs://localhost:9000/ren

2025-05-20 14:53:16,298 INFO mapred.LocalJobRunner: reduce > reduce

2025-05-20 14:53:16,298 INFO mapred.Task: Task 'attempt_local2143084439_0001_r_000000_0' done.

2025-05-20 14:53:16,298 INFO mapred.Task: Final Counters for attempt_local2143084439_0001_r_000000_0: Counters: 30

File System Counters

- FILE: Number of bytes read=122769
- FILE: Number of bytes written=763193
- FILE: Number of read operations=0
- FILE: Number of large read operations=0
- FILE: Number of write operations=0
- HDFS: Number of bytes read=888190
- HDFS: Number of bytes written=81
- HDFS: Number of read operations=10
- HDFS: Number of large read operations=0
- HDFS: Number of write operations=3
- HDFS: Number of bytes read erasure-coded=0

Map-Reduce Framework

- Combine input records=0
- Combine output records=0
- Reduce input groups=12
- Reduce shuffle bytes=100892
- Reduce input records=6564
- Reduce output records=12
- Spilled Records=6564
- Shuffled Maps =1
- Failed Shuffles=0
- Merged Map outputs=1
- GC time elapsed (ms)=0
- Total committed heap usage (bytes)=526305152

Shuffle Errors

- BAD_ID#
- CONNECTION-A

Screenshot captured
You can paste the image from the clipboard.

```

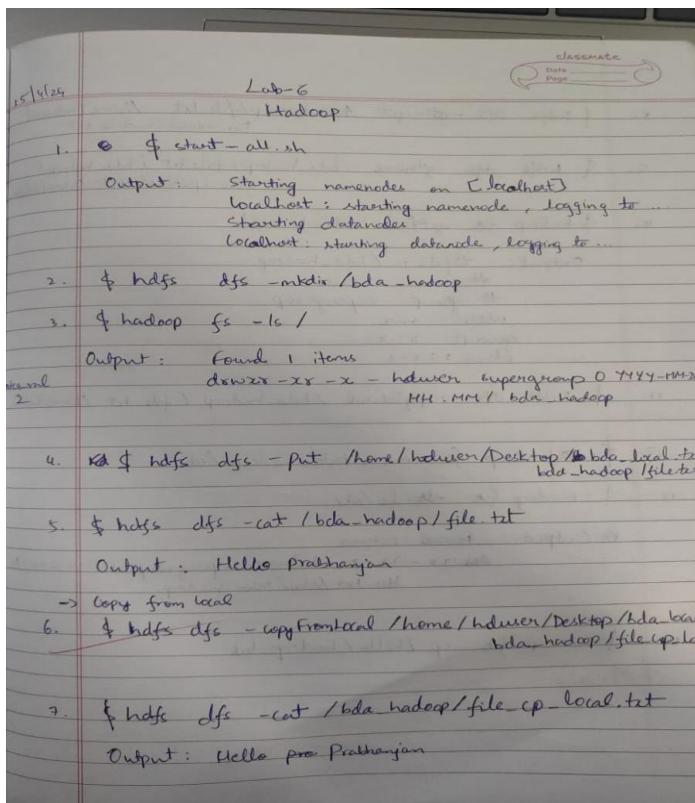
2025-05-20 14:53:15,982 INFO mapred.LocalJobRunner: Starting task: attempt_local2143084439_0001_m_000000_0
2025-05-20 14:53:15,996 INFO output.PathOutputCommitterFactory: No output committer factory defined, defaulting to FileOutputCommitterFactory
2025-05-20 14:53:15,996 INFO output.FileOutputCommitter: File Output Committer Algorithm version is 2
2025-05-20 14:53:15,996 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup _temporary folders under output directory:false, ignore cleanup failures: false
2025-05-20 14:53:16,007 INFO mapred.MapTask: Processing split: hdfs://localhost:9000/omn/1901:0+88190
2025-05-20 14:53:16,044 INFO mapred.MapTask: EQUATOR: 0 kv: 26214396(104857584)
2025-05-20 14:53:16,044 INFO mapred.MapTask: mapreduce.task.io.sort.mb: 100
2025-05-20 14:53:16,044 INFO mapred.MapTask: soft limit at 83886080
2025-05-20 14:53:16,044 INFO mapred.MapTask: bufstart = 0; bufvoid = 104857600
2025-05-20 14:53:16,044 INFO mapred.MapTask: kvstart = 26214396; length = 6553600
2025-05-20 14:53:16,044 INFO mapred.MapTask: MapOutputCollector: org.apache.hadoop.mapred.MapTask$MapOutputBuffer
2025-05-20 14:53:16,110 INFO mapred.LocalJobRunner:
2025-05-20 14:53:16,110 INFO mapred.MapTask: Starting flush of map output
2025-05-20 14:53:16,110 INFO mapred.MapTask: Spilling map output
2025-05-20 14:53:16,110 INFO mapred.MapTask: bufstart = 0; bufend = 45948; bufvoid = 104857600
2025-05-20 14:53:16,110 INFO mapred.MapTask: kvstart = 26214396(104857584); kvend = 26188144(104752576); length = 26253/6553600
2025-05-20 14:53:16,128 INFO mapred.MapTask: Finished spilt 0
2025-05-20 14:53:16,135 INFO mapred.Task: attempt_local2143084439_0001_m_000000_0 is done. And is in the process of committing
2025-05-20 14:53:16,135 INFO mapred.Task: mapreduce.job.committing
2025-05-20 14:53:16,135 INFO mapred.Task: Task 'attempt_local2143084439_0001_m_000000_0' done.
2025-05-20 14:53:16,138 INFO mapred.Task: Final Counters for attempt_local2143084439_0001_m_000000_0: Counters: 23
  File System Counters
    FILE: Number of bytes read=4573
    FILE: Number of bytes written=704111
    FILE: Number of read operations=0
    FILE: Number of large read operations=0
    FILE: Number of write operations=0
    HDFS: Number of bytes read=888190
    HDFS: Number of bytes written=0
    HDFS: Number of read operations=5
    HDFS: Number of large read operations=0
    HDFS: Number of write operations=1
    HDFS: Number of bytes read erasure-coded=0
  Map-Reduce Framework
    Map Input records=6565
    Map output records=6564
    Map output bytes=45948
    Map output materialized bytes=59082
    Input split bytes=95
    Combine input records=0
    Spilled Records=6564
    Failed Shuffles=0
    Merged Map outputs=0
    GC time elapsed (ms)=0
    Total committed heap usage (bytes)=526385152
  File Input Format Counters
    Bytes Read=0
2025-05-20 14:53:16,139 INFO mapred.LocalJobRunner: Finishing task: attempt_local2143084439_0001_m_000000_0
2025-05-20 14:53:16,139 INFO mapred.LocalJobRunner: map task executor complete.
2025-05-20 14:53:16,140 INFO mapred.LocalJobRunner: Waiting for reduce tasks
2025-05-20 14:53:16,140 INFO mapred.LocalJobRunner: Starting task: attempt_local2143084439_0001_r_000000_0
2025-05-20 14:53:16,145 INFO output.PathOutputCommitterFactory: No output committer factory defined, defaulting to FileOutputCommitterFactory
2025-05-20 14:53:16,145 INFO output.FileOutputCommitter: File Output Committer Algorithm version is 2
2025-05-20 14:53:16,145 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup _temporary folders under output directory:false, ignore cleanup failures: false
2025-05-20 14:53:16,145 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup _temporary folders under output directory:false, ignore cleanup failures: false
  File System Counters
    FILE: Number of bytes written=763193
    FILE: Number of read operations=0
    FILE: Number of large read operations=0
    FILE: Number of write operations=0
    HDFS: Number of bytes read=888190
    HDFS: Number of bytes written=81
    HDFS: Number of read operations=10
    HDFS: Number of large read operations=0
    HDFS: Number of write operations=3
    HDFS: Number of bytes read erasure-coded=0
  Map-Reduce Framework
    Combine input records=0
    Combine output records=0
    Reduce input groups=12
    Reduce shuffle bytes=59082
    Reduce input records=6564
    Reduce output records=12
    Spilled Records=6564
    Shuffled Maps =1
    Failed Shuffles=0
    Merged Map outputs=1
    GC time elapsed (ms)=0
    Total committed heap usage (bytes)=526385152
  Shuffle Errors
    BAD_ID=0
    CONNECTION=0
    IO_ERROR=0
    WRONG_LENGTH=0
    WRONG_MAP=0
    WRONG_PARTITION=0
    File Output Format Counters
    Bytes Written=81
2025-05-20 14:53:16,299 INFO mapred.LocalJobRunner: Finishing task: attempt_local2143084439_0001_r_000000_0
2025-05-20 14:53:16,291 INFO mapred.LocalJobRunner: reduce task executor complete.
2025-05-20 14:53:16,895 INFO mapreduce.Job: Job job_local2143084439_0001 running in uber mode : false
2025-05-20 14:53:16,897 INFO mapreduce.Job: map 100% reduce 100%
2025-05-20 14:53:16,899 INFO mapreduce.Job: Job job_local2143084439_0001 completed successfully
2025-05-20 14:53:16,900 INFO mapreduce.Job: Counters: 30
  File System Counters
    FILE: Number of bytes read=127342
    FILE: Number of bytes written=1467304
    FILE: Number of read operations=0
    FILE: Number of large read operations=0
    FILE: Number of write operations=0
    HDFS: Number of bytes read=1770988
    HDFS: Number of bytes written=81
    HDFS: Number of read operations=15
    HDFS: Number of large read operations=0
    HDFS: Number of write operations=4
    HDFS: Number of bytes read erasure-coded=0
  Map-Reduce Framework
    Map Input records=6565
    Map output records=6564
    Map output bytes=45948
    Map output materialized bytes=59082
    Input split bytes=0

```

Screenshot captured
You can paste the image from the clipboard.

```

hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC: ~
FILE: Number of bytes written=1467304
FILE: Number of read operations=0
FILE: Number of large read operations=0
FILE: Number of write operations=0
HDFS: Number of bytes read=177088
HDFS: Number of bytes written=81
HDFS: Number of read operations=15
HDFS: Number of large read operations=0
HDFS: Number of write operations=4
HDFS: Number of bytes read erasure-coded=0
Map-Reduce Framework
Map Input records=6565
Map Reducer records=6564
Map output bytes=45948
Map output materialized bytes=59082
Input split bytes=95
Combine input records=0
Combine output records=0
Reduce input records=0
Reduce shuffle bytes=59082
Reduce input records=6564
Reduce output records=12
Spilled Records=13128
Shuffled Maps =1
Failed Shuffles=0
Merged Map output=1
GC Collected (ms)=8
Total committed heap usage (bytes)=1052770304
Shuffle Errors
BAD_ID=0
CONNECTION=0
IO_ERROR=0
WRONG_LENGTH=0
WRONG_MAGIC=0
WRONG_REDUCE=0
File Input Format Counters
Bytes Read=888190
File Output Format Counters
Bytes Written=81
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC: $ hadoop fs -cat /omn/part-r-00000
cat: /omn/part-r-00000: No such file or directory
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC: $ hadoop fs -cat /ren/part-r-00000
01 13
02 -66
03 -15
04 43
05 100
06 186
07 219
08 198
09 141
10 100
11 1
12 -61
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC: $
```



Date _____
Page _____

- e. \$ hdfs dfs -get -get /bda-hadoop/file.txt /home/hduser
Downloaded file.txt
- f. \$ hdfs dfs -getmerge /bda-hadoop/file.txt /bda-hadoop/
file_cp-local.txt /home/hduser
(Downloaded)
- g. \$ hadoop fs -getfacl /bda-hadoop/
Output:
 #file: /bda-hadoop
 # owner: hduser
 # group: supengroup
 user::rwx
 group::r-x
 other::r-x
- h. \$ hdfs dfs -copyToLocal /bda-hadoop/file.txt /home/hduser/Desktop
- i. \$ hadoop fs -mr /bda-hadoop/abc
- j. \$ hadoop fs -ls /abc
- ~~k. Output: Found 1 items
 downrwxr-xr-x - hduser supengroup 0 4444-10-25
 11:44 /abc/bda-hadoop~~
- l. \$ hadoop fs -cp /hello/hadoop_lab
(24/10/25)

Average Mean Max Program

→ Mapper.py

```

import sys
for line in sys.stdin:
    line = line.strip()
    if not line:
        continue
    parts = line.split(',')
    if len(parts) != 2:
        continue
    year, temp_str = parts
    try:
        temperature = float(temp_str)
        print(f'{year}\t{temperature}')
    except ValueError:
        continue

```

→ Reducer.py

```

import sys
current_year = None
temp_sum = 0.0
temp_count = 0
temp_min = None
temp_max = None

for line in sys.stdin:
    line = line.strip()
    if not line:
        continue
    year, temp = line.split('\t')
    if current_year == None:
        current_year = year
        temp_min = temp
        temp_max = temp
        temp_sum = float(temp)
        temp_count = 1
    else:
        temp_sum += float(temp)
        temp_count += 1
        temp_min = min(temp_min, float(temp))
        temp_max = max(temp_max, float(temp))

```

parts = line.split('\n')
if len(parts) != 2:
 continue
year, temp_str = parts
try:
 temperature = float(temp_str)
except ValueError:
 continue
if current_year != year:
 if current_year is not None:
 avg_temp = temp_sum / temp_count
 print(f'{current_year}\t{avg_temp:.2f}')
 else:
 temp_min = temp_max = 2f
 print(f'{current_year}\t{temp_min:.2f}\t{temp_max:.2f}')
else:
 temp_sum += temperature
 temp_count += 1
 temp_min = min(temp_min, temperature)
 temp_max = max(temp_max, temperature)
if current_year is not None:
 avg_temp = temp_sum / temp_count
 print(f'{current_year}\t{temp_min:.2f}\t{temp_max:.2f}\t{avg_temp:.2f}')
 else:
 print(f'{current_year}\t{temp_min:.2f}\t{temp_max:.2f}')

In shell

Desktop-Pc : \$ hadoop jar /home/hadoop/hadoop-streaming-3.2.0.jar
hadoop/tools/lib/hadoop-streaming-3.2.0.jar
files map.py red.py -mapper map.py
-reducer red.py -input /lab0/in.txt
-output /lab0/output3

.... \$ hdfs dfs -ls /lab0/output3
"for checking"
\$ hdfs df -cat /lab0/output3/part-00
print output

Lab 6: Hadoop

Question: Implement Wordcount program on Hadoop framework

Code with Output:

The screenshot shows the Eclipse IDE interface with the following details:

- Project Explorer:** Shows the `word_count` project with a `src` folder containing `WCDriver.java`, `WCMapper.java`, and `WCReducer.java`.
- WCDriver.java Content:**

```
1 import java.io.IOException;
2 import org.apache.hadoop.conf.Configured;
3 import org.apache.hadoop.fs.Path;
4 import org.apache.hadoop.io.IntWritable;
5 import org.apache.hadoop.io.Text;
6 import org.apache.hadoop.mapred.FileInputFormat;
7 import org.apache.hadoop.mapred.FileOutputFormat;
8 import org.apache.hadoop.mapred.JobClient;
9 import org.apache.hadoop.mapred.JobConf;
10 import org.apache.hadoop.util.Tool;
11 import org.apache.hadoop.util.ToolRunner;
12
13 public class WCDriver extends Configured implements Tool {
14
15     public int run(String[] args) throws IOException {
16         if (args.length < 2) {
17             System.out.println("Please provide input and output paths");
18             return -1;
19         }
20
21         JobConf conf = new JobConf(WCDriver.class);
22         conf.setJobName("WordCount");
23         conf.setJarByClass(WCDriver.class); // Ensures job runs from correct JAR
24
25         FileInputFormat.setInputPaths(conf, new Path(args[0]));
26         FileOutputFormat.setOutputPath(conf, new Path(args[1]));
27
28         conf.setMapperClass(WCMapper.class);
29         conf.setReducerClass(WCReducer.class);
30
31         conf.setMapOutputKeyClass(Text.class);
32         conf.setMapOutputValueClass(IntWritable.class);
33     }
34 }
```
- Problems View:** A message from Java 24 support is displayed, asking if the user wants to install Java 24 Support. Options include "Install Java 24 Support", "Remind Me Later", and "Don't Ask Again".
- Console Output:**

```
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -mkdir /rsg
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -copyFromLocal /home/hadoop/Desktop/sample.txt /rsg/sample.txt
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop jar /home/hadoop/Desktop/wordcount.jar WCDriver /rsg/sample.txt /result
2025-05-06 15:05:01,260 INFO impl.MetricsConfig: Loaded properties from hadoop-metrics2.properties
2025-05-06 15:05:01,299 INFO impl.MetricsSystemImpl: Scheduled Metric snapshot period at 10 second(s).
2025-05-06 15:05:01,299 INFO impl.MetricsSystemImpl: JobTracker metrics system started
2025-05-06 15:05:01,305 WARN impl.MetricsSystemImpl: JobTracker metrics system already initialized!
2025-05-06 15:05:01,365 WARN mapreduce.JobResourceUploader: Hadoop command-line option parsing not performed. Implement the Tool interface and execute your application with ToolRunner to remedy this.
2025-05-06 15:05:01,414 INFO mapred.FileInputFormat: Total input files to process : 1
2025-05-06 15:05:01,445 INFO mapreduce.JobSubmitter: number of splits:1
2025-05-06 15:05:01,511 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_local90897529_0001
2025-05-06 15:05:01,511 INFO mapreduce.JobSubmitter: Executing with tokens: []
2025-05-06 15:05:01,565 INFO mapreduce.Job: The url to track the job: http://localhost:8080/
2025-05-06 15:05:01,566 INFO mapreduce.Job: Running job: job_local90897529_0001
2025-05-06 15:05:01,566 INFO mapred.LocalJobRunner: OutputCommitter set in config null
2025-05-06 15:05:01,567 INFO mapred.LocalJobRunner: OutputCommitter is org.apache.hadoop.mapred.FileOutputCommitter
2025-05-06 15:05:01,569 INFO output.FileOutputCommitter: File Output Committer Algorithm version is 2
```

```

hadoop@bmscse-HP-Elite-Tower-800-G9-Desktop-PC: ~
2025-05-06 15:05:01,299 INFO impl.MetricsSystemImpl: Scheduled Metric snapshot period at 10 second(s).
2025-05-06 15:05:01,299 INFO impl.MetricsSystemImpl: JobTracker metrics system started
2025-05-06 15:05:01,305 WARN impl.MetricsSystemImpl: JobTracker metrics system already initialized!
2025-05-06 15:05:01,365 WARN mapreduce.JobResourceUploader: Hadoop command-line option parsing not performed. Implement the Tool interface and execute your application with ToolRunner to remedy this.
2025-05-06 15:05:01,414 INFO mapred.FileInputFormat: Total input files to process : 1
2025-05-06 15:05:01,445 INFO mapreduce.JobSubmitter: number of splits:1
2025-05-06 15:05:01,511 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_local90897529_0001
2025-05-06 15:05:01,511 INFO mapreduce.JobSubmitter: Executing with tokens: []
2025-05-06 15:05:01,565 INFO mapreduce.Job: The url to track the job: http://localhost:8080/
2025-05-06 15:05:01,566 INFO mapreduce.Job: Running job: job_local90897529_0001
2025-05-06 15:05:01,566 INFO mapred.LocalJobRunner: OutputCommitter set in config null
2025-05-06 15:05:01,567 INFO mapred.LocalJobRunner: OutputCommitter is org.apache.hadoop.mapred.FileOutputCommitter
2025-05-06 15:05:01,569 INFO output.FileOutputCommitter: File Output Committer Algorithm version is 2
2025-05-06 15:05:01,569 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup _temporary folders under output directory:false , ignore cleanup failures: false
2025-05-06 15:05:01,606 INFO mapred.LocalJobRunner: Waiting for map tasks
2025-05-06 15:05:01,607 INFO mapred.LocalJobRunner: Starting task: attempt_local90897529_0001_m_000000_0
2025-05-06 15:05:01,618 INFO output.FileOutputCommitter: File Output Committer Algorithm version is 2
2025-05-06 15:05:01,618 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup _temporary folders under output directory:false , ignore cleanup failures: false
2025-05-06 15:05:01,624 INFO mapred.Task: Using ResourceCalculatorProcessTree : [ ]
2025-05-06 15:05:01,631 INFO mapred.MapTask: Processing split: hdfs://localhost:9000/rsg/sample.txt:0+89
2025-05-06 15:05:01,640 INFO mapred.MapTask: numReduceTasks: 1
2025-05-06 15:05:01,671 INFO mapred.MapTask: (EQUATOR) 0 kvt 26214396(104857584)
2025-05-06 15:05:01,671 INFO mapred.MapTask: mapreduce.task.io.sort.mb: 100
2025-05-06 15:05:01,671 INFO mapred.MapTask: soft limit at 83886080
2025-05-06 15:05:01,671 INFO mapred.MapTask: bufstart = 0; bufvoid = 104857600
2025-05-06 15:05:01,671 INFO mapred.MapTask: kvstart = 26214396; length = 6553600
2025-05-06 15:05:01,673 INFO mapred.MapTask: Map output collector class = org.apache.hadoop.mapred.MapTask$MapOutputBuffer
2025-05-06 15:05:01,742 INFO mapred.LocalJobRunner:
2025-05-06 15:05:01,742 INFO mapred.MapTask: Starting flush of map output
2025-05-06 15:05:01,742 INFO mapred.MapTask: Spilling map output
2025-05-06 15:05:01,742 INFO mapred.MapTask: bufstart = 0; bufend = 169; bufvoid = 104857600
2025-05-06 15:05:01,742 INFO mapred.MapTask: kvstart = 26214396(104857584); kvend = 26214320(104857280); length = 77/6553600
2025-05-06 15:05:01,751 INFO mapred.Task: Task:attempt_local90897529_0001_m_000000_0 is done. And is in the process of committing
2025-05-06 15:05:01,753 INFO mapred.LocalJobRunner: hdfs://localhost:9000/rsg/sample.txt:0+89
2025-05-06 15:05:01,753 INFO mapred.Task: Task 'attempt_local90897529_0001_m_000000_0' done.
2025-05-06 15:05:01,756 INFO mapred.Task: Final Counters for attempt_local90897529_0001_m_000000_0: Counters: 23
    File System Counters
        FILE: Number of bytes read=4273
        FILE: Number of bytes written=639534
        FILE: Number of read operations=0
hadoop@bmscse-HP-Elite-Tower-800-G9-Desktop-PC: ~
BAD_ID=0
CONNECTION=0
IO_ERROR=0
WRONG_LENGTH=0
WRONG_MAP=0
WRONG_REDUCE=0
File Output Format Counters
Bytes Written=69
2025-05-06 15:05:01,897 INFO mapred.LocalJobRunner: Finishing task: attempt_local90897529_0001_r_000000_0
2025-05-06 15:05:01,897 INFO mapred.LocalJobRunner: reduce task executor complete.
2025-05-06 15:05:02,569 INFO mapreduce.Job: Job job_local90897529_0001 running in uber mode : false
2025-05-06 15:05:02,572 INFO mapreduce.Job: map 100% reduce 100%
2025-05-06 15:05:02,574 INFO mapreduce.Job: Job job_local90897529_0001 completed successfully
2025-05-06 15:05:02,584 INFO mapreduce.Job: Counters: 36
    File System Counters
        FILE: Number of bytes read=9008
        FILE: Number of bytes written=1279283
        FILE: Number of read operations=0
        FILE: Number of large read operations=0
        FILE: Number of write operations=0
        HDFS: Number of bytes read=178
        HDFS: Number of bytes written=69
        HDFS: Number of read operations=15
        HDFS: Number of large read operations=0
        HDFS: Number of write operations=4
        HDFS: Number of bytes read erasure-coded=0
Map-Reduce Framework
    Map input records=5
    Map output records=20
    Map output bytes=169
    Map output materialized bytes=215
    Input split bytes=88
    Combine input records=0
    Combine output records=0
    Reduce input groups=10
    Reduce shuffle bytes=215
    Reduce input records=20
    Reduce output records=10
    Spilled Records=40
    Shuffled Maps =1
    Failed Shuffles=0
    Merged Map outputs=1
    GC time elapsed (ms)=0
    Total committed heap usage (bytes)=1052770304

```

```

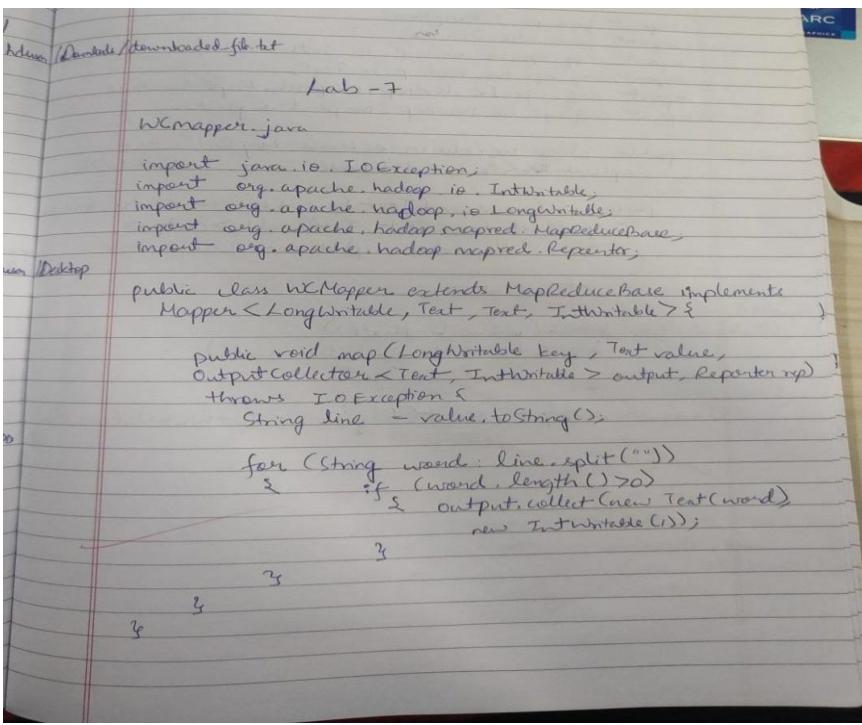
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC: ~
FILE: Number of write operations=0
HDFS: Number of bytes read=89
HDFS: Number of bytes written=0
HDFS: Number of read operations=5
HDFS: Number of large read operations=0
HDFS: Number of write operations=1
HDFS: Number of bytes read erasure-coded=0
Map-Reduce Framework
  Map input records=5
  Map output records=20
  Map output bytes=169
  Map output materialized bytes=215
  Input split bytes=88
  Combine input records=0
  Spilled Records=20
  Failed Shuffles=0
  Merged Map outputs=0
  GC time elapsed (ms)=0
  Total committed heap usage (bytes)=526385152
File Input Format Counters
  Bytes Read=89
2025-05-06 15:05:01,756 INFO mapred.LocalJobRunner: Finishing task: attempt_local90897529_0001_m_000000_0
2025-05-06 15:05:01,757 INFO mapred.LocalJobRunner: map task executor complete.
2025-05-06 15:05:01,758 INFO mapred.LocalJobRunner: Waiting for reduce tasks
2025-05-06 15:05:01,758 INFO mapred.LocalJobRunner: Starting task: attempt_local90897529_0001_r_000000_0
2025-05-06 15:05:01,762 INFO output.FileOutputCommitter: File Output Committer Algorithm version is 2
2025-05-06 15:05:01,762 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup _temporary folders under output directory:false , ignore cleanup failures: false
2025-05-06 15:05:01,762 INFO mapred.Task: Using ResourceCalculatorProcessTree : [ ]
2025-05-06 15:05:01,763 INFO mapred.ReduceTask: Using ShuffleConsumerPlugin: org.apache.hadoop.mapreduce.task.reduce.shuffle@636a90e9
2025-05-06 15:05:01,764 WARN impl.MetricsSystemImpl: JobTracker metrics system already initialized!
2025-05-06 15:05:01,771 INFO reduce.MergeManagerImpl: MergerManager: memoryLimit=5827985408, maxSingleShuffleLimit=1456996352, mergeThreshold=3846470400, ioSortFactor=10, memToMemMergeOutputsThreshold=10
2025-05-06 15:05:01,772 INFO output.FileOutputCommitter: Thread started: EventFetcher for fetching Map Completion Events
2025-05-06 15:05:01,785 INFO reduce.LocalFetcher: localfetcher#1 about to shuffle output of map attempt_local90897529_0001_m_000000_0 decomp: 211 len: 215 to MEMORY
2025-05-06 15:05:01,787 INFO reduce.InMemoryMapOutput: Read 211 bytes from map-output for attempt_local90897529_0001_m_000000_0
2025-05-06 15:05:01,788 INFO reduce.MergeManagerImpl: closeInMemoryFile -> map-output of size: 211, inMemoryMapOutputs.size() -> 1, committedMemory -> 0, usedMemory -> 211
2025-05-06 15:05:01,788 INFO reduce.EventFetcher: EventFetcher is interrupted.. Returning
2025-05-06 15:05:01,789 INFO mapred.LocalJobRunner: 1 / 1 copied.
2025-05-06 15:05:01,789 INFO reduce.MergeManagerImpl: finalMerge called with 1 in-memory map-outputs and 0 on-disk map-outputs
2025-05-06 15:05:01,792 INFO mapred.Merger: Merging 1 sorted segments
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC: ~
2025-05-06 15:05:01,792 INFO reduce.MergeManagerImpl: Merged 1 segments, 211 bytes to disk to satisfy reduce memory limit
2025-05-06 15:05:01,793 INFO reduce.MergeManagerImpl: Merging 1 files, 215 bytes from disk
2025-05-06 15:05:01,793 INFO reduce.MergeManagerImpl: Merging 0 segments, 0 bytes from memory into reduce
2025-05-06 15:05:01,793 INFO mapred.Merger: Merging 1 sorted segments
2025-05-06 15:05:01,793 INFO mapred.Merger: Down to the last merge-pass, with 1 segments left of total size: 205 bytes
2025-05-06 15:05:01,793 INFO mapred.LocalJobRunner: 1 / 1 copied.
2025-05-06 15:05:01,867 INFO mapred.Task: Task:attempt_local90897529_0001_r_000000_0 is done. And is in the process of committing
2025-05-06 15:05:01,869 INFO mapred.LocalJobRunner: 1 / 1 copied.
2025-05-06 15:05:01,869 INFO mapred.Task: Task attempt_local90897529_0001_r_000000_0 is allowed to commit now
2025-05-06 15:05:01,894 INFO output.FileOutputCommitter: Saved output of task 'attempt_local90897529_0001_r_000000_0' to hdfs://localhost:9000/result
2025-05-06 15:05:01,896 INFO mapred.LocalJobRunner: reduce > reduce
2025-05-06 15:05:01,896 INFO mapred.Task: Task 'attempt_local90897529_0001_r_000000_0' done.
2025-05-06 15:05:01,897 INFO mapred.Task: Final Counters for attempt_local90897529_0001_r_000000_0: Counters: 30
  File System Counters
    FILE: Number of bytes read=4735
    FILE: Number of bytes written=639749
    FILE: Number of read operations=0
    FILE: Number of large read operations=0
    FILE: Number of write operations=0
    HDFS: Number of bytes read=89
    HDFS: Number of bytes written=69
    HDFS: Number of read operations=10
    HDFS: Number of large read operations=0
    HDFS: Number of write operations=3
    HDFS: Number of bytes read erasure-coded=0
Map-Reduce Framework
  Combine input records=0
  Combine output records=0
  Reduce input groups=10
  Reduce shuffle bytes=215
  Reduce input records=20
  Reduce output records=10
  Spilled Records=20
  Shuffled Maps =1
  Failed Shuffles=0
  Merged Map outputs=1
  GC time elapsed (ms)=0
  Total committed heap usage (bytes)=526385152
Shuffle Errors
  BAD_ID=0
  CONNECTION=0
  IO_ERROR=0
  WRONG_LENGTH=0

```

```

hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC: ~
HDFS: Number of write operations=4
HDFS: Number of bytes read erasure-coded=0
Map -Reduce Framework
  Map input records=5
  Map output records=20
  Map output bytes=169
  Map output materialized bytes=215
  Input split bytes=88
  Combine input records=0
  Combine output records=0
  Reduce input groups=10
  Reduce shuffle bytes=215
  Reduce input records=20
  Reduce output records=10
  Spilled Records=40
  Shuffled Maps =1
  Failed Shuffles=0
  Merged Map outputs=1
  GC time elapsed (ms)=0
  Total committed heap usage (bytes)=1052770304
Shuffle Errors
  BAD_ID=0
  CONNECTION=0
  IO_ERROR=0
  WRONG_LENGTH=0
  WRONG_MAP=0
  WRONG_REDUCE=0
File Input Format Counters
  Bytes Read=89
File Output Format Counters
  Bytes Written=69
Exit Code: 0
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC: ~$ hadoop fs -cat /result/part-00000
are 1
brother 1
family 1
hi 1
how 5
is 4
job 1
sister 1
you 1
your 4
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC: ~$ []

```



Reducer.java

```
import java.io.IOException;
import java.util.Iterator;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapred.MapReduceBase;
import org.apache.hadoop.mapred.Reporter;
import org.apache.hadoop.mapreduce.*;

public class WCReducer extends MapReduceBase
    implements <Text, IntWritable, Text, IntWritable> {
    public void reduce(Text key, Iterator<IntWritable> value,
                      OutputCollector<Text, IntWritable> output,
                      Reporter reporter) throws IOException {
        int count = 0;
        while (value.hasNext()) {
            IntWritable i = value.next();
            count += i.get();
        }
        output.collect(key, new IntWritable(count));
    }
}
```

Driver.java:

```
import java.io.IOException;
import org.apache.hadoop.conf.Configuration;
import org.apache.hadoop.fs.Path;
import org.apache.hadoop.mapred.JobConf;
public class WCDriver extends Configuration implements
    Tool {
    public int run(String args[]) throws IOException {
        if (args.length < 2)
            System.out.println("Please give
                valid input");
        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.setMapOutputValueClass(IntWritable.class),
conf.setOutputValueClass(IntWritable.class);
JobClient.runJob(conf);
return 0;
}
```

```
public static void main(String args[]) throws
Exception {
    int exitCode = ToolRunner.run(
        new WCDriver(),
        args);
}
```

~~System.out.println(exitCode);~~

Lab 7: Hadoop

Question: 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.

Code with Output:

```
[+] hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC: ~
```

```
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC:~$ start -all.sh
Command 'start' not found, did you mean:
  command 'stars' from snap stars (2.7jrc3)
  command 'rstart' from deb x11-session-utils (7.7+4build2)
  command 'kstart' from deb kde-cli-tools (4:5.24.4-0ubuntu1)
  command 'startx' from deb xinit (1.4.1-0ubuntu4)
  command 'stat' from deb coreutils (8.32-4.1ubuntu1.2)
  command 'tart' from deb tart (3.10-1build1)
See 'snap info <snapname>' for additional versions.
hadoop@bmscsece-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 [bmscsece-HP-Elite-Tower-800-G9-Desktop-PC]
Starting resourcemanager
Starting nodemanagers
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -mkdir /mno
mkdir: Cannot create directory /mno. Name node is in safe mode.
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC:~$ ^C
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC:~$ ^C
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC:~$ hdfs dfsadmin -safemode get
Safe mode is OFF
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -mkdir /mno
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -copyFromLocal /home/hadoop/Desktop/sample.txt /mno/sample.txt
t
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop jar /home/hadoop/Desktop/topn.jar TopN /mno/sample.txt /res
Exception in thread "main" java.lang.ClassNotFoundException: TopN
  at java.base/java.net.URLClassLoader.findClass(URLClassLoader.java:476)
  at java.base/java.lang.ClassLoader.loadClass(ClassLoader.java:594)
  at java.base/java.lang.ClassLoader.loadClass(ClassLoader.java:527)
  at java.base/java.lang.Class.forName0(Native Method)
  at java.base/java.lang.Class.forName(Class.java:398)
  at org.apache.hadoop.util.RunJar.run(RunJar.java:321)
  at org.apache.hadoop.util.RunJar.main(RunJar.java:241)
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop jar /home/hadoop/Desktop/topn.jar topnlab /mno/sample.txt /res
Exception in thread "main" java.lang.ClassNotFoundException: topnlab
  at java.base/java.net.URLClassLoader.findClass(URLClassLoader.java:476)
  at java.base/java.lang.ClassLoader.loadClass(ClassLoader.java:594)
  at java.base/java.lang.ClassLoader.loadClass(ClassLoader.java:527)
  at java.base/java.lang.Class.forName0(Native Method)
  at java.base/java.lang.Class.forName(Class.java:398)
  at org.apache.hadoop.util.RunJar.run(RunJar.java:321)
  at org.apache.hadoop.util.RunJar.main(RunJar.java:241)
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop jar /home/hadoop/Desktop/topn.jar TopN /mno/sample.txt /res
Exception in thread "main" java.lang.NoClassDefFoundError: topnlab/TopN (wrong name: TopN)
  at java.base/java.lang.ClassLoader.defineClass1(Native Method)
```

```
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC: ~
at java.base/java.lang.ClassLoader.loadClass(ClassLoader.java:594)
at java.base/java.lang.ClassLoader.loadClass(ClassLoader.java:527)
at java.base/java.lang.Class.forName0(Native Method)
at java.base/java.lang.Class.forName(Class.java:398)
at org.apache.hadoop.util.RunJar.run(RunJar.java:321)
at org.apache.hadoop.util.RunJar.main(RunJar.java:241)
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop jar /home/hadoop/Desktop/topn.jar topnlab /mno/sample.txt /res
Exception in thread "main" java.lang.ClassNotFoundException: topnlab
at java.base/java.net.URLClassLoader.findClass(URLClassLoader.java:476)
at java.base/java.lang.ClassLoader.loadClass(ClassLoader.java:594)
at java.base/java.lang.Class.forName0(Native Method)
at java.base/java.lang.Class.forName(Class.java:398)
at org.apache.hadoop.util.RunJar.run(RunJar.java:321)
at org.apache.hadoop.util.RunJar.main(RunJar.java:241)
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop jar /home/hadoop/Desktop/topn.jar TopN /mno/sample.txt /res
Exception in thread "main" java.lang.NoClassDefFoundError: topnlab/TopN (wrong name: TopN)
at java.base/java.lang.ClassLoader.defineClass1(Native Method)
at java.base/java.lang.ClassLoader.defineClass(ClassLoader.java:1022)
at java.base/java.security.SecureClassLoader.defineClass(SecureClassLoader.java:174)
at java.base/java.net.URLClassLoader.defineClass(URLClassLoader.java:555)
at java.base/java.net.URLClassLoader$1.run(URLClassLoader.java:458)
at java.base/java.net.URLClassLoader$1.run(URLClassLoader.java:452)
at java.base/java.security.AccessController.doPrivileged(Native Method)
at java.base/java.net.URLClassLoader.findClass(URLClassLoader.java:451)
at java.base/java.lang.ClassLoader.loadClass(ClassLoader.java:594)
at java.base/java.lang.ClassLoader.loadClass(ClassLoader.java:527)
at java.base/java.lang.Class.forName0(Native Method)
at java.base/java.lang.Class.forName(Class.java:398)
at org.apache.hadoop.util.RunJar.run(RunJar.java:321)
at org.apache.hadoop.util.RunJar.main(RunJar.java:241)
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop jar /home/hadoop/Desktop/topn.jar topnlab.TopN /mno/sample.txt /
res
2025-05-20 13:58:09,506 INFO impl.MetricsConfig: Loaded properties from hadoop-metrics2.properties
2025-05-20 13:58:09,545 INFO impl.MetricsSystemImpl: Scheduled Metric snapshot period at 10 second(s).
2025-05-20 13:58:09,545 INFO impl.MetricsSystemImpl: JobTracker metrics system started
2025-05-20 13:58:09,658 INFO input.FileInputFormat: Total input files to process : 1
2025-05-20 13:58:09,709 INFO mapreduce.JobSubmitter: number of splits:1
2025-05-20 13:58:09,777 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_local408680812_0001
2025-05-20 13:58:09,778 INFO mapreduce.JobSubmitter: Executing with tokens: []
2025-05-20 13:58:09,836 INFO mapreduce.Job: The url to track the job: http://localhost:8080/
2025-05-20 13:58:09,837 INFO mapreduce.Job: Running job: job_local408680812_0001
2025-05-20 13:58:09,838 INFO mapred.LocalJobRunner: OutputCommitter set in config null
2025-05-20 13:58:09,841 INFO output.PathOutputCommitterFactory: No output committer factory defined, defaulting to FileOutp
utCommitterFactory
2025-05-20 13:58:09,842 INFO output.FileOutputCommitter: File Output Committer Algorithm version is 2
2025-05-20 13:58:09,842 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup _temporary folders under output d
irectory:false, ignore cleanup failures: false
```

```
hadoop@bmscse-HP-Elite-Tower-800-G9-Desktop-PC: ~
```

```
2025-05-20 13:58:09,842 INFO output.FileOutputCommitter: File Output Committer Algorithm version is 2
2025-05-20 13:58:09,842 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup _temporary folders under output directory:false, ignore cleanup failures: false
2025-05-20 13:58:09,842 INFO mapred.LocalJobRunner: OutputCommitter is org.apache.hadoop.mapreduce.lib.output.FileOutputCommitter
2025-05-20 13:58:09,884 INFO mapred.LocalJobRunner: Waiting for map tasks
2025-05-20 13:58:09,885 INFO mapred.LocalJobRunner: Starting task: attempt_local408680812_0001_m_000000_0
2025-05-20 13:58:09,895 INFO output.PathOutputCommitterFactory: No output committer factory defined, defaulting to FileOutputCommitterFactory
2025-05-20 13:58:09,895 INFO output.FileOutputCommitter: File Output Committer Algorithm version is 2
2025-05-20 13:58:09,895 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup _temporary folders under output directory:false, ignore cleanup failures: false
2025-05-20 13:58:09,903 INFO mapred.Task: Using ResourceCalculatorProcessTree : [ ]
2025-05-20 13:58:09,906 INFO mapred.MapTask: Processing split: hdfs://localhost:9000/mno/sample.txt:0+75
2025-05-20 13:58:09,945 INFO mapred.MapTask: (EQUATOR) 0 kvi 26214396(104857584)
2025-05-20 13:58:09,945 INFO mapred.MapTask: mapreduce.task.io.sort.mb: 100
2025-05-20 13:58:09,945 INFO mapred.MapTask: soft limit at 83886080
2025-05-20 13:58:09,945 INFO mapred.MapTask: bufstart = 0; bufvoid = 104857600
2025-05-20 13:58:09,945 INFO mapred.MapTask: kvstart = 26214396; length = 6553600
2025-05-20 13:58:09,947 INFO mapred.MapTask: Map output collector class = org.apache.hadoop.mapred.MapTask$MapOutputBuffer
2025-05-20 13:58:10,006 INFO mapred.LocalJobRunner:
2025-05-20 13:58:10,007 INFO mapred.MapTask: Starting flush of map output
2025-05-20 13:58:10,007 INFO mapred.MapTask: Spilling map output
2025-05-20 13:58:10,007 INFO mapred.MapTask: bufstart = 0; bufend = 135; bufvoid = 104857600
2025-05-20 13:58:10,007 INFO mapred.MapTask: kvstart = 26214396(104857584); kvend = 26214340(104857360); length = 57/6553600
2025-05-20 13:58:10,010 INFO mapred.MapTask: Finished spill 0
2025-05-20 13:58:10,014 INFO mapred.Task: Task:attempt_local408680812_0001_m_000000_0 is done. And is in the process of committing
2025-05-20 13:58:10,016 INFO mapred.LocalJobRunner: map
2025-05-20 13:58:10,017 INFO mapred.Task: Task 'attempt_local408680812_0001_m_000000_0' done.
2025-05-20 13:58:10,020 INFO mapred.Task: Final Counters for attempt_local408680812_0001_m_000000_0: Counters: 23
    File System Counters
        FILE: Number of bytes read=7513
        FILE: Number of bytes written=645435
        FILE: Number of read operations=0
        FILE: Number of large read operations=0
        FILE: Number of write operations=0
        HDFS: Number of bytes read=75
        HDFS: Number of bytes written=0
        HDFS: Number of read operations=5
        HDFS: Number of large read operations=0
        HDFS: Number of write operations=1
        HDFS: Number of bytes read erasure-coded=0
    Map-Reduce Framework
        Map input records=2
        Map output records=15
        Map output bytes=135
```

```
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC: ~
2025-05-20 13:58:10,168 INFO mapred.Task: Task:attempt_local408680812_0001_r_000000_0 is done. And is in the process of committing
2025-05-20 13:58:10,169 INFO mapred.LocalJobRunner: 1 / 1 copied.
2025-05-20 13:58:10,169 INFO mapred.Task: Task attempt_local408680812_0001_r_000000_0 is allowed to commit now
2025-05-20 13:58:10,194 INFO output.FileOutputCommitter: Saved output of task 'attempt_local408680812_0001_r_000000_0' to hdfs://localhost:9000/res
2025-05-20 13:58:10,195 INFO mapred.LocalJobRunner: reduce > reduce
2025-05-20 13:58:10,196 INFO mapred.Task: Task 'attempt_local408680812_0001_r_000000_0' done.
2025-05-20 13:58:10,197 INFO mapred.Task: Final Counters for attempt_local408680812_0001_r_000000_0: Counters: 30
    File System Counters
        FILE: Number of bytes read=7887
        FILE: Number of bytes written=645606
        FILE: Number of read operations=0
        FILE: Number of large read operations=0
        FILE: Number of write operations=0
        HDFS: Number of bytes read=75
        HDFS: Number of bytes written=105
        HDFS: Number of read operations=10
        HDFS: Number of large read operations=0
        HDFS: Number of write operations=3
        HDFS: Number of bytes read erasure-coded=0
    Map-Reduce Framework
        Combine input records=0
        Combine output records=0
        Reduce input groups=15
        Reduce shuffle bytes=171
        Reduce input records=15
        Reduce output records=15
        Spilled Records=15
        Shuffled Maps =1
        Failed Shuffles=0
        Merged Map outputs=1
        GC time elapsed (ms)=0
        Total committed heap usage (bytes)=526385152
    Shuffle Errors
        BAD_ID=0
        CONNECTION=0
        IO_ERROR=0
        WRONG_LENGTH=0
        WRONG_MAP=0
        WRONG_REDUCE=0
    File Output Format Counters
        Bytes Written=105
2025-05-20 13:58:10,197 INFO mapred.LocalJobRunner: Finishing task: attempt_local408680812_0001_r_000000_0
2025-05-20 13:58:10,197 INFO mapred.LocalJobRunner: reduce task executor complete.
2025-05-20 13:58:10,840 INFO mapreduce.Job: Job job_local408680812_0001 running in uber mode : false
2025-05-20 13:58:10,842 INFO mapreduce.Job: map 100% reduce 100%
2025-05-20 13:58:10,843 INFO mapreduce.Job: Job job_local408680812_0001 completed successfully
```

```
hadoop@bmscsece-HP-Elite-Tower-800-G9-Desktop-PC: ~
2025-05-20 13:58:10,168 INFO mapred.Task: Task:attempt_local408680812_0001_r_000000_0 is done. And is in the process of committing
2025-05-20 13:58:10,169 INFO mapred.LocalJobRunner: 1 / 1 copied.
2025-05-20 13:58:10,169 INFO mapred.Task: Task attempt_local408680812_0001_r_000000_0 is allowed to commit now
2025-05-20 13:58:10,194 INFO output.FileOutputCommitter: Saved output of task 'attempt_local408680812_0001_r_000000_0' to hdfs://localhost:9000/res
2025-05-20 13:58:10,195 INFO mapred.LocalJobRunner: reduce > reduce
2025-05-20 13:58:10,196 INFO mapred.Task: Task 'attempt_local408680812_0001_r_000000_0' done.
2025-05-20 13:58:10,197 INFO mapred.Task: Final Counters for attempt_local408680812_0001_r_000000_0: Counters: 30
    File System Counters
        FILE: Number of bytes read=7887
        FILE: Number of bytes written=645606
        FILE: Number of read operations=0
        FILE: Number of large read operations=0
        FILE: Number of write operations=0
        HDFS: Number of bytes read=75
        HDFS: Number of bytes written=105
        HDFS: Number of read operations=10
        HDFS: Number of large read operations=0
        HDFS: Number of write operations=3
        HDFS: Number of bytes read erasure-coded=0
    Map-Reduce Framework
        Combine input records=0
        Combine output records=0
        Reduce input groups=15
        Reduce shuffle bytes=171
        Reduce input records=15
        Reduce output records=15
        Spilled Records=15
        Shuffled Maps =1
        Failed Shuffles=0
        Merged Map outputs=1
        GC time elapsed (ms)=0
        Total committed heap usage (bytes)=526385152
    Shuffle Errors
        BAD_ID=0
        CONNECTION=0
        IO_ERROR=0
        WRONG_LENGTH=0
        WRONG_MAP=0
        WRONG_REDUCE=0
    File Output Format Counters
        Bytes Written=105
2025-05-20 13:58:10,197 INFO mapred.LocalJobRunner: Finishing task: attempt_local408680812_0001_r_000000_0
2025-05-20 13:58:10,197 INFO mapred.LocalJobRunner: reduce task executor complete.
2025-05-20 13:58:10,840 INFO mapreduce.Job: Job job_local408680812_0001 running in uber mode : false
2025-05-20 13:58:10,842 INFO mapreduce.Job: map 100% reduce 100%
2025-05-20 13:58:10,843 INFO mapreduce.Job: Job job_local408680812_0001 completed successfully
```

```
+ hadoop@bmscscse-HP-Elite-Tower-800-G9-Desktop-PC: ~
Map input records=2
Map output records=15
Map output bytes=135
Map output materialized bytes=171
Input split bytes=101
Combine input records=0
Spilled Records=15
Failed Shuffles=0
Merged Map outputs=0
GC time elapsed (ms)=0
Total committed heap usage (bytes)=526385152
File Input Format Counters
  Bytes Read=75
2025-05-20 13:58:10,020 INFO mapred.LocalJobRunner: Finishing task: attempt_local408680812_0001_m_000000_0
2025-05-20 13:58:10,020 INFO mapred.LocalJobRunner: map task executor complete.
2025-05-20 13:58:10,021 INFO mapred.LocalJobRunner: Waiting for reduce tasks
2025-05-20 13:58:10,022 INFO mapred.LocalJobRunner: Starting task: attempt_local408680812_0001_r_000000_0
2025-05-20 13:58:10,027 INFO output.PathOutputCommitterFactory: No output committer factory defined, defaulting to FileOutputCommitterFactory
2025-05-20 13:58:10,027 INFO output.FileOutputCommitter: File Output Committer Algorithm version is 2
2025-05-20 13:58:10,027 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup _temporary folders under output directory:false, ignore cleanup failures: false
2025-05-20 13:58:10,027 INFO mapred.Task: Using ResourceCalculatorProcessTree : [ ]
2025-05-20 13:58:10,028 INFO mapred.ReduceTask: Using ShuffleConsumerPlugin: org.apache.hadoop.mapreduce.task.reduce.Shuffle@6622090a
2025-05-20 13:58:10,029 WARN impl.MetricsSystemImpl: JobTracker metrics system already initialized!
2025-05-20 13:58:10,037 INFO reduce.MergeManagerImpl: MergerManager: memoryLimit=5829453312, maxSingleShuffleLimit=14573633
28, mergeThreshold=3847439360, ioSortFactor=10, memToMemMergeOutputsThreshold=10
2025-05-20 13:58:10,038 INFO reduce.EventFetcher: attempt_local408680812_0001_r_000000_0 Thread started: EventFetcher for fetching Map Completion Events
2025-05-20 13:58:10,053 INFO reduce.LocalFetcher: localfetcher#1 about to shuffle output of map attempt_local408680812_0001_m_000000_0 decomp: 167 len: 171 to MEMORY
2025-05-20 13:58:10,054 INFO reduce.InMemoryMapOutput: Read 167 bytes from map-output for attempt_local408680812_0001_m_000000_0
2025-05-20 13:58:10,055 INFO reduce.MergeManagerImpl: closeInMemoryFile -> map-output of size: 167, inMemoryMapOutputs.size() -> 1, commitMemory -> 0, usedMemory ->167
2025-05-20 13:58:10,056 INFO reduce.EventFetcher: EventFetcher is interrupted.. Returning
2025-05-20 13:58:10,056 INFO mapred.LocalJobRunner: 1 / 1 copied.
2025-05-20 13:58:10,056 INFO reduce.MergeManagerImpl: finalMerge called with 1 in-memory map-outputs and 0 on-disk map-outputs
2025-05-20 13:58:10,059 INFO mapred.Merger: Merging 1 sorted segments
2025-05-20 13:58:10,059 INFO mapred.Merger: Down to the last merge-pass, with 1 segments left of total size: 162 bytes
2025-05-20 13:58:10,060 INFO reduce.MergeManagerImpl: Merged 1 segments, 167 bytes to disk to satisfy reduce memory limit
2025-05-20 13:58:10,060 INFO reduce.MergeManagerImpl: Merging 1 files, 171 bytes from disk
2025-05-20 13:58:10,060 INFO reduce.MergeManagerImpl: Merging 0 segments, 0 bytes from memory into reduce
2025-05-20 13:58:10,060 INFO mapred.Merger: Merging 1 sorted segments
2025-05-20 13:58:10,061 INFO mapred.Merger: Down to the last merge-pass, with 1 segments left of total size: 162 bytes
2025-05-20 13:58:10,061 INFO mapred.LocalJobRunner: 1 / 1 copied.
```

```
hadoop@bmscsecse-HP-Elite-Tower-800-G9-Desktop-PC: ~
```

```
2025-05-20 13:58:10,840 INFO mapreduce.Job: Job job_local408680812_0001 running in uber mode : false
2025-05-20 13:58:10,842 INFO mapreduce.Job: map 100% reduce 100%
2025-05-20 13:58:10,843 INFO mapreduce.Job: Job job_local408680812_0001 completed successfully
2025-05-20 13:58:10,854 INFO mapreduce.Job: Counters: 36
    File System Counters
        FILE: Number of bytes read=15400
        FILE: Number of bytes written=1291041
        FILE: Number of read operations=0
        FILE: Number of large read operations=0
        FILE: Number of write operations=0
        HDFS: Number of bytes read=150
        HDFS: Number of bytes written=105
        HDFS: Number of read operations=15
        HDFS: Number of large read operations=0
        HDFS: Number of write operations=4
        HDFS: Number of bytes read erasure-coded=0
    Map-Reduce Framework
        Map input records=2
        Map output records=15
        Map output bytes=135
        Map output materialized bytes=171
        Input split bytes=101
        Combine input records=0
        Combine output records=0
        Reduce input groups=15
        Reduce shuffle bytes=171
        Reduce input records=15
        Reduce output records=15
        Spilled Records=30
        Shuffled Maps =1
        Failed Shuffles=0
        Merged Map outputs=1
        GC time elapsed (ms)=0
        Total committed heap usage (bytes)=1052770304
    Shuffle Errors
        BAD_ID=0
        CONNECTION=0
        IO_ERROR=0
        WRONG_LENGTH=0
        WRONG_MAP=0
        WRONG_REDUCE=0
    File Input Format Counters
        Bytes Read=75
    File Output Format Counters
        Bytes Written=105
hadoop@bmscsecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -cat /res/part-00000
cat: '/res/part-00000': No such file or directory
hadoop@bmscsecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -ls /res
```

```
hadoop@bmscsecse-HP-Elite-Tower-800-G9-Desktop-PC: ~
```

```
Input split bytes=101
Combine input records=0
Combine output records=0
Reduce input groups=15
Reduce shuffle bytes=171
Reduce input records=15
Reduce output records=15
Spilled Records=30
Shuffled Maps =1
Failed Shuffles=0
Merged Map outputs=1
GC time elapsed (ms)=0
Total committed heap usage (bytes)=1052770304
Shuffle Errors
BAD_ID=0
CONNECTION=0
IO_ERROR=0
WRONG_LENGTH=0
WRONG_MAP=0
WRONG_REDUCE=0
File Input Format Counters
Bytes Read=75
File Output Format Counters
Bytes Written=105
hadoop@bmscsecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -cat /res/part-00000
cat: '/res/part-00000': No such file or directory
hadoop@bmscsecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -ls /res
Found 2 items
-rw-r--r-- 1 hadoop supergroup 0 2025-05-20 13:58 /res/_SUCCESS
-rw-r--r-- 1 hadoop supergroup 105 2025-05-20 13:58 /res/part-r-00000
hadoop@bmscsecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ ^C
hadoop@bmscsecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ hadoop fs -cat /res/part-r-00000
college 1
in 1
bms 1
hi 1
i 1
inna 1
am 1
m 1
bhuvana 1
how 1
are 1
avyukth 1
of 1
you 1
engineering 1
hadoop@bmscsecse-HP-Elite-Tower-800-G9-Desktop-PC:~$
```

Python - Hadoop Alphabetical order

Open hadoop folder:

Desktop-PC: - / hadoop \$ nano map.py

import sys
import re

for line in sys.stdin:

```
words = re.findall(r'\b[a-zA-Z]+\b', line.lower())
for word in words:
    print(f'{word}\t1')
```

press Ctrl X + Y + Enter

Desktop-PC: - / hadoop \$ nano red.py

import sys
import re

from collections import defaultdict

word_count = defaultdict(int)

for line in sys.stdin:

```
word, count = line.strip().split('\t')
word_count[word] += int(count)
```

sorted_words = sorted(word_count.items(),

key=lambda x: (-x[1], x[0]))[:10]

for word, count in sorted_words:

print(f'{word}\t{count}')

Desktop-P: - / hadoop \$ nano probst.txt

Hello Hello my my in probst

IMP

CD / HDFS

Desktop-P: hadoop jar /home/hadoop/hadoop/
share/hadoop/tdds/lib/hadoop-streaming
- 3.3.4.jar -mapper map.py
- reducer red.py -input file:///home/hadoop/
hadoop/probst.txt -output file:///home/hadoop/
hadoop/output1
Output path

Lab 8: Scala

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

Code with Output:

```
bmscecse@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ nano pi.scala
bmscecse@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ scalac pi.scala
bmscecse@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ scala pi
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 5
7 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83
84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100
```

The screenshot shows a terminal window titled "bmscecse@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC: ~". The window contains the following Scala code in a file named "pi.scala":

```
GNU nano 6.2                               pi.scala
object pi {
  def main(args: Array[String]): Unit = {
    for(counter <- 1 to 100)
      print(counter + " ")
    println()
  }
}
```

At the bottom of the terminal window, there is a menu bar with the following options: Help, Write Out, Where Is, Cut, Execute, Location, Exit, Read File, Replace, Paste, Justify, and Go To Line. The "Read 7 lines" option is highlighted in the menu bar.

Lab 9: Spark

Question: 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.

Code with Output:

```
bmscecse@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ spark-shell
25/05/20 15:32:38 WARN Utils: Your hostname, bmscecse-HP-Elite-Tower-800-G9-Desktop-PC resolves to a loopback address: 127.0.1.1
; using 10.124.2.8 instead (on interface eno1)
25/05/20 15:32:38 WARN Utils: Set SPARK_LOCAL_IP if you need to bind to another address
WARNING: An illegal reflective access 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
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 15:32:38 WARN NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
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).
Spark context Web UI available at http://10.124.2.8:4040
Spark context available as 'sc' (master = local[*], app id = local-1747735361481).
Spark session available as 'spark'.
Welcome to

    /_\_/\_ _\_\_/\_/\_/\_
   / \ \ - \ \ - / \ / \ / \
  /__\ / . \ \_, \ / \ / \ / \
 /_/

Using Scala version 2.12.10 (OpenJDK 64-Bit Server VM, Java 11.0.26)
Type in expressions to have them evaluated.
Type :help for more information.

scala> val textFile = sc.textFile("/home/bmscecse/Desktop/sparkdata.txt")
textFile: org.apache.spark.rdd.RDD[String] = /home/bmscecse/Desktop/sparkdata.txt MapPartitionsRDD[1] at textFile at <console>:2
4

scala>

scala> val counts = textFile
counts: org.apache.spark.rdd.RDD[String] = /home/bmscecse/Desktop/sparkdata.txt MapPartitionsRDD[1] at textFile at <console>:24

scala>   .flatMap(line => line.split(" "))
res0: org.apache.spark.rdd.RDD[String] = MapPartitionsRDD[2] at flatMap at <console>:26

scala>   .map(word => (word, 1))
scala> val data = sc.textFile("sparkdata.txt")
data: org.apache.spark.rdd.RDD[String] = sparkdata.txt MapPartitionsRDD[1] at textFile at <console>:25

scala> val splitdata = data.flatMap(line => line.split(" "))
splitdata: org.apache.spark.rdd.RDD[String] = MapPartitionsRDD[2] at flatMap at <console>:26

scala> val mapdata = splitdata.map(word => (word, 1))
mapdata: org.apache.spark.rdd.RDD[(String, Int)] = MapPartitionsRDD[3] at map at <console>:26

scala> val reducedata = mapdata.reduceByKey(_ + _)
reducedata: org.apache.spark.rdd.RDD[(String, Int)] = ShuffledRDD[4] at reduceByKey at <console>:26

scala> reducedata.collect.foreach(println)
(,1)
(hello,2)
(world,1)
(spark,1)
```

```

scala> val textFile = sc.textFile("/home/bmscecse/Desktop/WC.txt")
textFile: org.apache.spark.rdd.RDD[String] = /home/bmscecse/Desktop/WC.txt MapPartitionsRDD[31] at textFile at <console>:31

scala> val words = textFile.flatMap(line => line.split(" "))
words: org.apache.spark.rdd.RDD[String] = MapPartitionsRDD[32] at flatMap at <console>:32

scala>

scala> val pairs = words.map(word => (word, 1))
pairs: org.apache.spark.rdd.RDD[(String, Int)] = MapPartitionsRDD[33] at map at <console>:32

scala>

scala> val counts = pairs.reduceByKey(_ + _)
counts: org.apache.spark.rdd.RDD[(String, Int)] = ShuffledRDD[34] at reduceByKey at <console>:32

scala> val countsArray = counts.collect() // This is Array[(String, Int)]
countsArray: Array[(String, Int)] = Array(("","1"), (hello,6), (world,1), (spark,1))

scala> val sorted = ListMap(countsArray.sortWith(_._2 > _._2): _*)
sorted: scala.collection.immutable.ListMap[String,Int] = ListMap(hello -> 6, "" -> 1, world -> 1, spark -> 1)

scala> for ((k, v) <- sorted) {
|   if (v > 4) println(s"$k, $v")
| }
hello, 6

scala>

```

