#### Task1:

A = load '/hadoopdata/pig/test.txt/' using PigStorage as (line:chararray); grunt> B = FOREACH A GENERATE flatten(TOKENIZE((chararray)\$0)) as word; grunt> dump B;

Output of B

```
()
(Hi)
(this)
(is)
(big)
(data)
(class)
(Hi)
(this)
(is)
(big)
(data)
(class)
(big)
(diti)
(this)
(is)
(fi)
(this)
(is)
(fi)
(this)
(is)
(big)
(data)
(class)
(fi)
(data)
(class)
(fi)
(data)
(class)
(Hi)
(this)
(big)
(data)
(class)
(this)
(big)
(data)
(class)
(this)
```

C = group B by word;

### Dump C;

```
Delta - September - Success - September -
```

D = foreach C generate group, COUNT(B);

```
2018-08-02 10:35:07,251 [main] INFO org.apache.pig.backend.hadoop.executionengine.util.MapRedUtil - Total input paths to process : 1
(Hi,5)
(15,3)
(big,5)
(data,5)
(data,5)
(class,5)
(class,5)
(class,5)
(graphic organization of the control of the
```

Task2: We have employee\_details and employee\_expenses files. Use local mode while running Pig and write Pig Latin script to get below results:

employee\_details (EmpID,Name,Salary,EmployeeRating)

emp = Load '/hadoopdata/pig/employee\_details.txt/' using PigStorage(',') AS (emp\_id :int,
emp\_name:chararray,emp\_salary:int, emp\_rating:int);

dump emp;

```
(101, Amitabh, 20000, 1)
(102, Shahrukh, 10000, 2)
(103, Akshay, 11000, 3)
(104, Amubhay, 5000, 4)
(105, Pawan, 2500, 5)
(106, Aamir, Z5000, 1)
(107, Salman, 17500, 2)
(108, Ranbir, 14000, 3)
(109, Ratrina, 1000, 4)
(110, Priyanka, 2000, 5)
(111, Tushar, 500, 1)
(112, Ajay, 5000, 2)
(113, Jubean, 1000, 1)
(113, Madhuri, 2000, 2)
(113, Madhuri, 2000, 2)
(113, Madhuri, 2000, 2)
```

employee\_expenses(EmpID,Expense)

emp\_expenses = LOAD '/hadoopdata/pig/employee\_expense.txt/' AS (emp\_id: int, expenses: int);

```
2010 00 00 00 11.20.22,405 [moxin] 1m 0 019.0pacher.pxy.oackena.moaoop.executionengine.octic / rotat impac paths to process . 1
(102,100)
(110,400)
(114,200)
(119,200)
(105,100)
(101,100)
(104,300)
(104,400)
grunt>
■
```

(a) Top 5 employees (employee id and employee name) with highest rating. (In case two employees have same rating, employee with name coming first in dictionary should get preference)

emp\_rating1 = order emp by emp\_rating DESC, emp\_name ASC;

```
(105,Pawan,2500,5)
(110,Priyanka,2000,5)
(104,Anubhav,5000,4)
(109,Katrina,1000,4)
(103,Akshay,11000,3)
(108,Ranbir,14000,3)
(112,Ajay,5000,2)
(114,Madhuri,2000,2)
(107,Salman,17500,2)
(102,Shahrukh,10000,2)
(106,Aamir,25000,1)
(101,Amitabh,20000,1)
(113,Jubeen,1000,1)
(111,Tushar,500,1)
```

```
emp_rating_limit = LIMIT emp_rating1 5;
Dump emp_rating_limit;
```

```
(105, Pawan, 2500, 5)
(110, Priyanka, 2000, 5)
(104, Anubhav, 5000, 4)
(109, Katrina, 1000, 4)
(103, Akshay, 11000, 3)
]runt>
```

Top 3 employees (employee id and employee name) with highest salary, whose employee id is an odd number. (In case two employees have same salary, employee with name coming first in dictionary should get preference)

emp\_sal = ORDER emp by emp\_salary DESC, emp\_name ASC;

```
106, Aamir, 25000, 1)
101, Amitabh, 20000, 1)
107, Salman, 17500, 2)
108, Ranbir, 1,4000, 3)
103, Akshay, 11000, 3)
102, Shahrukh, 10000, 2)
112, Ajay, 5000, 2)
104, Anubhav, 5000, 4)
105, Pawan, 2500, 5)
114, Madhuri, 2000, 2)
114, Madhuri, 2000, 2)
115, Pawan, 1000, 1)
109, Katrina, 1000, 4)
111, Tushar, 500, 1)
110, Priyanka, 2000, 5)
113, Jubeen, 1000, 1)
1109, Fatrina, 1000, 4)
111, Tushar, 500, 1)
110, Priyanda, 2000, 4)
```

emp\_sal\_id = FILTER emp\_sal by emp\_id%2==1;
dump emp\_sal\_id;

```
2018-08-02 17:21:20,448 [main] INFO org.apache.pig.backend.hadoop.executionengine.util.MapRedUtil - Total input paths to process : 1
(101,Amitabh,20000,1)
(107,Salman,17500,2)
(103,Akshay,11000,3)
(105,Pawan,2500,5)
(113,Jubeen,1000,1)
(109,Katrina,1000,4)
(111,Tushar,500,1)
runt=
```

emp\_final\_limit = LIMIT emp\_sal\_id 3;
grunt> dump emp\_final\_id;

```
(101, Amitabh, 20000, 1)
(107, Salman, 17500, 2)
(103, Akshay, 11000, 3)
grunt>
```

(c) Employee (employee id and employee name) with maximum expense (In case two employees have same expense, employee with name coming first in dictionary should get preference)

```
emp = Load '/hadoopdata/pig/employee_details.txt/' using PigStorage(',') AS (emp_id :int,
emp_name:chararray,emp_salary:int, emp_rating:int);
empexpenses = LOAD '/hadoopdata/pig/employee_expense.txt/' AS (emp_id :int, expense_emp
:int);
emp_exp = JOIN emp BY emp_id , empexpenses BY emp_id;
grunt> maxexpense = ORDER emp_exp BY empexpenses::expense_emp DESC;
grunt> dump maxexpense ;
```

```
2018-08-02 18:10:03,372 [main] INFO org.apache.pig.backend.hadoop.executionengine.util.MapRedUtil - Total input paths to process : 1
(101, Mmitabh, 20000, 1, 101, 100)
(102, Shiahrukh, 10000, 2, 102, 400)
(102, Shiahrukh, 10000, 2, 102, 400)
(104, Anubhav, 5000, 4, 104, 300)
(105, Pawan, 2500, 5, 105, 100)
(110, Priyanda, 2500, 5, 105, 100)
(110, Priyanda, 2500, 5, 110, 400)
(110, Priyanda, 2500, 5, 110, 400)
(114, Madhuri, 2000, 2, 114, 200)
runts emp expenses max BY emp id . emp expenses max BY emp id:You have new mail in /yar/spool/mail/acadoild
```

```
Limitmaxepnse = LIMIT maxexpense 1;
```

```
2018-08-02 19:35:38,410 [main] INFO
(110,Priyanka,2000,5,110,400)
grunt> ■
```

Limitmaxexpensefinal= FOREACH Limitmaxexpense generate emp:emp\_id, emp:emp\_name;

Dump Limitmaxexpensefinal;

```
2018-08-02 20:02:39.990 [main] INFO org.apache.pig.backend.hadoop.executionengine.mapReduceLayer.MapReduceLauncher - Success!
2018-08-02 20:02:40,004 [main] INFO org.apache.pig.data.SchemaTupleBackend - Key [pig.schematuple] was not set... will not generate code.
2018-08-02 20:02:40,032 [main] INFO org.apache.hadoop.mapreduce.lib.input.FileInputFormat - Total input paths to process : 1
2018-08-02 20:02:40,032 [main] INFO org.apache.pig.backend.hadoop.executionengine.util.MapRedUtil - Total input paths to process : 1
(110,Priyanka)
grunt>
```

d) (d) List of employees (employee id and employee name) having entries in employee\_expenses file.

grunt> A = Load '/hadoopdata/pig/employee\_details.txt/' using PigStorage(',') AS (emp\_id :int,
emp\_name:chararray,emp\_salary:int, emp\_rating:int);

B = LOAD '/hadoopdata/pig/employee\_expense.txt/' AS (emp\_id :int, expense\_emp :int);

emp\_expenses = JOIN A BY emp\_id, B BY emp\_id;
emp\_expense\_data = FOREACH emp\_expenses GENERATE emp::emp\_id,emp::emp\_name;

```
grunt> emp_expenses = JOIN A BY emp_id, B BY emp_id;
grunt> emp_expense_data = FOREACH emp_expenses GENERATE A::emp_id, A::emp_name;
grunt> emp_exp_distinct_data = DISTINCT emp_expense_data;
grunt> dump_emp_exp_distinct_data;
```

```
(101,Amitabh)
(182,Shahrukh)
(184,Anubhav)
(185,Pawan)
(110,Priyanka)
(114,Madhuri)
grunt>
```

(e) List of employees (employee id and employee name) having no entry in employee\_expenses file.

A = Load '/hadoopdata/pig/employee\_details.txt/' using PigStorage(',') AS (emp\_id :int, emp\_name:chararray,emp\_salary:int, emp\_rating:int);

B = LOAD '/hadoopdata/pig/employee\_expense.txt/' AS (emp\_id :int, expense\_emp :int);

```
emp_without_exp = JOIN A BY emp_id LEFT OUTER, B BY emp_id;
emp_without_exp_filter = FILTER emp_without_exp BY B::emp_id is null;
emp_without_exp_filter_data = FOREACH emp_without_exp_filter GENERATE A::emp_id, A::emp_name;
dump emp_without_exp_filter_data;
```

```
2018-08-02 21:04:51,987 [main] INFO org.apache.pig.backend.hadoop.executionengine.util.MapRedUtil - Total input paths to process : 1
(103, Akshay)
(106, Salman)
(107, Salman)
(108, Ranbir)
(109, Katrina)
(111, Tushar)
(111, Jushar)
(112, Ajay)
(113, Jubeen)
grunt>
```

# **Task 3: Implementing the use case:** aviation-data-analysis-using-apache-pig.

```
grunt> Register '/home/master/Downloads/piggybank.jar';
2018-02-13 23:35:52,828 [main] INFO org.apache.hadoop.conf.Configuration.deprecation - fs.default.name is deprecated. Instead,
use fs.defaultFS
grunt>
```

### **Problem1: Top 5 most visited destinations.**

```
grunt> A = load '/user/pig/DelayedFlights.csv' USING org.apache.pig.piggybank.storage.CSVExcelStorage(',','NO_MULTILINE','UNIX','SKIP_INPUT_HEADER');
2018-02-13 23:37:08,751 [main] INFO org.apache.hadoop.conf.Configuration.deprecation - fs.default.name is deprecated. Instead, use fs.defaultFS
grunt>
grunt> B = foreach A generate (int)$1 as year, (int)$10 as flight_num, (chararray)$17 as origin, (chararray) $18 as dest;
grunt>
grunt> C = filter B by dest is not null;
grunt> b = group C by dest;
grunt> grunt> E = foreach D generate group, COUNT(C.dest);
grunt> grunt> F = order E by $1 DESC;
grunt>
grunt> grunt> Result = LIMIT F 5;
grunt>
grunt> At = load '/user/pig/airports.csv' USING org.apache.pig.piggybank.storage.CSVExcelStorage(',','NO_MULTILINE','UNIX','SKIP_INPUT_HEADER');
2018-02-13 23:37:13,672 [main] INFO org.apache.hadoop.conf.Configuration.deprecation - fs.default.name is deprecated. Instead, use fs.defaultFS
grunt>
grunt> At = foreach At generate (chararray)$0 as dest, (chararray)$2 as city, (chararray)$4 as country;
grunt>
grunt>
grunt> joined_table = join Result by $0, A2 by dest;
grunt>
grunt> dump joined_table;
```

```
2018-02-13 23:43:54,029 [main] INFO org.apache.hadoop.mapreduce.lib.input.FileInputFormat - Total input paths to process: 1
2018-02-13 23:43:54,029 [main] INFO org.apache.pig.backend.hadoop.executionengine.util.MapRedUtil - Total input paths to process: 1
(ATL,106898,ATL,Atlanta,USA)
(DEN,63003,DEN,Denver,USA)
(DFN,70657,DFW,Dailas-Fort Worth,USA)
(LAX,59969,LAX,Los Angeles,USA)
(ORD,108984,ORD,Chicago,USA)
grunt>
grunt>
grunt>
grunt>
grunt>
```

# Problem2: Which month has seen the most number of cancellations due to bad weather.

```
grunt> A = load '/user/pig/DelayedFlights.csv' USING org.apache.pig.piggybank.storage.CSVExcelStorage(',','NO_MULTILINE','UNIX','SKIP_INPUT_HEADER'
2018-02-13 23:48:22,783 [main] INFO org.apache.hadoop.conf.Configuration.deprecation - fs.default.name is deprecated. Instead, use fs.defaultFS
grunt>
grunt> B = foreach A generate (int)$2 as month,(int)$10 as flight_num,(int)$22 as cancelled,(chararray)$23 as cancel_code;
grunt>
grunt> C = filter B by cancelled == 1 AND cancel_code =='B';
grunt> grunt> D = group C by month;
grunt> grunt> E = foreach D generate group, COUNT(C.cancelled);
grunt> grunt> F = order E by $1 DESC;
grunt> Grun
```

```
2018-02-13 23:43:54,029 [main] INFO org.apache.hadoop.mapreduce.lib.input.fileInputFormat - Total input paths to process: 1
2018-02-13 23:43:54,029 [main] INFO org.apache.pig.backend.hadoop.executionengine.util.MapRedUtil - Total input paths to process: 1
(ATL,106898,ATL,Atlanta,USA)
(DEN,63003,DEN,Denver,USA)
(DFW,70657,DFW,Dallas-Fort Worth,USA)
(LAX,59969,LAX,Los Angeles,USA)
(ORD,108984,ORD,Chicago,USA)
grunt>
grunt>
grunt>
grunt>
grunt>
grunt>
```

## Problem2: Which month has seen the most number of cancellations due to bad weather.

```
grunt> & = load '/user/pig/DelayedFlights.csv' USING org.apache.pig.piggybank.storage.CSVExcelStorage(',','NO_MULTILINE','UNIX','SKIP_INPUT_HEADER');
2018-02-13 23:48:22,783 [main] INFO org.apache.hadoop.conf.Configuration.deprecation - fs.default.name is deprecated. Instead, use fs.defaultFS
grunt> B = foreach & generate (int)$2 as month,(int)$10 as flight_num,(int)$22 as cancelled,(chararray)$23 as cancel_code;
grunt> C = filter B by cancelled == 1 AND cancel_code =='B';
grunt> D = group C by month;
grunt> grunt> E = foreach D generate group, COUNT(C.cancelled);
grunt> F = order E by $1 DESC;
grunt> grunt> Result = limit F 1;
grunt> grunt> Result = limit F 1;
grunt> grunt> dump Result;
```

JobId Maps Reduces MaxM eature Outputs	apTime	MinMa	pTime	AvgHa	pTime	Media	nMapTime	MaxRed	luceTime	MinRed	luceTime AvgRed	uceTime	MedianReducetim
job local150561383 0007 1		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a		SAMPLER		
ob_local1516058916_0009			n/a	n/a	n/a		n/a	n/a	n/a	n/a		hdfs://	localhost:54310/
tmp2063473579,													
job_local1590884819_0006			n/a	n/a			n/a	n/a		n/a	A,B,C,D,E	GROUP_E	BY, COMBINER
job_local399420129_0008 1							n/a				ORDER_BY, COMBI	NER	
Input(s):													
Successfully read 1936758 re-	cords (14	175388323	bytes) :	from: "/	user/pig	/Delayed	Flights.c	sv"					

Job Stats (time in seconds):													
JobId Maps Reduces MaxMa	apTime	MinMap	Time	AvgMap	Time	Median	nMapTime	MaxRe	duceTime	MinRe	duceTime	AvgReduceTin	me MedianReducetime
eature Outputs													
job_local150561383_0007 1		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a		SAMPLER		
job_local1516058916_0009			n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a		hdfs	:://localhost:54310/tm
/tmp2063473579,													
job_local1590884819_0006			n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	A,B,C,D		JP_BY, COMBINER
job_loca1399420129_0008 1		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	F	ORDER_B	Y, COMBINER	
Input(s):													
Successfully read 1936758 red	cords (14	75388323	bytes)	from: "/u	user/pig,	/DelayedI	flights.c	sv"					
Output (s):													
Successfully stored 1 records (100671595 bytes) in: "hdfs://localhost:54310/tmp/temp201885068/tmp2063473579"													
Counters:													
Total records written : 1													
Total bytes written : 1006715													
Spillable Memory Manager spill count : 0													
Total bags proactively spilled: 0													
Total records proactively sp:	illed: 0												

#### **OUTPUT:**

# Problem3: Top ten origins with the highest AVG departure delay.

```
grunt> A = load '/user/pig/DelayedFlights.csv' USING org.apache.pig.piggybank.storage.CSVExcelStorage(',','NO_HULTILINE','UNIX','SKIP_INPUT_HEADER');
2018-02-13 23:53:53,710 [main] INFO org.apache.hadoop.conf.Configuration.deprecation - fs.default.name is deprecated. Instead, use fs.defaultFS
grunt>
grunt> B1 = foreach & generate (int) $16 as dep_delay, (chararray) $17 as origin;
grunt> C1 = filter B1 by (dep_delay is not null) AND (origin is not null);
grunt> D1 = group C1 by origin;
grunt> grunt> D1 = group C1 by origin;
grunt> grunt> E1 = foreach D1 generate group, AVG(C1.dep_delay);
grunt> grunt> Result = order E1 by $1 DESC;
grunt> grunt> Top_ten = limit Result 10;
grunt> Top_ten = limit Result 10;
grunt> lookup = load '/user/pig/airports.csv' USING org.apache.pig.piggybank.storage.CSVExcelStorage(',','NO_HULTILINE','UNIX','SKIP_INPUT_HEADER');
2018-02-13 23:53:58,798 [main] INFO org.apache.hadoop.conf.Configuration.deprecation - fs.default.name is deprecated. Instead, use fs.defaultFS
grunt> grunt> Lookup1 = foreach Lookup generate (chararray) $0 as origin, (chararray) $2 as city, (chararray) $4 as country;
grunt> grunt> Joined = join Lookup1 by origin, Top_ten by $0;
grunt> Final = foreach Joined generate $0,$1,$2,$4;
grunt> grunt> Final = foreach Joined generate $0,$1,$2,$4;
grunt> grunt> Final = foreach Joined generate $0,$1,$2,$4;
grunt> grunt> Final Result = ORDER Final by $3 DESC;
grunt> grunt> final_Result:
```

### **Output:-**

```
2018-02-13 23:55:26,551 [main] INFO org.apache.pig.backend.hadoop.executionengine.mapReduceLayer.MapReduceLauncher - Success!
2018-02-13 23:55:26,552 [main] INFO org.apache.pig.backend.hadoop.conf.Configuration.deprecation - fs.default.name is deprecated. Instead, use fs.defaultFS
2018-02-13 23:55:26,552 [main] INFO org.apache.pig.data.SchemaTupleBackend - SchemaTupleBackend has already been initialized
2018-02-13 23:55:26,555 [main] INFO org.apache.pig.data.SchemaTupleBackend - SchemaTupleBackend has already been initialized
2018-02-13 23:55:26,555 [main] INFO org.apache.pig.backend.hadoop.executionengine.util.MapRedUtil - Total input paths to process: 1
(CMX,Hancock,USA,116.1470588235294)
(PLN,Pellston,USA,93.76190476190476)
(SPI,Springfield,USA,83.84873949579831)
(ALO,Waterloo,USA,82.2258064516129)
(NOT,NA,USA,79.5565024630542)
(ACY,Atlantic City,USA,79.3103448275862)
(NOT,Minot,USA,76.66165413533835)
(HHH,NA,USA,76.53005464480874)
(EGE, Eagle,USA,74.12891986062718)
(BGM,Binghamton,USA,73.15533980582525)
```

### Problem4: Which route (origin & destination) has seen the maximum diversion.

```
grunt> A = load '/user/pig/DelayedFlights.csv' USING org.apache.pig.piggybank.storage.CSVExcelStorage(',','NO_MULTILINE','UNIX','SKIP_INPUT_HEADER');
2018-02-13 23:58:22,279 [main] INFO org.apache.hadoop.conf.Configuration.deprecation - fs.default.name is deprecated. Instead, use fs.defaultFS
grunt>
grunt> B = FOREACH & GENERATE (chararray)$17 as origin, (chararray)$18 as dest, (int)$24 as diversion;
grunt> C = FILTER B BY (origin is not null) AND (dest is not null) AND (diversion == 1);
grunt> D = GROUP C by (origin,dest);
grunt> Grunt> E = FOREACH D generate group, COUNT(C.diversion);
grunt> F = ORDER E BY $1 DESC;
grunt> grunt> Grunt> Result = limit F 10;
grunt> grunt>
```

### **Output:-**

```
2018-02-14 00:01:30,655 [main] INFO org.apache.pig.backend.hadoop.executionengine.mapReduceLayer.MapReduceLauncher - Success!
2018-02-14 00:01:30,657 [main] INFO org.apache.pig.data.SchemaTupleBackend - SchemaTupleBackend has already been initialized
2018-02-14 00:01:30,673 [main] INFO org.apache.pig.data.SchemaTupleBackend - SchemaTupleBackend has already been initialized
2018-02-14 00:01:30,673 [main] INFO org.apache.hadoop.mapreduce.lib.input.FileInputFormat - Total input paths to process: 1
2018-02-14 00:01:30,674 [main] INFO org.apache.pig.backend.hadoop.executionengine.util.MapRedUtil - Total input paths to process: 1
((ORD,LGA),39)
((DAL,HOU),35)
((DFV,LGA),33)
((ATL,LGA),33)
((MIL,LGA),31)
((SLC,SUN),31)
((BUR,OFW),29)
((HAL,HOU),28)
((BUR,DFW),25)
```

```
2018-02-13 23:50:17,897 [main] INFO org.apache.pig.backend.hadoop.executionengine.mapReduceLayer.MapReduceLauncher - Success!
2018-02-13 23:50:17,898 [main] INFO org.apache.hadoop.conf.Configuration.deprecation - fs.default.name is deprecated. Instead, use fs.defaultFS
2018-02-13 23:50:17,899 [main] WARN org.apache.pig.data.SchemaTupleBackend - SchemaTupleBackend has already been initialized
2018-02-13 23:50:17,931 [main] INFO org.apache.hadoop.mapreduce.lib.input.FileInputFormat - Total input paths to process: 1
2018-02-13 23:50:17,932 [main] INFO org.apache.pig.backend.hadoop.executionengine.util.MapRedUtil - Total input paths to process: 1
[12,250]
```