A BEST APPROACH TO RANGE-AGGREGATE QUERIES IN BIG DATA ENVIRONMENT

BIG DATA FOR BETTER SOLUTION

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Project Definition

What is BIG DATA?

Big data is a term that describes the large volume of data – both structured and unstructured – that inundates a business on a day-to-day basis. But it’s not the amount of data that’s important. It’s what organizations do with the data that matters. Big data can be analysed for insights that lead to better decisions and strategic business moves. Big data is changing the way people within organizations work together. It is creating a culture in which business and IT leaders must join forces to realize value from all data. Insights from big data can enable all employees to make better decisions—deepening customer engagement, optimizing operations, preventing threats and fraud, and capitalizing on new sources of revenue. But escalating demand for insights requires a fundamentally new approach to architecture, tools and practices.

Background

Range-aggregate queries execute the aggregate function on number of columns with simultaneously in a given query range. The processing of range-aggregate queries on large amount of data takes the long time to provide the accurate result.

Business Case

Huge amount of data being generated by everything around us at all times. Every digital process and social media exchange produces it. Industries struggling with handle this amount of data. So we made it as a business to give accurate data solution.

Project scope

To increase the processing speed of range-aggregate query and to achieve scalability. The main aim of this project is handling data efficiently for the aggregate functions which are fired on one or more column on the big data.

Desired output for project

This project`s output comes with clear scenarios, use cases, conditions and filtration that has applied on each phases. So it should be clear vision about what we expected in the particular range.

Tools and Techniques

Various complex tools and mind crashing techniques we applied for this project are…

Map Reduce

HDFS

Hive

Pig

Sqoop

Hadoop Framework

The Apache Hadoop software library is a framework that allows for the distributed processing of large data sets across clusters of computers using simple programming models. It is designed to scale up from single servers to thousands of machines, each offering local computation and storage. Rather than rely on hardware to deliver high-availability, the library itself is designed to detect and handle failures at the application layer, so delivering a highly-available service on top of a cluster of computers, each of which may be prone to failures.

The project includes these modules:

Hadoop Common: The common utilities that support the other Hadoop modules.

Hadoop Distributed File System (HDFS): A distributed file system that provides high-throughput access to application data.

Hadoop YARN: A framework for job scheduling and cluster resource management.

Hadoop MapReduce: A YARN-based system for parallel processing of large data sets.

Benefits

Some of the reasons organizations use Hadoop is its' ability to store, manage and analyse vast amounts of structured and unstructured data quickly, reliably, flexibly and at low-cost.

Scalability and Performance – distributed processing of data local to each node in a cluster enables Hadoop to store, manage, process and analyse data at petabyte scale.

Reliability – large computing clusters are prone to failure of individual nodes in the cluster. Hadoop is fundamentally resilient – when a node fails processing is re-directed to the remaining nodes in the cluster and data is automatically re-replicated in preparation for future node failures.

Flexibility – unlike traditional relational database management systems, you don't have to create structured schemas before storing data. You can store data in any format, including semi-structured or unstructured formats, and then parse and apply schema to the data when read.

Low Cost – unlike proprietary software, Hadoop is open source and runs on low-cost commodity hardware.

Hive

The Apache Hive data warehouse software facilitates reading, writing, and managing large datasets residing in distributed storage using SQL. Structure can be projected onto data already in storage. A command line tool and JDBC driver are provided to connect users to Hive.

Benefits

Time-It take very less time to write Hive Query compared to Map Reduce code. For example, the word count problem which takes around 50 lines of code can be written in 5 lines in Hive. So, you save time.

Easy-It is very easy to write query involving joins (if there are few joins) in Hive.

Maintenance-It has very low maintenance and is very simple to learn & use (low learning curve).

Pig

Apache Pig is a platform for analysing large data sets that consists of a high-level language for expressing data analysis programs, coupled with infrastructure for evaluating these programs. The salient property of Pig programs is that their structure is amenable to substantial parallelization, which in turns enables them to handle very large data sets.

Benefits

Ease of programming. It is trivial to achieve parallel execution of simple, "embarrassingly parallel" data analysis tasks

Optimization opportunities. The way in which tasks are encoded permits the system to optimize their execution automatically, allowing the user to focus on semantics rather than efficiency.

Extensibility. Users can create their own functions to do special-purpose processing.

Sqoop

Sqoop is a tool designed to transfer data between Hadoop and relational database servers. It is used to import data from relational databases such as MySQL, Oracle to Hadoop HDFS, and export from Hadoop file system to relational databases.

Database for US Citizens Details

Age	Education	Marital Status	Gender	Tax Filer Status	Income	Parents	Country Of Birth	Citizenship	Weeks Worked
73	High school graduate	Widowed	Female	Non filer	1700.09	Not in universe	United-States	Native-Born in the United States	0

List of use cases

- Total count of male/female based on education.
- Total count of employed/unemployed based on education.
- Total count for people in age range of 18-25 based on education.
- Tax analysis total and gender wise

- Per Capita Income (PCI) analysis consolidated, gender wise and category wise.
- Total amount dispensed on pension in x year(s)
- Total amount dispensed on scholarship in current year
- For given age range employable female widowed and divorced count
- Voter(s) count in x year(s)
- Senior Citizen(s) count in x year(s)
- Total number of Male/Female
- Citizens and immigrants count for employed lot
- Degree wise count for employability
- Customer base analysis
- Non-US citizen(s) tax filer status
- Country of birth wise count for US citizenship

Total count of male/female based on education:

Consider Stanford University, they are trying to offer education in less fee in various categories, but they don`t know about who are all looking for Higher education, who are all looking for Bachelor degree, who are all looking for Master degree and who are all looking for Research in a field. This scenario will help them to filter peoples based on education and they can easily offer their courses.

Used Technologies: HIVE and PIG

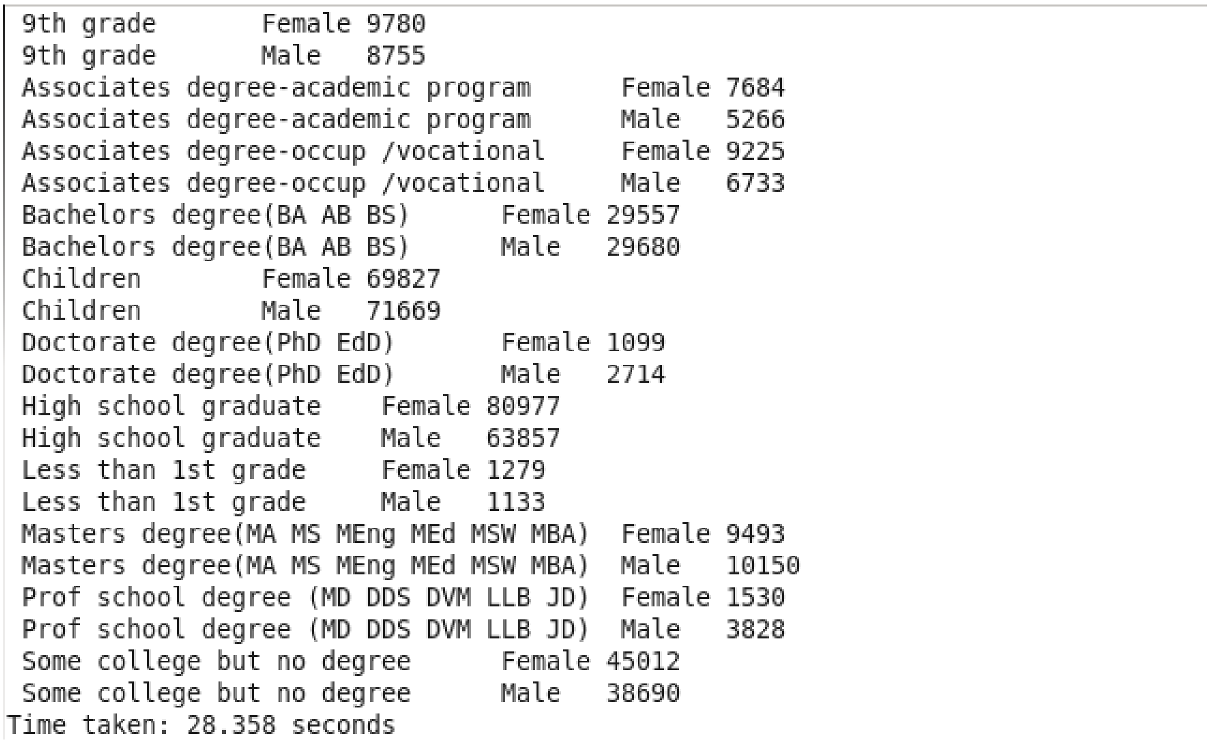
Input: Total US Citizens Details.

Expected output: Total count male and female based on their education.

Hive:

Query: select edu,gen, COUNT(*) Total from final_census1 group by edu,gen;

Output:



```
 9th grade       Female 9780
 9th grade       Male   8755
 Associates degree-academic program      Female 7684
 Associates degree-academic program      Male   5266
 Associates degree-occup /vocational     Female 9225
 Associates degree-occup /vocational     Male   6733
 Bachelors degree(BA AB BS)      Female 29557
 Bachelors degree(BA AB BS)      Male   29680
 Children        Female 69827
 Children        Male   71669
 Doctorate degree(PhD EdD)       Female 1099
 Doctorate degree(PhD EdD)       Male   2714
 High school graduate    Female 80977
 High school graduate    Male   63857
 Less than 1st grade     Female 1279
 Less than 1st grade     Male   1133
 Masters degree(MA MS MEng MEd MSW MBA)  Female 9493
 Masters degree(MA MS MEng MEd MSW MBA)  Male   10150
 Prof school degree (MD DDS DVM LLB JD)  Female 1530
 Prof school degree (MD DDS DVM LLB JD)  Male   3828
 Some college but no degree      Female 45012
 Some college but no degree      Male   38690
Time taken: 28.358 seconds
```

PIG:

Script:

step1 = load '/user/cloudera/Census_Records.json' using JsonLoader('Age:int,Education:chararray,MartialStatus:chararray,Gender:chararray,TaxFilerStatus:chararray,Income:float,Parents:chararray,CountryOfBirth:chararray,Citizenship:chararray,WeeksWorked:chararray');

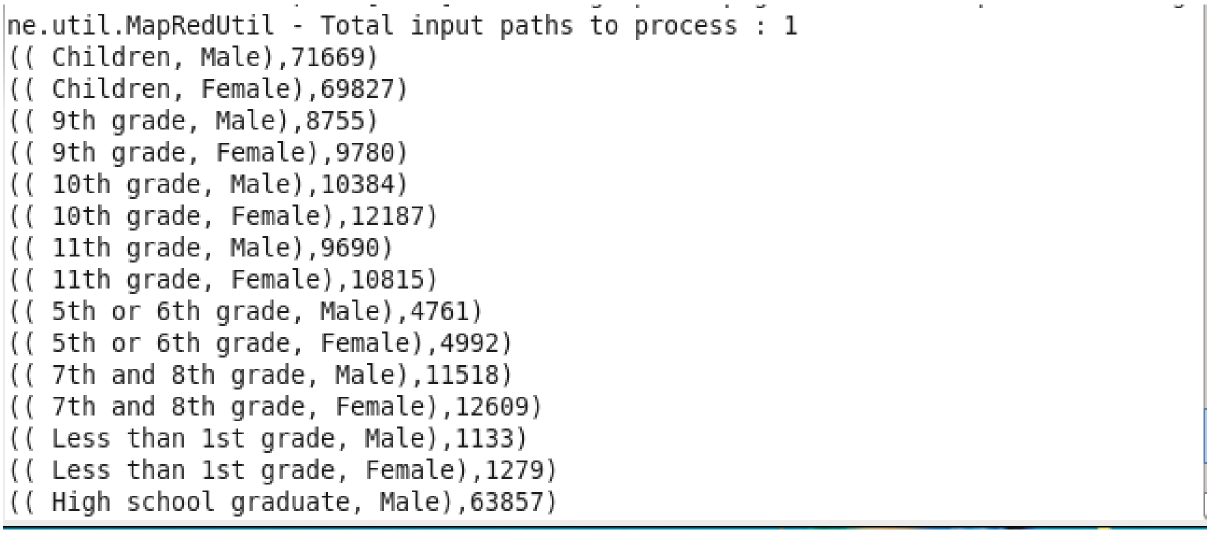
step2 = foreach step1 generate $1 as Edu,$3 as Gen;

step3 = group step2 by ($0,$1);

step4 = foreach step3 generate group,COUNT(step2.Gen);

dump step4;

Output**:**



```
ne.util.MapRedUtil - Total input paths to process : 1
(( Children, Male),71669)
(( Children, Female),69827)
(( 9th grade, Male),8755)
(( 9th grade, Female),9780)
(( 10th grade, Male),10384)
(( 10th grade, Female),12187)
(( 11th grade, Male),9690)
(( 11th grade, Female),10815)
(( 5th or 6th grade, Male),4761)
(( 5th or 6th grade, Female),4992)
(( 7th and 8th grade, Male),11518)
(( 7th and 8th grade, Female),12609)
(( Less than 1st grade, Male),1133)
(( Less than 1st grade, Female),1279)
(( High school graduate, Male),63857)
```

Total count of employed/unemployed based on education:

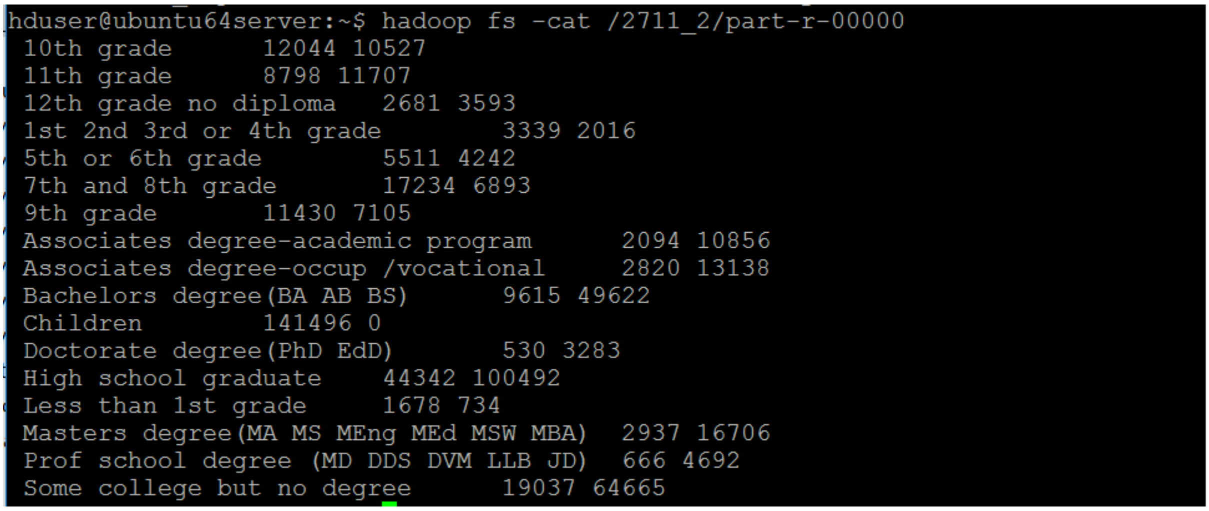
Consider, Microsoft corporation need employees for different categories like security, office staff, and software engineer as fresher and software engineer in experienced. But they don`t know about ho w many peoples are employed and unemployed. So this scenario will help them to filter peoples based on employability, and based on their education they can provide related jobs.

Used Technologies: HIVE and PIG Advance MapReduce

Input: Total US Citizens Details.

Expected output: Total count employed and unemployed based on their education.

Advance MapReduce:



```
hduser@ubuntu64server:~$ hadoop fs -cat /2711_2/part-r-00000
 10th grade       12044 10527
 11th grade       8798 11707
 12th grade no diploma    2681 3593
 1st 2nd 3rd or 4th grade        3339 2016
 5th or 6th grade        5511 4242
 7th and 8th grade       17234 6893
 9th grade       11430 7105
 Associates degree-academic program      2094 10856
 Associates degree-occup /vocational     2820 13138
 Bachelors degree(BA AB BS)      9615 49622
 Children        141496 0
 Doctorate degree(PhD EdD)       530 3283
 High school graduate    44342 100492
 Less than 1st grade     1678 734
 Masters degree(MA MS MEng MEd MSW MBA)  2937 16706
 Prof school degree (MD DDS DVM LLB JD)  666 4692
 Some college but no degree      19037 64665
```

PIG:

Employed Counts:

Script:

step1 = load '/user/cloudera/Census_Records.json' using JsonLoader('Age:int,Education:chararray,MartialStatus:chararray,Gender:chararray,TaxFilerStatus:chararray,Income:float,Parents:chararray,CountryOfBirth:chararray,Citizenship:chararray,WeeksWorked:int');

step2 = foreach step1 generate $1 as Edu,$9 as ww;

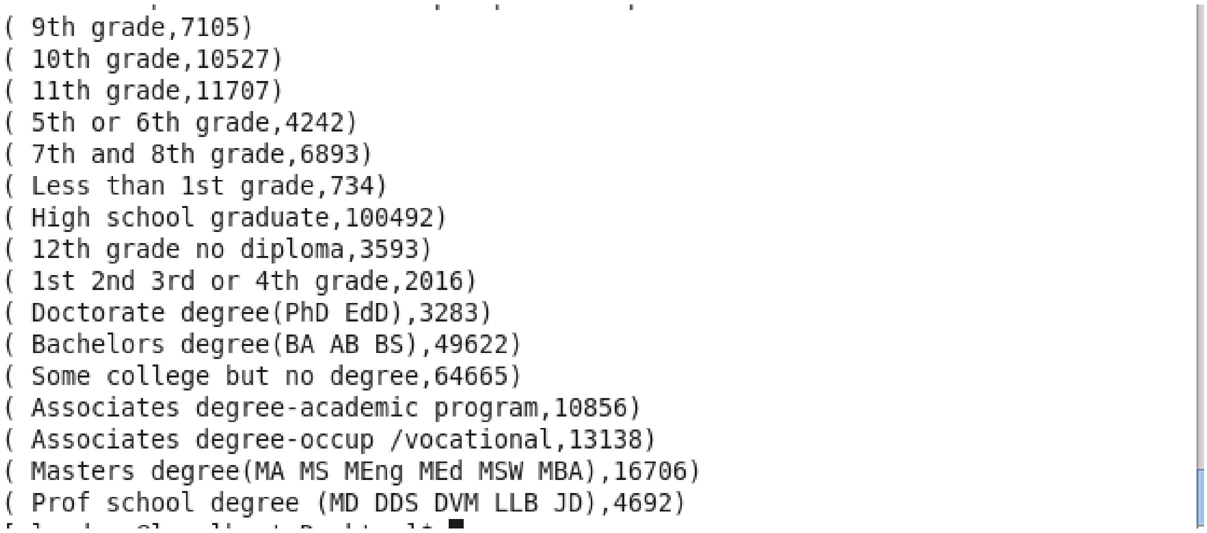
step3 = filter step2 by $1>0;

step4 = group step3 by $0;

step5 = foreach step4 generate group,COUNT($1);

dump step5;

Output:



```
( 9th grade,7105)
( 10th grade,10527)
( 11th grade,11707)
( 5th or 6th grade,4242)
( 7th and 8th grade,6893)
( Less than 1st grade,734)
( High school graduate,100492)
( 12th grade no diploma,3593)
( 1st 2nd 3rd or 4th grade,2016)
( Doctorate degree(PhD EdD),3283)
( Bachelors degree(BA AB BS),49622)
( Some college but no degree,64665)
( Associates degree-academic program,10856)
( Associates degree-occup /vocational,13138)
( Masters degree(MA MS MEng MEd MSW MBA),16706)
( Prof school degree (MD DDS DVM LLB JD),4692)
```

Unemployed Counts:

Script:

step1 = load '/user/cloudera/Census_Records.json' using JsonLoader('Age:int,Education:chararray,MartialStatus:chararray,Gender:chararray,TaxFilerStatus:chararray,Income:float,Parents:chararray,CountryOfBirth:chararray,Citizenship:chararray,WeeksWorked:int');

step2 = foreach step1 generate $1 as Edu,$9 as ww;

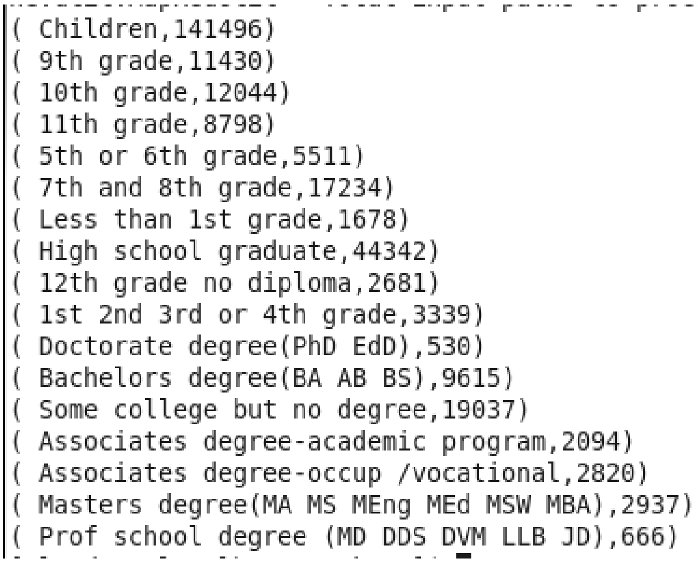
step3 = filter step2 by $1==0;

step4 = group step3 by $0;

step5 = foreach step4 generate group,COUNT($1);

dump step5;

Output**:**

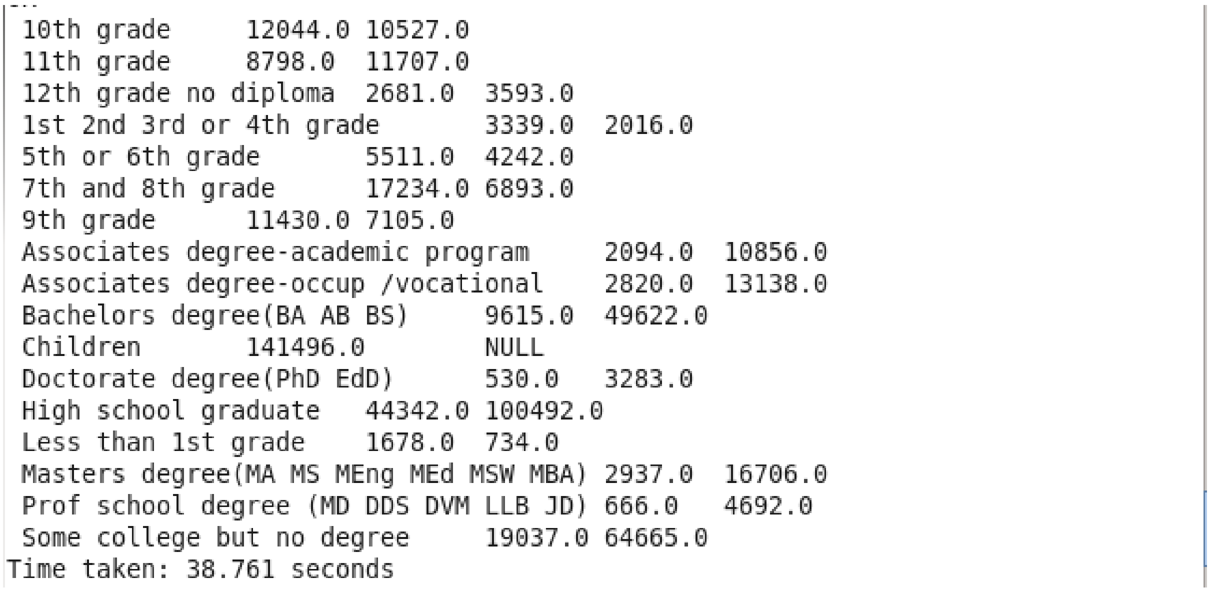


```
( Children,141496)
( 9th grade,11430)
( 10th grade,12044)
( 11th grade,8798)
( 5th or 6th grade,5511)
( 7th and 8th grade,17234)
( Less than 1st grade,1678)
( High school graduate,44342)
( 12th grade no diploma,2681)
( 1st 2nd 3rd or 4th grade,3339)
( Doctorate degree(PhD EdD),530)
( Bachelors degree(BA AB BS),9615)
( Some college but no degree,19037)
( Associates degree-academic program,2094)
( Associates degree-occup /vocational,2820)
( Masters degree(MA MS MEng MEd MSW MBA),2937)
( Prof school degree (MD DDS DVM LLB JD),666)
```

HIVE:

Query**:** select edu, SUM(CASE when ww <=0 then '1' else null END) as Employed , SUM(CASE when ww >0 then '1' else null END) as Unemployed from final_census1 group by edu;

Output:



```
 10th grade     12044.0 10527.0
 11th grade     8798.0  11707.0
 12th grade no diploma  2681.0  3593.0
 1st 2nd 3rd or 4th grade       3339.0  2016.0
 5th or 6th grade       5511.0  4242.0
 7th and 8th grade      17234.0 6893.0
 9th grade      11430.0 7105.0
 Associates degree-academic program     2094.0  10856.0
 Associates degree-occup /vocational    2820.0  13138.0
 Bachelors degree(BA AB BS)     9615.0  49622.0
 Children       141496.0        NULL
 Doctorate degree(PhD EdD)      530.0   3283.0
 High school graduate   44342.0 100492.0
 Less than 1st grade    1678.0  734.0
 Masters degree(MA MS MEng MEd MSW MBA) 2937.0  16706.0
 Prof school degree (MD DDS DVM LLB JD) 666.0   4692.0
 Some college but no degree     19037.0 64665.0
Time taken: 38.761 seconds
```

Total count for people in age range of 18-25 based on education:

Consider, US government need 5000 peoples for their military defence and those peoples must in 18-25 age range. So in these cases this scenario will help US government to restrict peoples who are all between 18-25 ages.

Used Technologies: HIVE and PIG

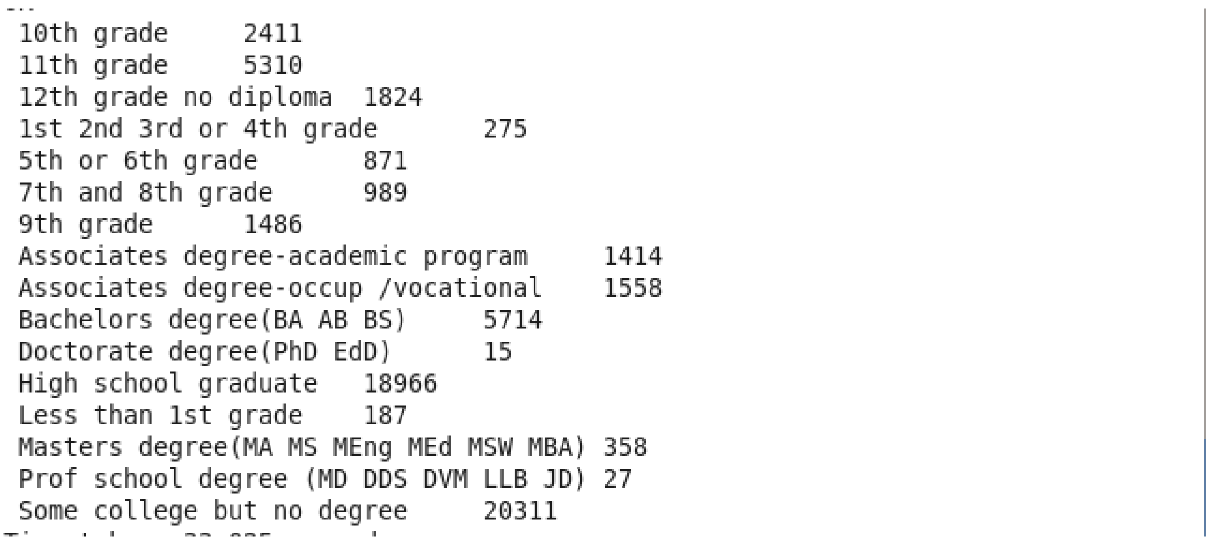
Input: Total US Citizens Details.

Expected output: Total number of peoples based on their age.

HIVE:

Query: select edu,count(*) as total_peoples from the final_census where age between 18 and 25 group by edu;

Output:



```
10th grade      2411
11th grade      5310
12th grade no diploma   1824
1st 2nd 3rd or 4th grade        275
5th or 6th grade        871
7th and 8th grade       989
9th grade       1486
Associates degree-academic program      1414
Associates degree-occup /vocational     1558
Bachelors degree(BA AB BS)      5714
Doctorate degree(PhD EdD)       15
High school graduate    18966
Less than 1st grade     187
Masters degree(MA MS MEng MEd MSW MBA) 358
Prof school degree (MD DDS DVM LLB JD) 27
Some college but no degree      20311
```

PIG:

Script:

a = load '/user/cloudera/Census_Records.json' using JsonLoader('age:int,edu:chararray,mar:chararray,gen:chararray,tax:chararray,income:chararray,parent:chararray,country:chararray,citizen:chararray,ww:int');

b = foreach a generate age,edu;

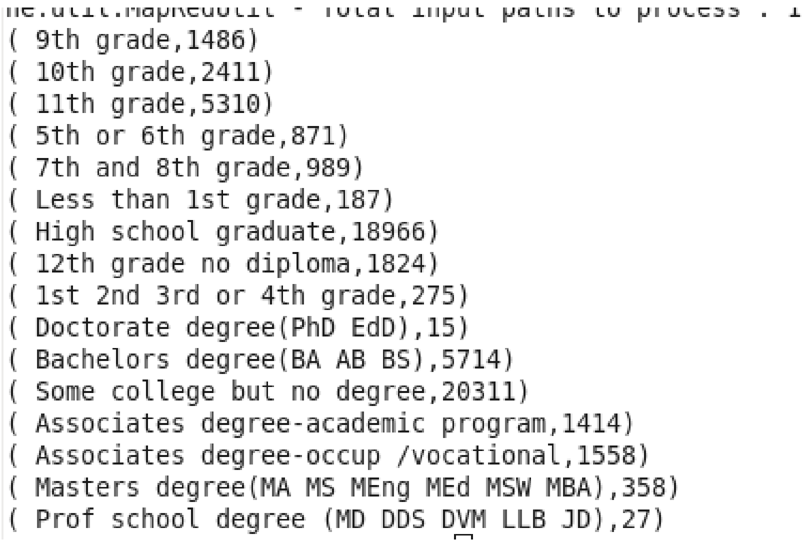
c = filter b by age>17 and age<26;

j = group c by edu;

d = foreach j generate group,COUNT(c.age);

dump d;

Output:



```
ne.util.MapRedUtil - Total input paths to process : 1
( 9th grade,1486)
( 10th grade,2411)
( 11th grade,5310)
( 5th or 6th grade,871)
( 7th and 8th grade,989)
( Less than 1st grade,187)
( High school graduate,18966)
( 12th grade no diploma,1824)
( 1st 2nd 3rd or 4th grade,275)
( Doctorate degree(PhD EdD),15)
( Bachelors degree(BA AB BS),5714)
( Some college but no degree,20311)
( Associates degree-academic program,1414)
( Associates degree-occup /vocational,1558)
( Masters degree(MA MS MEng MEd MSW MBA),358)
( Prof school degree (MD DDS DVM LLB JD),27)
```

Tax analysis total and gender wise:

Consider, Income Tax Department want to know total tax filers and gender wise tax filers, then this scenario will help them to filter total tax filers and gender wise tax filers.

Used Technologies: HIVE

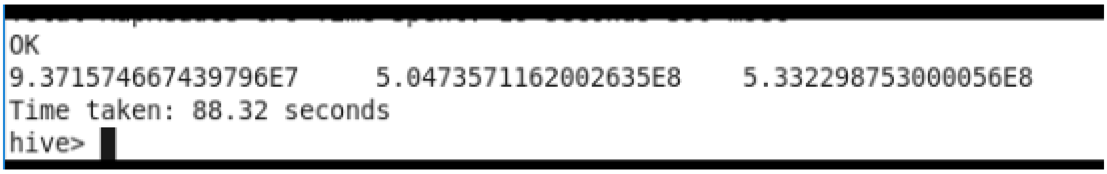
Input: Total US Citizens Details.

Expected output: Total count of tax filers and gender wise tax filers.

HIVE:

Query: select SUM(income*tax_pct) as total,SUM(CASE f.gender when ‘ Male’ then income END) as taxmale,SUM(CASE f.gender when ‘ Female’ then income END) as taxfemale from final_census f join genwisetax t on (f.gender=t.gender) where f.income between t.minamount and t,maxamount;

Output:



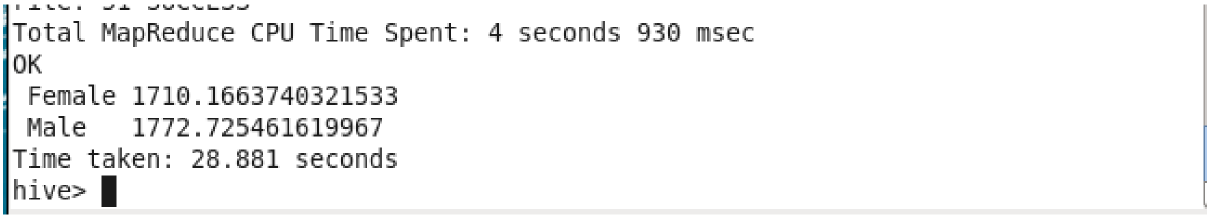
```
OK
9.371574667439796E7     5.0473571162002635E8    5.332298753000056E8
Time taken: 88.32 seconds
hive> 
```

Per Capita Income (PCI) analysis consolidated, gender wise and category wise:

HIVE:

Query: select gen,sum(income)/count(gen) from final_census group by gen;

Output:



```
Total MapReduce CPU Time Spent: 4 seconds 930 msec
OK
 Female 1710.1663740321533
 Male   1772.725461619967
Time taken: 28.881 seconds
hive> 
```

PIG:

Script:

a = load '/user/cloudera/Census_Records.json' using JsonLoader('age:int,edu:chararray,mar:chararray,gen:chararray,tax:chararray,income:float,parent:chararray,country:chararray,citizen:chararray,ww:int');

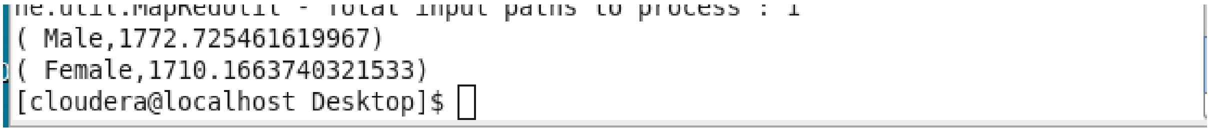
b = foreach a generate gen,income;

c = group b by gen;

d = foreach c generate group,SUM(b.income)/COUNT(b.gen);

dump d;

Output:



```
ne.util.MapRedUtil - Total input paths to process : 1
( Male,1772.725461619967)
( Female,1710.1663740321533)
[cloudera@localhost Desktop]$ 
```

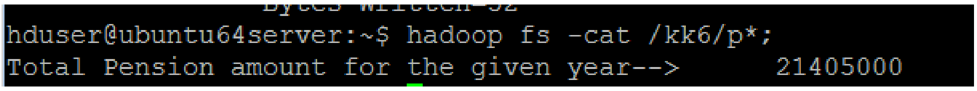
Social Welfare:

Consider, Magicbususa is the top most Non-Government Organization in US. Magicbususa ready to offer pension for senior citizens in US and scholarship for students who are all don`t have their both parents and who are all have mother only and who are all have father only. And Magicbususa takes more care on woman who are all employable and who are all widowed and who are all divorced. Magicbususa also want to know how much amount dispensed in pension, scholarship, widowed, divorced, and unemployable categories. So this scenario will definitely help them to filter peoples in several categories.

Used Technologies: Advance MapReduce, PIG and HIVE

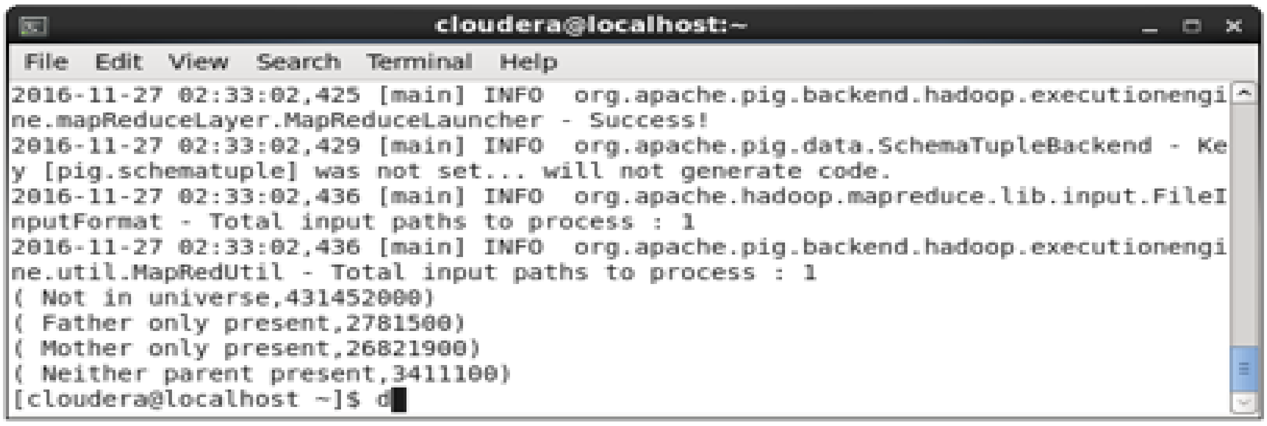
Input: Total US Citizens Details.

Total amount dispensed on pension in x year(s):



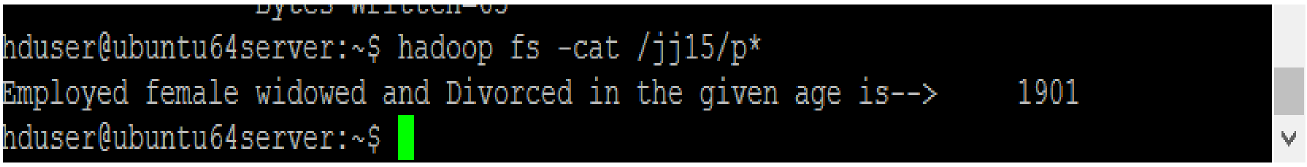
```
                 Bytes Written=32
hduser@ubuntu64server:~$ hadoop fs -cat /kk6/p*;
Total Pension amount for the given year-->      21405000
```

Total amount dispensed on scholarship in current year:



```
2016-11-27 02:33:02,425 [main] INFO  org.apache.pig.backend.hadoop.executionengi
ne.mapReduceLayer.MapReduceLauncher - Success!
2016-11-27 02:33:02,429 [main] INFO  org.apache.pig.data.SchemaTupleBackend - Ke
y [pig.schematuple] was not set... will not generate code.
2016-11-27 02:33:02,436 [main] INFO  org.apache.hadoop.mapreduce.lib.input.FileI
nputFormat - Total input paths to process : 1
2016-11-27 02:33:02,436 [main] INFO  org.apache.pig.backend.hadoop.executionengi
ne.util.MapRedUtil - Total input paths to process : 1
( Not in universe,431452000)
( Father only present,2781500)
( Mother only present,26821900)
( Neither parent present,3411100)
[cloudera@localhost ~]$ d
```

For given age range employable female widowed and divorced count:



```
        Bytes Written=65
hduser@ubuntu64server:~$ hadoop fs -cat /jj15/p*
Employed female widowed and Divorced in the given age is-->     1901
hduser@ubuntu64server:~$
```

Process for the future:

Consider, US government try to take a survey about voters and senior citizens after 5 years, this scenario is very suitable for take a survey.

Used Technologies: HIVE

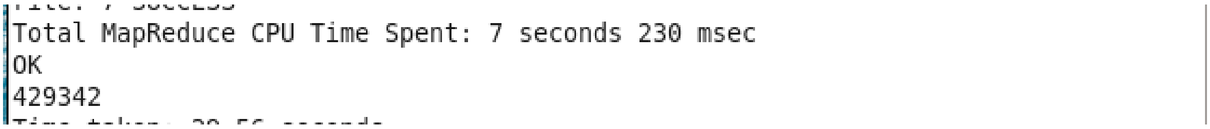
Input: Total US Citizens Details.

Plan for voter(s):

Query:

select COUNT(*) as Total_Voters from final_census where age+(${hiveconf:year}-YEAR(from_unixtime(unix_timestamp())))>=18;

Output:

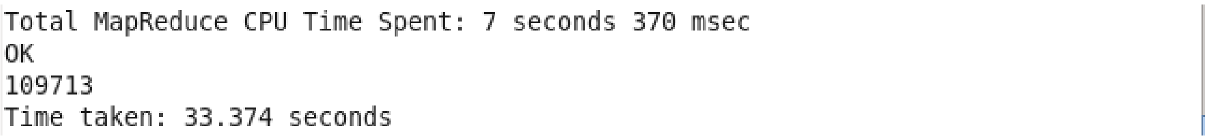


```
Total MapReduce CPU Time Spent: 7 seconds 230 msec
OK
429342
```

Senior Citizen(s) count in x year(s):

Query: select COUNT(*) as Total_Senior_Citizen from final_census where age+(${hiveconf:year}-YEAR(from_unixtime(unix_timestamp())))>=60;

Output:



```
Total MapReduce CPU Time Spent: 7 seconds 370 msec
OK
109713
Time taken: 33.374 seconds
```

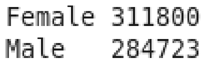
Total number of Male/Female:

Input: Total US Citizens Details.

Expected output: Total count of male and female.

Query: select gender, COUNT(*) as Total from final_census group by gender;

Output:



```
Female 311800
Male   284723
```

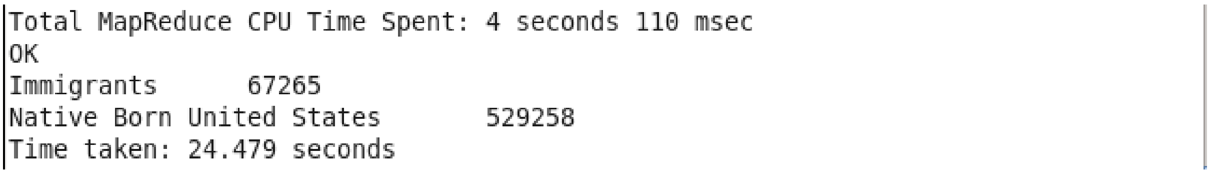
Citizens and immigrants count for employed lot:

Input: Total US Citizens Details.

Expected output: Total count citizen and immigrants.

Query: select citizenship, COUNT(*) from (select CASE citizenship when ' Native- Born in the United States' then 'Native Born United States' else 'Immigrants' END citizenship from final_census) a group by citizenship;

Output:



```
Total MapReduce CPU Time Spent: 4 seconds 110 msec
OK
Immigrants      67265
Native Born United States       529258
Time taken: 24.479 seconds
```

Degree wise count for employability:

Consider, Google corporation need employees for different categories like security, office staff, and software engineer as fresher and software engineer in experienced. But they don`t know about how many peoples are unemployed. So this scenario will help them to filter peoples based on unemployed as per education, and based on their education they can provide related jobs.

Used Technologies: HIVE, PIG and Advance MapReduce

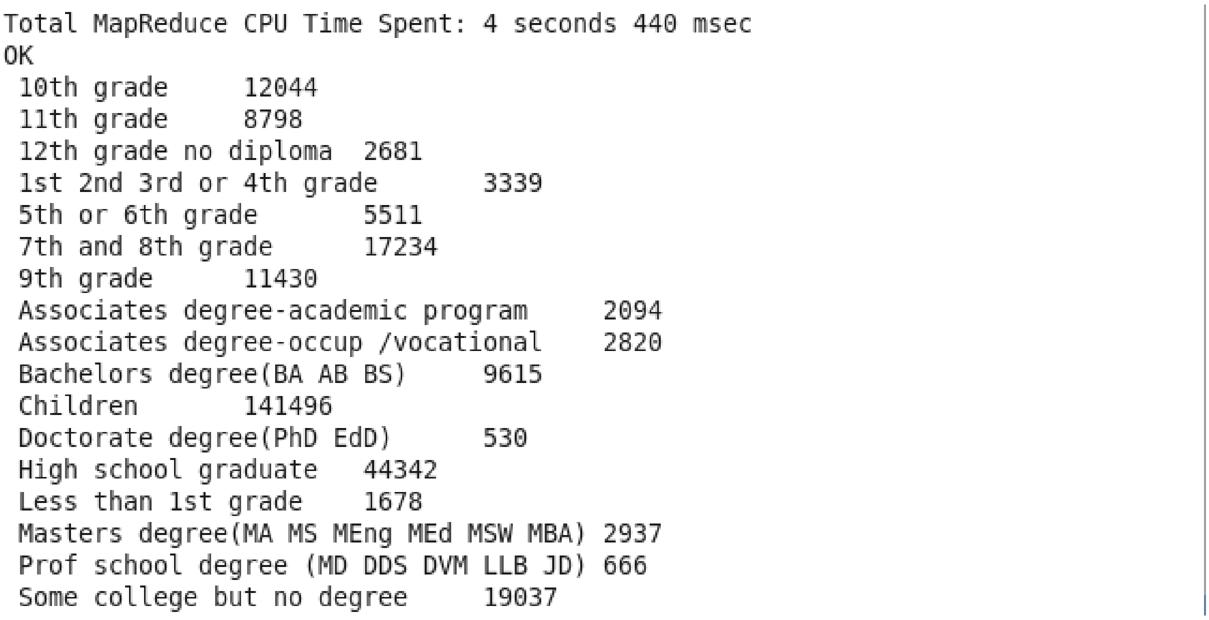
Input: Total US Citizens Details.

Expected output: Degree wise count for employability.

HIVE:

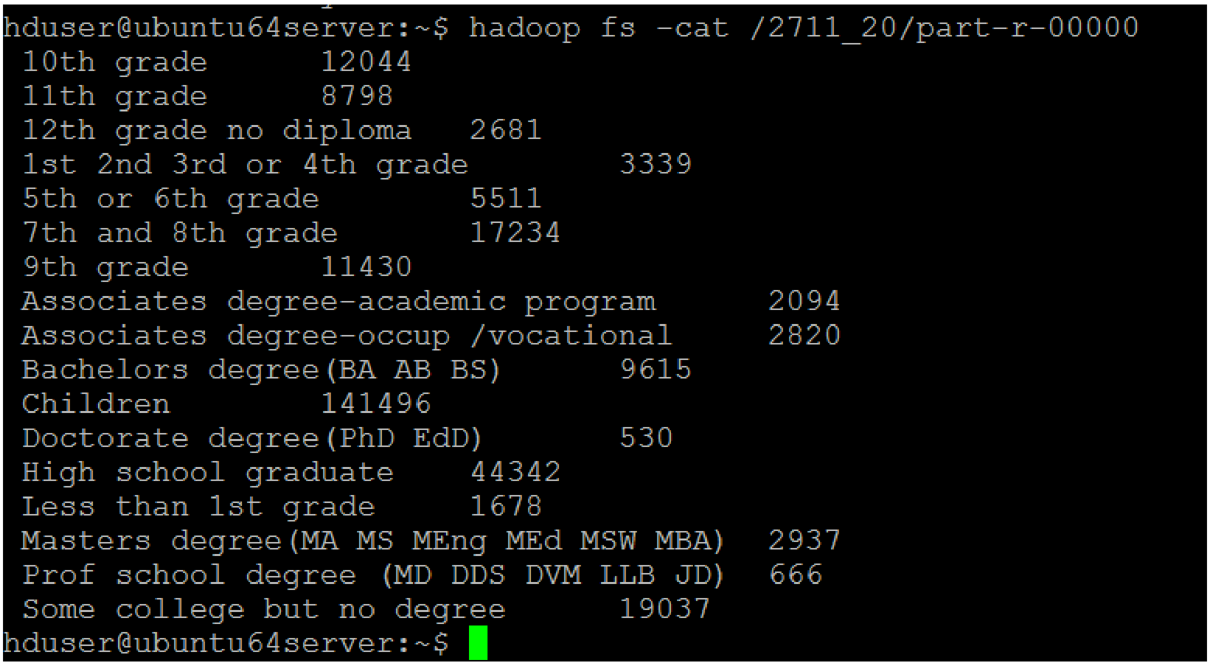
Query: select edu,COUNT(*) from final_census where ww=0 group by edu;

Output:



```
Total MapReduce CPU Time Spent: 4 seconds 440 msec
OK
 10th grade     12044
 11th grade     8798
 12th grade no diploma  2681
 1st 2nd 3rd or 4th grade       3339
 5th or 6th grade       5511
 7th and 8th grade      17234
 9th grade      11430
 Associates degree-academic program     2094
 Associates degree-occup /vocational    2820
 Bachelors degree(BA AB BS)     9615
 Children       141496
 Doctorate degree(PhD EdD)      530
 High school graduate   44342
 Less than 1st grade    1678
 Masters degree(MA MS MEng MEd MSW MBA) 2937
 Prof school degree (MD DDS DVM LLB JD) 666
 Some college but no degree     19037
```

Advance MapReduce:



```
hduser@ubuntu64server:~$ hadoop fs -cat /2711_20/part-r-00000
 10th grade     12044
 11th grade     8798
 12th grade no diploma  2681
 1st 2nd 3rd or 4th grade       3339
 5th or 6th grade       5511
 7th and 8th grade      17234
 9th grade      11430
 Associates degree-academic program     2094
 Associates degree-occup /vocational    2820
 Bachelors degree(BA AB BS)     9615
 Children       141496
 Doctorate degree(PhD EdD)      530
 High school graduate   44342
 Less than 1st grade    1678
 Masters degree(MA MS MEng MEd MSW MBA) 2937
 Prof school degree (MD DDS DVM LLB JD) 666
 Some college but no degree     19037
hduser@ubuntu64server:~$
```

PIG:

a = load '/user/cloudera/Census_Records.json' using JsonLoader('age:int,edu:chararray,mar:chararray,gen:chararray,tax:chararray,income:float,parent:chararray,country:chararray,citizen:chararray,ww:int');

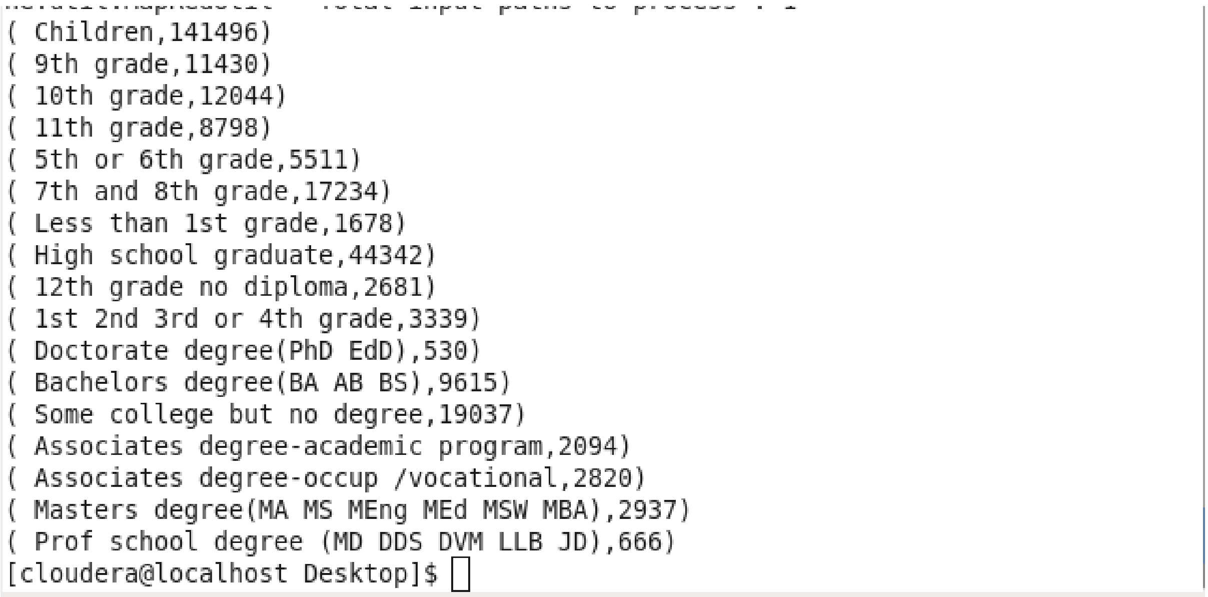
b = foreach a generate $1,$9;

c = filter b by ww==0;

d = group c by $0;

e = foreach d generate group,COUNT(c.$0);

dump e;



```
[illegible] - Total input paths to process : 1
( Children,141496)
( 9th grade,11430)
( 10th grade,12044)
( 11th grade,8798)
( 5th or 6th grade,5511)
( 7th and 8th grade,17234)
( Less than 1st grade,1678)
( High school graduate,44342)
( 12th grade no diploma,2681)
( 1st 2nd 3rd or 4th grade,3339)
( Doctorate degree(PhD EdD),530)
( Bachelors degree(BA AB BS),9615)
( Some college but no degree,19037)
( Associates degree-academic program,2094)
( Associates degree-occup /vocational,2820)
( Masters degree(MA MS MEng MEd MSW MBA),2937)
( Prof school degree (MD DDS DVM LLB JD),666)
[cloudera@localhost Desktop]$ 
```

Customer base analysis:

Consider, Amazon Company made a hair gel a product, they try to sell this. This product mostly focused on adults and who have their income more than $1500. So based on US citizenship Amazon want to know how many adults are there and their incomes. This scenario will help Amazon to filter peoples based on age, income and gender wise.

Used Technologies: PIG

Input: Total US Citizens Details.

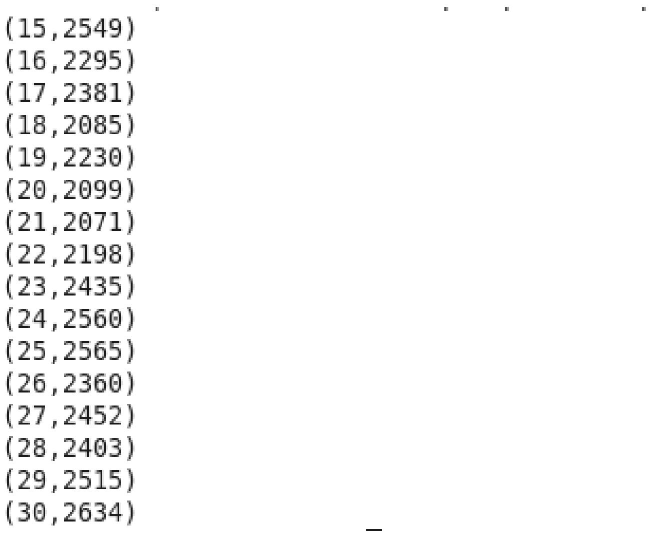
Expected output: Gender wise adults and income wise greater than $1500.

PIG:

Script:

```
a = load '/user/cloudera/Census.json' using
JsonLoader('age:int,edu:chararray,mar:chararray,gen:chararray,tax:chararray,inc
ome:long,parent:chararray,country:chararray,citizen:chararray,ww:int');
b = foreach a generate age,gen,income;
d = filter b by ((gen==' Male' and income>1500) and (age>14 and age<31)) ;
j = group d by age;
k = foreach j generate group,COUNT(d.age);
dump k;
```

Output:



```
(15,2549)
(16,2295)
(17,2381)
(18,2085)
(19,2230)
(20,2099)
(21,2071)
(22,2198)
(23,2435)
(24,2560)
(25,2565)
(26,2360)
(27,2452)
(28,2403)
(29,2515)
(30,2634)
```

Non-US citizen(s) tax filer status:

Consider, US government want to know who all Non-US citizens are paying tax in US. This scenario will help government to filter Non-US tax filers.

Used Technologies: HIVE

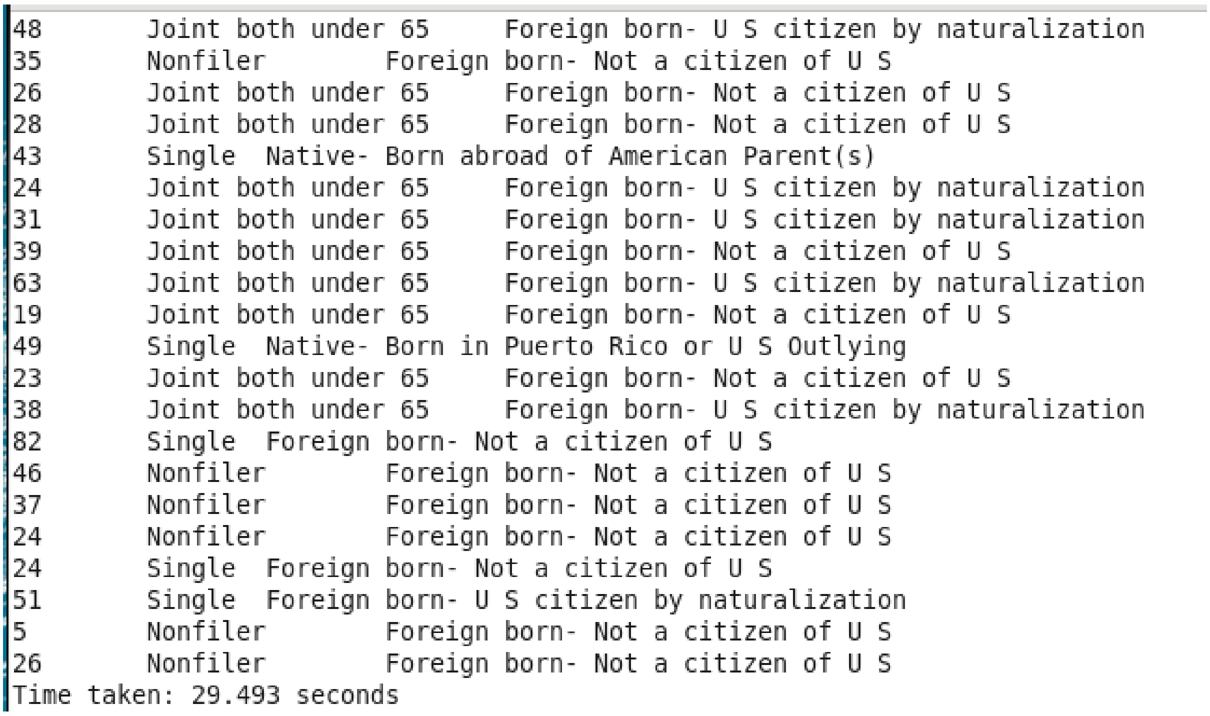
Input: Total US Citizens Details.

Expected output: Tax filers of Non-US citizens.

HIVE:

Query: select age,tax,citizen from final_census where citizen not in(‘ Native-Born in the Unites States’);

Output:



```
48       Joint both under 65     Foreign born- U S citizen by naturalization
35       Nonfiler        Foreign born- Not a citizen of U S
26       Joint both under 65     Foreign born- Not a citizen of U S
28       Joint both under 65     Foreign born- Not a citizen of U S
43       Single  Native- Born abroad of American Parent(s)
24       Joint both under 65     Foreign born- U S citizen by naturalization
31       Joint both under 65     Foreign born- U S citizen by naturalization
39       Joint both under 65     Foreign born- Not a citizen of U S
63       Joint both under 65     Foreign born- U S citizen by naturalization
19       Joint both under 65     Foreign born- Not a citizen of U S
49       Single  Native- Born in Puerto Rico or U S Outlying
23       Joint both under 65     Foreign born- Not a citizen of U S
38       Joint both under 65     Foreign born- U S citizen by naturalization
82       Single  Foreign born- Not a citizen of U S
46       Nonfiler        Foreign born- Not a citizen of U S
37       Nonfiler        Foreign born- Not a citizen of U S
24       Nonfiler        Foreign born- Not a citizen of U S
24       Single  Foreign born- Not a citizen of U S
51       Single  Foreign born- U S citizen by naturalization
5        Nonfiler        Foreign born- Not a citizen of U S
26       Nonfiler        Foreign born- Not a citizen of U S
Time taken: 29.493 seconds
```

Country of birth wise count for US citizenship:

Consider, Indian government offer Rs.50,000 for their native peoples who are all struggling in United States. If the Indian government don`t know any idea about how many peoples are settled in United States. So in this situation this scenario will help them to figure out. And this scenario will also help to United States government to keep track on birth wise other country citizens.

Used Technologies: HIVE

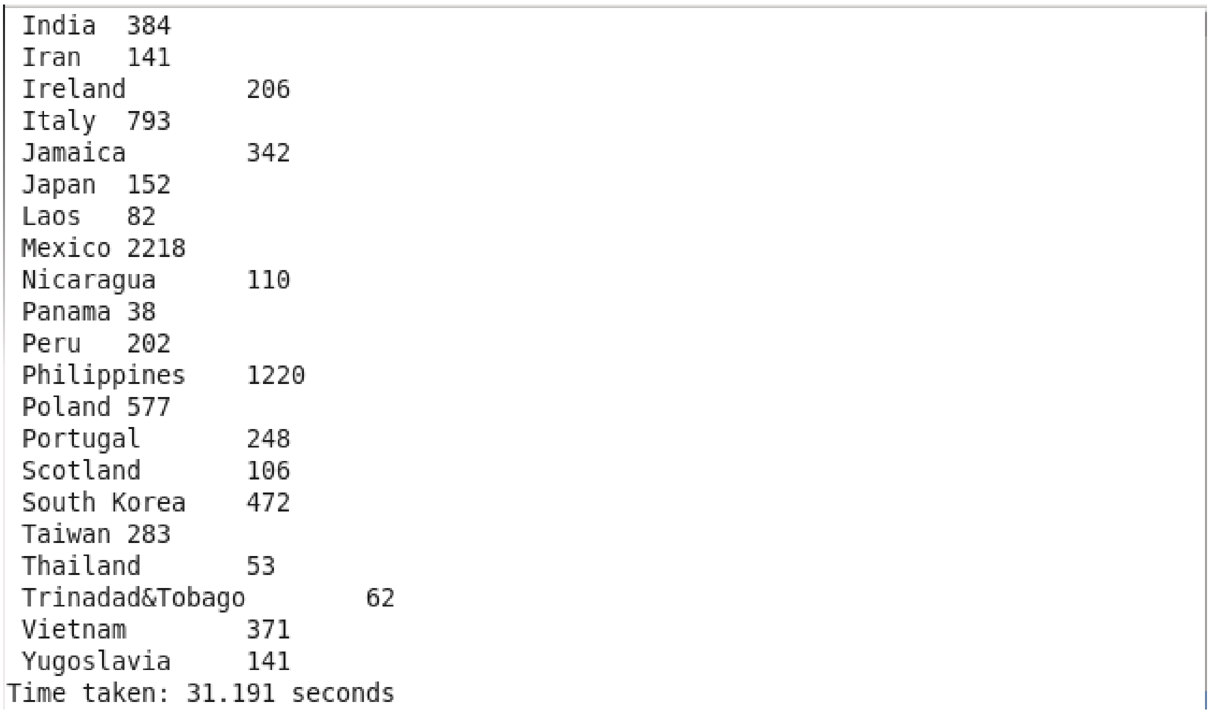
Input: Total US Citizens Details.

Expected output: Country of birth wise count for US citizenship

HIVE:

Query: select cntry,count(citizen) from final_census where citizen=’ Foreign born- U S citizen by naturalization’ group by cntry;

Output:



```
 India  384
 Iran   141
 Ireland        206
 Italy  793
 Jamaica        342
 Japan  152
 Laos   82
 Mexico 2218
 Nicaragua      110
 Panama 38
 Peru   202
 Philippines    1220
 Poland 577
 Portugal       248
 Scotland       106
 South Korea    472
 Taiwan 283
 Thailand       53
 Trinadad&Tobago        62
 Vietnam        371
 Yugoslavia     141
Time taken: 31.191 seconds
```

Software and Hardware requirement

- **Operating System :** Windows 7,8,10 and Mac.
- **Supporting software's:** Ubuntu,putty, Oracle VM VirtualBox,WinSCP.
- **RAM :** Minimum 4GB.

Conclusion

With these different scenarios I can find accurate solution with a huge dataset in different technologies. From this project I have ability to handle tools and techniques from Hadoop.