

# Project Part 1

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## Introduction and Problem Description:

From the dataset provided we could compare products and develop insights as to which products are better with respect to sales and response rate. This was possible because of various parameters like Number of Reviews, Number of Users, Rating, Customer ID, Product ID wherein Customer ID is unique and could not be reused more than once. Another parameter would be customer ratings for the products. Customer ratings would give a fair insight to the potential buyer and would help them choose the right product for them.

Some products are bound to have better ratings than others. My aim is to analyze which product is performing well and which product is not through the queries that are mentioned below. The products which have not so good reviews could be brought to the notice of the business and they could then focus on how to improve them.

As for the products with good customer reviews and ratings could be used by the business to analyze what they did right, how to improve on them and introduce the same kind of plan for future products for them to be a success.

The approach that I have followed to complete my analysis include :

**Data Cleaning, Views, Partition the dataset, Visualization for better understanding for the business, Analytic queries to achieve desired interpretations.**

## Technical Scripts and SQL Queries

The dataset has too many records with multiple reviews by the same user for the same product.

Use of such data could lead to misrepresentation of the product review.

I have thus decided to exclude records that have multiple reviews of the same product by the same user.

For this I have created a filter View and taken data into consideration only after 2005 as the previous data is not of much importance for our analysis.

I have also included suitable Visualizations for the queries and their interpretation.

The data has various product categories and they have been analyzed

### **Create View with excluded data**

```
CREATE view filter_excluded AS
```

```

SELECT *

FROM amazon_review.amazon_reviews_parquet

WHERE review_id IN

(SELECT x.review_id FROM

(SELECT customer_id, product_id, review_id,

count(*))

FROM amazon_review.amazon_reviews_parquet

GROUP BY customer_id, product_id, review_id

HAVING (count(*)) = 1) as x) and product_category IN

('Wireless', 'Automotive', 'Music', 'Digital_Music_Purchase', 'Sports', 'Toys', 'Digital_Video_Games', 'Video_Games');

```

```

> group by product_category;
Query ID = hadoop_20200411193229_1639477c-d96c-49f0-8246-d059cb3861bf
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1586631615195_0009)

-----
VERTICES    MODE             STATUS    TOTAL    COMPLETED    RUNNING    PENDING    FAILED    KILLED
-----
Map 1 ..... container    SUCCEEDED    13        13            0           0           0           0
Reducer 2 ... container    SUCCEEDED    39        39            0           0           0           0
-----
VERTICES: 02/02 [=====] 100% ELAPSED TIME: 146.55 s
-----
OK
product_category    cnt
Music                6177781
Video_Games          1888486
Wireless             9038249
Toys                 4981601
Automotive           3516476
Sports               4868054
Digital_Music_Purchase 1852184
Digital_Video_Games  145431
Time taken: 151.556 seconds, Fetched: 8 row(s)
hive> CREATE view filter_excluded AS
> SELECT *
> FROM amazon_review.amazon_reviews_parquet
> WHERE review_id IN
> (SELECT x.review_id
> FROM
> (SELECT customer_id,
> product_id,
> review_id,
> count(*))
> FROM amazon_review.amazon_reviews_parquet
> GROUP BY customer_id, product_id, review_id
> HAVING (count(*)) = 1) as x) and product_category IN
> ('Wireless', 'Automotive', 'Music', 'Digital_Music_Purchase', 'Sports', 'Toys', 'Digital_Video_Games', 'Video_Games');
OK
marketplace    customer_id    review_id    product_id    product_parent    product_title    star_rating    helpful_votes    total_votes    vine    verifi
ed_purchase    review_headline    review_body    review_date    year    product_category

```

## Create table with Excluded data

```

CREATE TABLE amazon_review.amazon_review_filtered_data

AS

SELECT y.* from

(SELECT *,

```

row\_number()

OVER (partition by customer\_id, product\_id) AS row\_num FROM filter\_excluded)y

WHERE row\_num=1;

```
ec2-3-81-117-63.compute-1.amazonaws.com (hadoop)
Terminal Sessions View X server Tools Games Settings Macros Help
Session Servers Tools Games Sessions View Split Multiterm Tunneling Packages Settings Help
Quick connect...
/home/hadoop/
Name
.
.aws
.ssh
.bash_profile
.bashrc
Stop
UNREGISTERED VERSION - Please support MobaXterm by subscribing to the professional edition here: https://mobaxterm.mobatek.net
Type here to search
3:36 PM 4/11/2020
```

VERTICES	MODE	STATUS	TOTAL	COMPLETED	RUNNING	PENDING	FAILED	KILLED
43	INITED	43	0	0	43			
39	RUNNING	39	31	7	1			
13	INITED	13	0	0	13			
13	SUCCEEDED	13	13	0	0			
43	INITED	43	0	0	43			
39	RUNNING	39	31	7	1			
13	INITED	13	0	0	13			
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39	RUNNING	39	31	7	1			
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13	SUCCEEDED	13	13	0	0			
43	INITED	43	0	0	43			
39	RUNNING	39	31	7	1			
13	INITED	13	0	0	13			
13	SUCCEEDED	13	13	0	0			
43	INITED	43	0	0	43			
39	RUNNING	39	31	7	1			
13	INITED	13	0	0	13			
13	SUCCEEDED	13	13	0	0			
43	INITED	43	0	0	43			
39	RUNNING	39	31	7	1			
13	INITED	13	0	0	13			
13	SUCCEEDED	13	13	0	0			
43	INITED	43	0	0	43			
39	RUNNING	39	31	7	1			
13	INITED	13	0	0	13			
13	SUCCEEDED	13	13	0	0			
43	INITED	43	0	0	43			
39	RUNNING	39	31	7	1			
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13	SUCCEEDED	13	13	0	0			
43	INITED	43	0	0	43			
39	RUNNING	39	31	7	1			
13	INITED							

```

ELSE 0 end) AS Number_of_Helpful_Votes, count(distinct(product_id)) AS
Total_Number_of_Products
FROM amazon_review.amazon_review_filtered_data
WHERE year>=2005
GROUP BY year
ORDER BY year;

```

### Output:

```

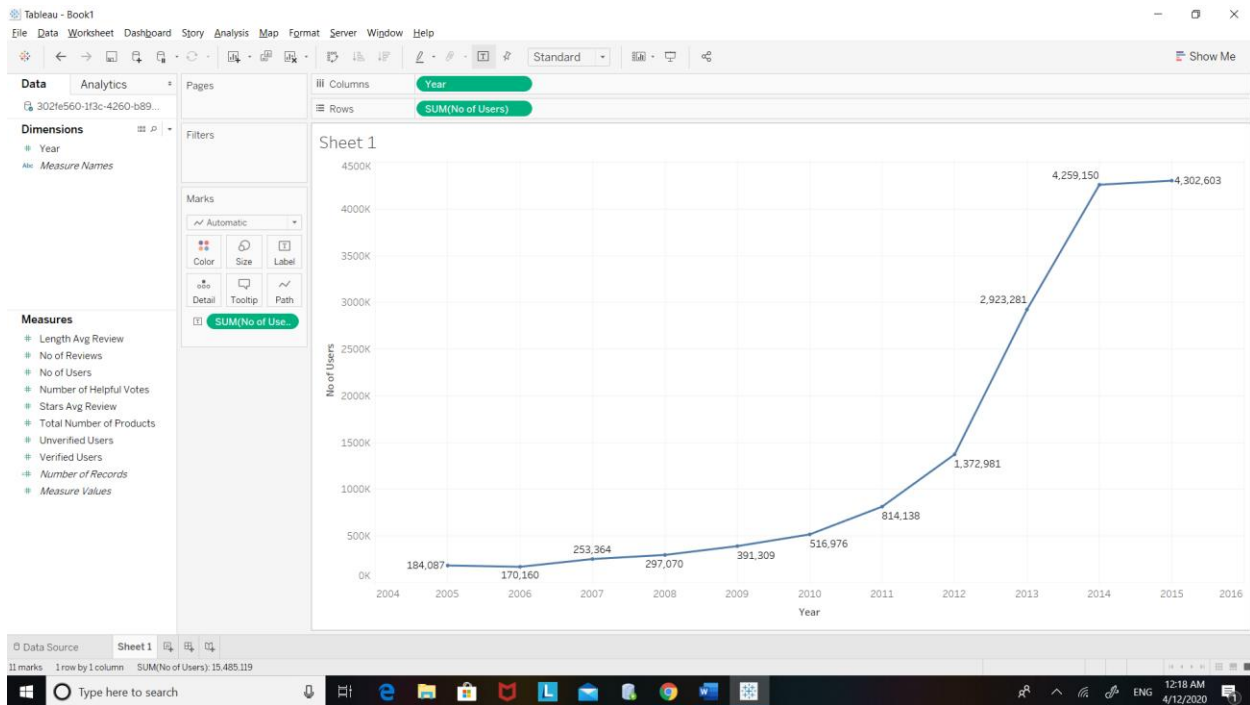
> 1
> ELSE 0 end) AS unverified_users, sum(case
> WHEN helpful_votes= 1 THEN
> 1
> ELSE 0 end) AS Number_of_Helpful_Votes, count(distinct(product_id)) AS
> Total_Number_of_Products
> FROM amazon_review.amazon_review_filtered_data
> WHERE year>=2005
> GROUP BY year;
> ORDER BY year;

Query ID = hadoop_20200410215046_bbc1c923-2aba-448e-90e1-879231aeddff0
Total jobs = 1
Launching Job 1 out of 1
Tez session was closed. Reopening...
Session re-established.
Status: Running (Executing on YARN cluster with App id application_1586543835271_0017)

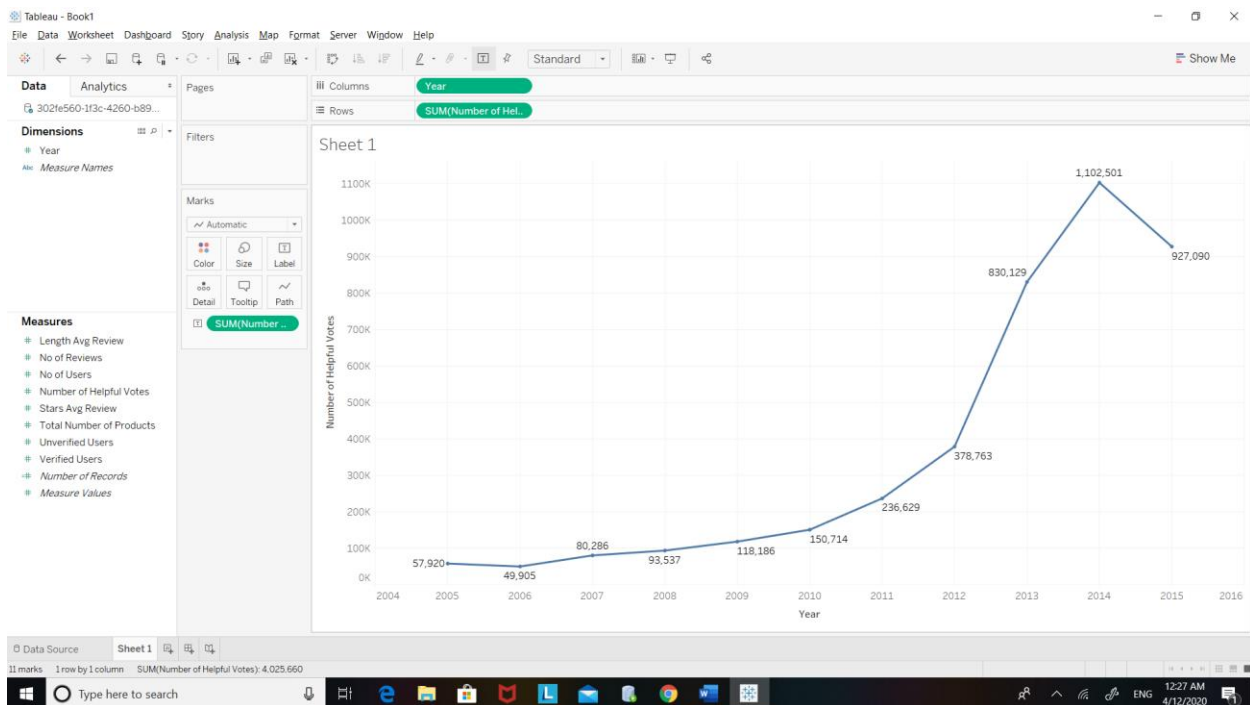
-----
VERTICES      MODE        STATUS      TOTAL   COMPLETED   RUNNING   PENDING   FAILED   KILLED
-----
Map 1 ..... container  SUCCEEDED    17         17         0         0         0         0
Reducer 2 ..... container  SUCCEEDED    20         20         0         0         0         0
Reducer 3 ..... container  SUCCEEDED     1          1         0         0         0         0
-----
VERTICES: 03/03 [=====] 100% ELAPSED TIME: 276.83 s
-----
OK
year    no. of reviews  no. of users  stars_avg_review  length_avg_review  verified_users  unverified_users  number_of_helpful_votes total_
number_of_products
2005    335399          184097        4.14             989.21             26823          388486           57918             116574
2006    287542          170159        4.15             896.59             38457          249085           46903             118277
2007    403643          253365        4.2              711.01             105274         298369           80279             168787
2008    450848          297059        4.13             691.89             140861         318987           93535             201060
2009    586056          390594        4.11             641.04             258994         327062           117906            253893
2010    759575          515798        4.04             617.65             514058         245517           150223            320027
2011    1219578         809788        4.01             557.09             899054         320524           235065            473524
2012    2228724         1363591       4.08             441.51             1883127        425587           375674            783599
2013    5437834         2901956       4.15             312.63             4851759        586075           823681            1457942
2014    8473867         4237555       4.19             220.41             7284526        1269347          1097297           2007465
2015    8515334         4287381       4.22             166.8              7886599        628735           924118            2014248
Time taken: 289.69 seconds, Fetched: 11 row(s)
hive>

```

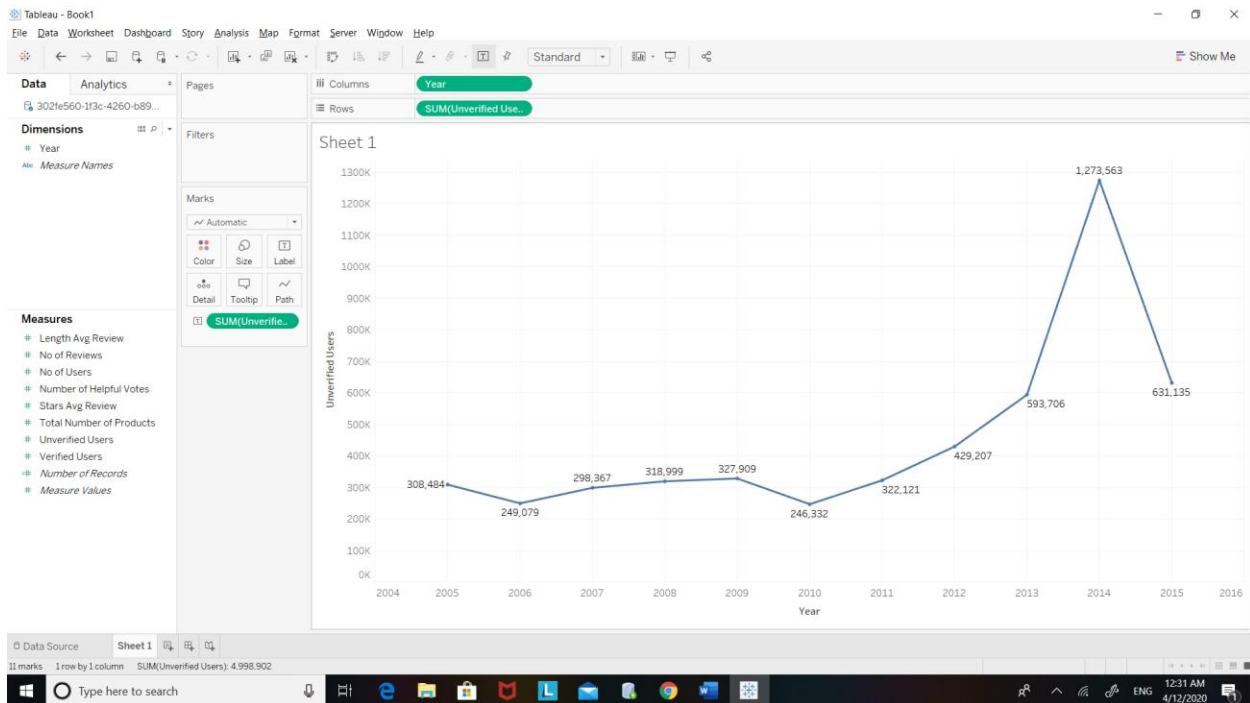
## Visualizations:



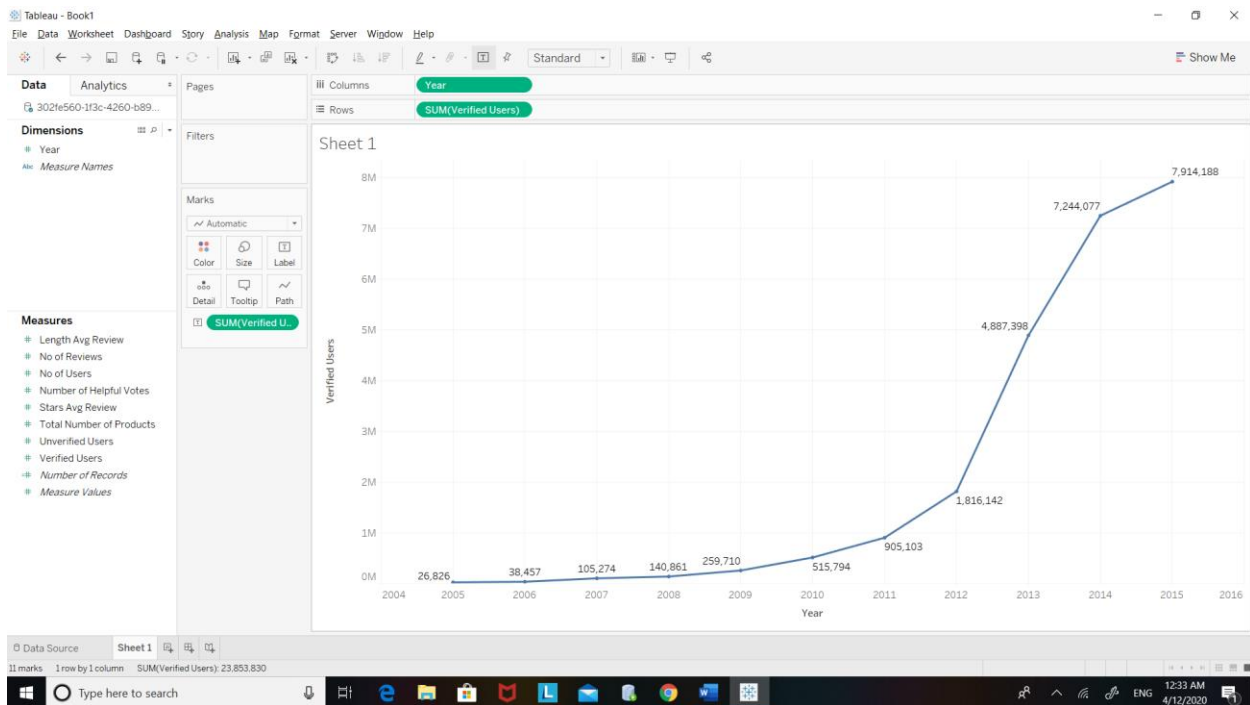
From the above visualization we can see that the number of Users increased over the years.



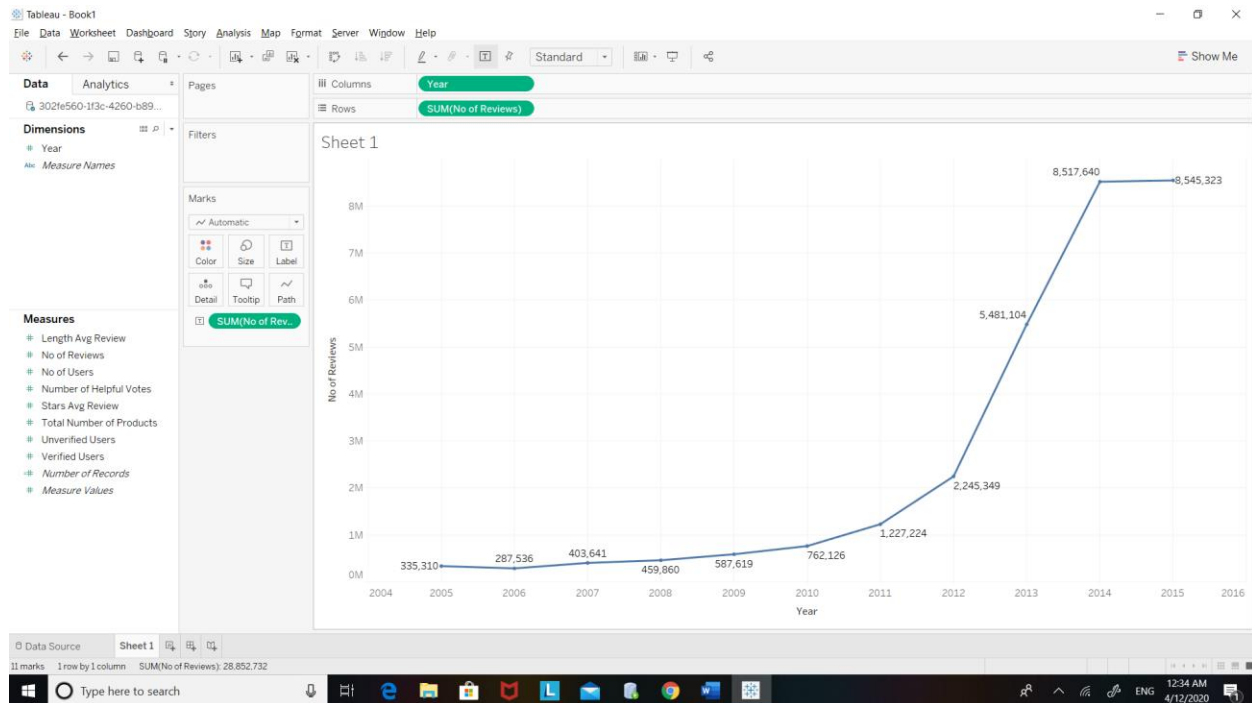
The above graph shows us an upward trend in the Number of Helpful Votes up until 2014 and then a decrease in the number in 2015.



The above Visualization helps us analyse that the Number of Unverified Users increased over the year up until 2014 and then saw a decrease in Number in 2015



This graph shows increase in the number of verified users over the years.



This graph helps us conclude that the number of reviews increased over the years.

## Detailed Analysis of Music/Digital\_Music\_Purchase and Digital\_Video\_Games/Video\_Games over time

### Analysis on Music Related Category

```
SELECT year, sum(case
WHEN product_category ='Music'then 1
ELSE 0 end) AS music_category_customers, sum(case
WHEN product_category ='Digital_Music_Purchase' THEN
1
ELSE 0 end) AS digital_music_category_customers
FROM amazon_review.amazon_review_filtered_data
WHERE year>=2005
GROUP BY year
ORDER BY year;
```



Terminal Sessions View X server Tools Games Sessions View Split Multitrac Tunneling Packages Settings Help

Quick connect...

ec2-3-85-195-220.compute-1.amazonaws.com

hadoop> SELECT year,  
> sum(case  
> WHEN product\_category='Music' then 1  
> ELSE 0 end) AS music\_category\_customers, sum(case  
> WHEN product\_category='Digital\_Music\_Purchase' THEN  
> 1  
> ELSE 0 end) AS digital\_music\_category\_customers  
> FROM amazon\_review\_filtered\_data  
> WHERE year=2005  
> GROUP BY year  
> ORDER BY year;

Query ID = hadoop\_20200410221328\_5d49338b-6648-4b86-b95f-efc6a5d809b8  
Total jobs = 1  
Launching Job 1 out of 1  
Terz session was closed. Reopening...  
Session re-established.  
Status: Running (Executing on YARN cluster with App id application\_1586543835271\_0010)

VERTICES	NODE	STATUS	TOTAL	COMPLETED	RUNNING	PENDING	FAILED	KILLED
Map 1 .....	container	SUCCEEDED	17	17	0	0	0	0
Reducer 2 .....	container	SUCCEEDED	20	20	0	0	0	0
Reducer 3 .....	container	SUCCEEDED	1	1	0	0	0	0

VERTICES: 03/03 [=====] 100% ELAPSED TIME: 161.38 s

OK	year	music_category_customers	digital_music_category_customers
2005	255090	8	
2006	204396	21	
2007	223647	2235	
2008	193913	22041	
2009	204796	36181	
2010	190794	40889	
2011	201768	57245	
2012	251184	192641	
2013	498753	448609	
2014	613322	487011	
2015	497940	348712	

Time taken: 172.816 seconds, Fetched: 11 row(s)  
hive>

UNREGISTERED VERSION - Please support MobaxTerm by subscribing to the professional edition here: <https://mobaxterm.mobatek.net>

**Tableau Desktop Interface:**

- Columns:** Year
- Rows:** SUM(Digital Music Category Customers), SUM(Music Category Customers)
- Dimensions:** Year, Measure Names
- Measures:** SUM(Digital Music Category Customers), SUM(Music Category Customers)

**Sheet 1 Data (Approximate):**

Year	Digital Music Category Customers (Left Axis)	Music Category Customers (Right Axis)
2004	0	200,000
2005	0	160,000
2006	0	160,000
2007	0	180,000
2008	20,000	150,000
2009	40,000	160,000
2010	40,000	150,000
2011	60,000	160,000
2012	180,000	180,000
2013	450,000	400,000
2014	580,000	550,000
2015	348,712	390,000
2016	0	0



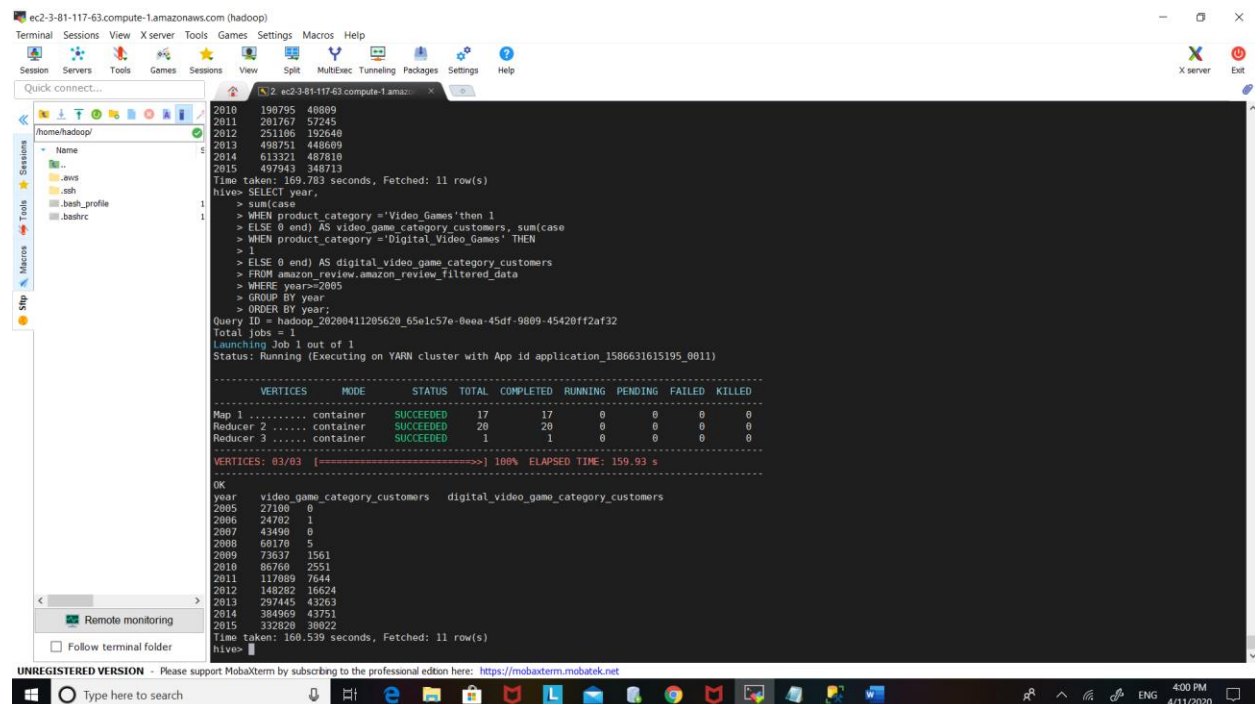
Both the categories had an increase in the number of users over the years.

## Co-relation between Various Categories over time.

### Analysis on Game Related Category

```
SELECT year, sum(case
WHEN product_category ='Video_Games'then 1
ELSE 0 end) AS video_game_category_customers, sum(case
WHEN product_category ='Digital_Video_Games' THEN
1
ELSE 0 end) AS digital_video_game_category_customers
FROM amazon_review.amazon_review_filtered_data
WHERE year>=2005
GROUP BY year
ORDER BY year;
```

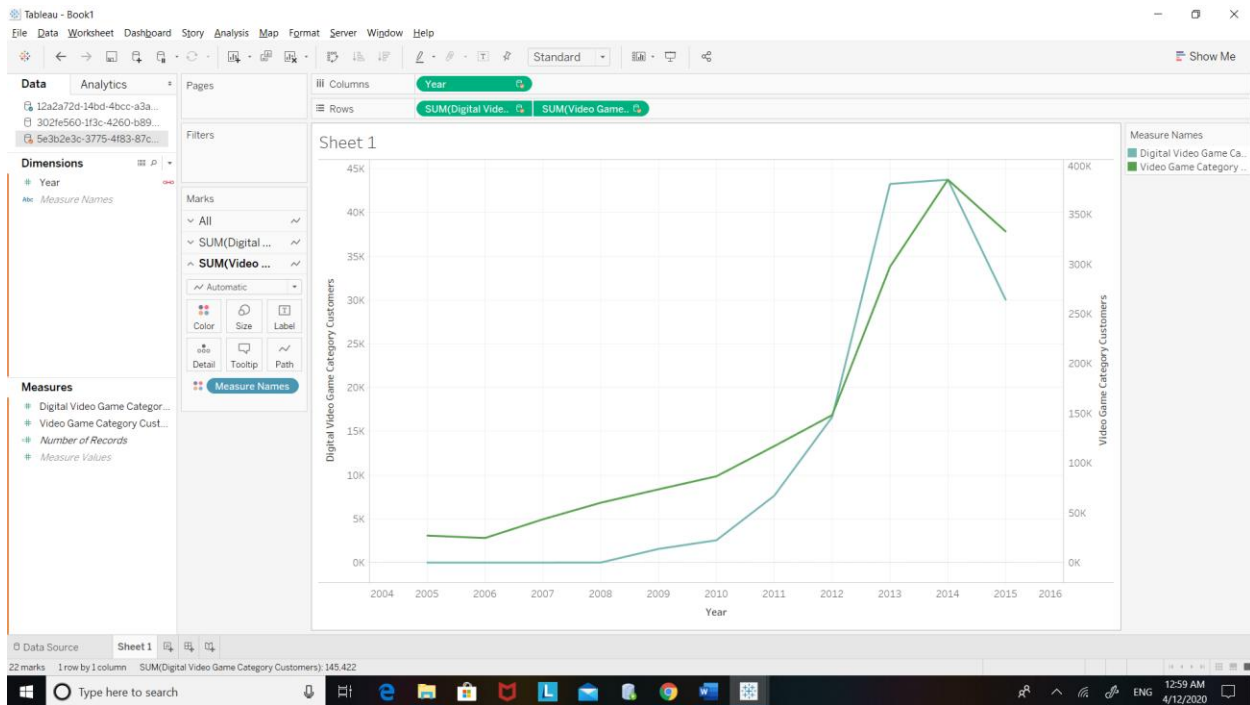
### Output:



```
ec2-3-81-117-63.compute-1.amazonaws.com (hadoop)
Terminal Sessions View Xserver Tools Games Settings Macros Help
Session Servers Tools Games Sessions View Split MultExec Tunneling Packages Settings Help
Quick connect...
/home/hadoop/
Name
aws
ssh
.bash_profile
.bashrc
2010 190795 48899
2011 201767 57245
2012 251106 152640
2013 480751 448699
2014 613321 487810
2015 497943 348713
Time taken: 169.783 seconds, Fetched: 11 row(s)
hive> SELECT year,
> sum(case
> WHEN product_category ='Video_Games'then 1
> ELSE 0 end) AS video_game_category_customers, sum(case
> WHEN product_category ='Digital_Video_Games' THEN
> 1
> ELSE 0 end) AS digital_video_game_category_customers
> FROM amazon_review.amazon_review_filtered_data
> WHERE year>=2005
> GROUP BY year
> ORDER BY year;
Query ID = hadoop_20200411205620_65e1c57e-0bea-45df-9809-45420ff2af32
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1586631615195_0011)

VERTICES      MODE        STATUS      TOTAL  COMPLETED  RUNNING  PENDING  FAILED  KILLED
-----
Map 1 ..... container SUCCEEDED   17         17         0         0         0         0
Reducer 2 ..... container SUCCEEDED   20         20         0         0         0         0
Reducer 3 ..... container SUCCEEDED    1          1         0         0         0         0
VERTICES: 03/03 [=====] 100% ELAPSED TIME: 159.03 s
OK
year      video_game_category_customers  digital_video_game_category_customers
2005      27100                        0
2006      24702                        1
2007      43490                        0
2008      60170                        5
2009      73637                        1561
2010      86760                        2551
2011      117089                       7644
2012      148282                       16624
2013      297445                       43263
2014      384969                       43751
2015      312820                       38022
Time taken: 168.539 seconds, Fetched: 11 row(s)
hive>
```

## Visualization:



Digital Video Game Category witnessed a steep increase in the number of customers after the year 2010. It did overtake the Video Game category for some time in 2012-2014.

On an individual basis both of them increased and had a decline in 2015, similar to the Music Category.

## Are there Users reviewing in both categories?

### Music Category:

```
SELECT count(y.customer_id) AS count,y.year
FROM amazon_review.amazon_review_filtered_data y,
(SELECT distinct(customer_id)
FROM amazon_review.amazon_review_filtered_data
WHERE product_category='Music'
AND year>=2005) intersect SELECT distinct(customer_id)
FROM amazon_review.amazon_review_filtered_data
WHERE product_category='Digital_Music_Purchase'
AND year>=2005)z
WHERE y.customer_id=z.customer_id
```

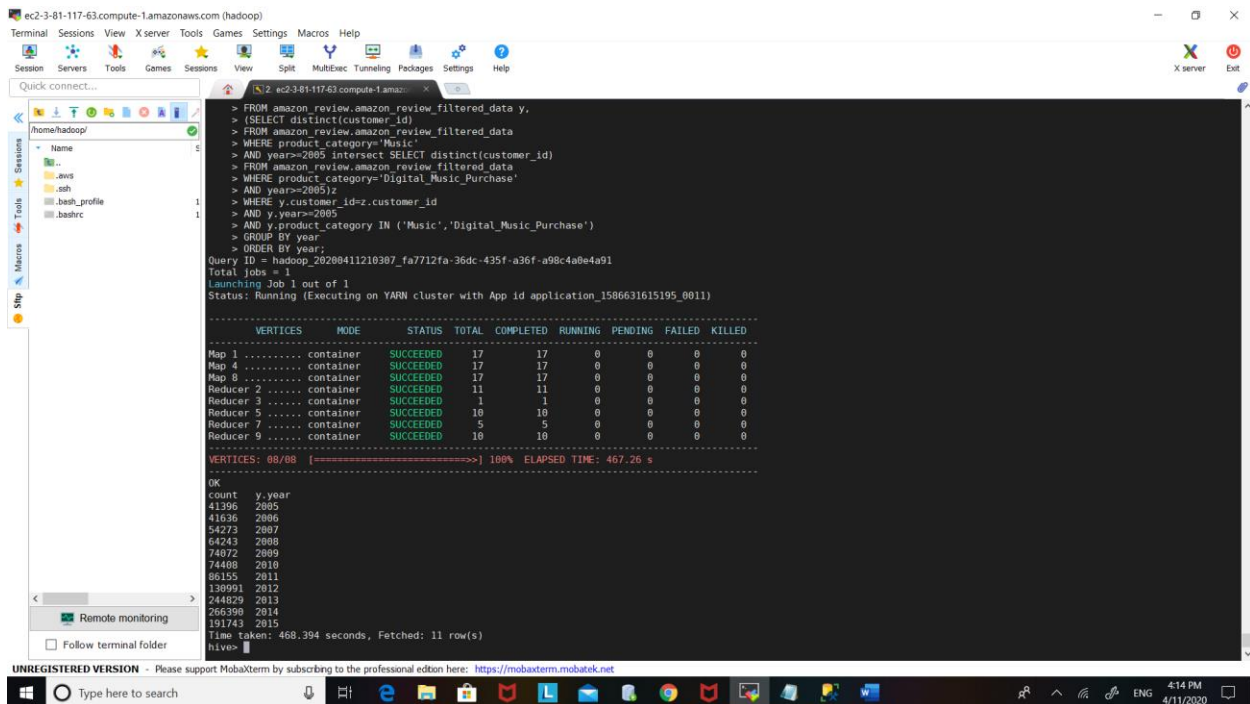
AND y.year>=2005

AND y.product\_category IN ('Music','Digital\_Music\_Purchase')

GROUP BY year

ORDER BY year;

**Output:**



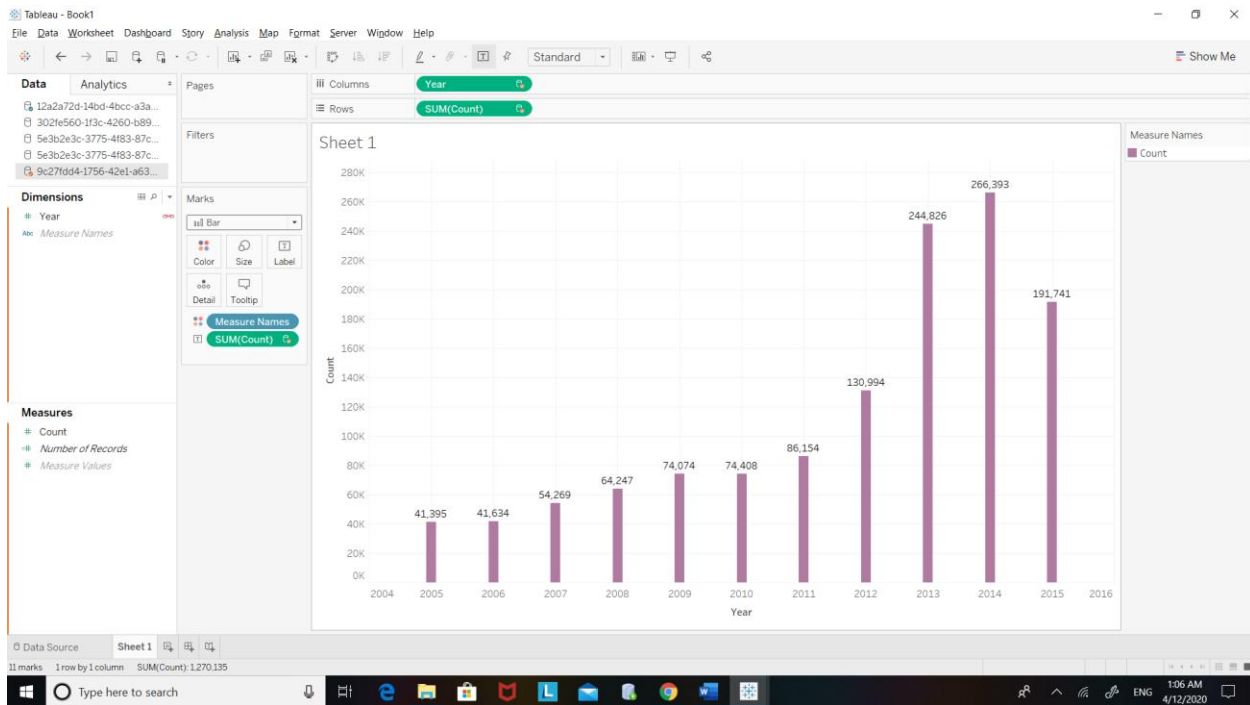
```
ec2-3-81-117-63.compute-1.amazonaws.com (hadoop)
Terminal Sessions View X server Tools Games Settings Macros Help
Session Servers Tools Games Sessions View Split MultExec Tunneling Packages Settings Help
Quick connect...
/home/hadoop/
Name
aws
ssh
bash_profile
.bashrc
1
1
Ship
Remote monitoring
Follow terminal folder
UNREGISTERED VERSION - Please support MobateM by subscribing to the professional edition here: https://mobatem.mobatek.net
Type here to search
4/11/2020 4:14 PM ENG
```

```
> FROM amazon_review.amazon_review_filtered_data y,
> (SELECT distinct(customer_id)
> FROM amazon_review.amazon_review_filtered_data
> WHERE product_category='Music'
> AND year=2005 intersect SELECT distinct(customer_id)
> FROM amazon_review.amazon_review_filtered_data
> WHERE product_category='Digital_Music_Purchase'
> AND year=2005)z
> WHERE y.customer_id=z.customer_id
> AND y.year=2005
> AND y.product_category IN ('Music','Digital_Music_Purchase')
> GROUP BY year
> ORDER BY year;

Query ID = hadoop_20200411210307_fa7712fa-36dc-435f-a36f-a98c4a0e4a91
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1580631615195_0011)

-----
VERTICES      MODE      STATUS TOTAL  COMPLETED  RUNNING  PENDING  FAILED  KILLED
-----
Map 1 ..... container  SUCCEEDED 17      17          0         0         0         0
Map 4 ..... container  SUCCEEDED 17      17          0         0         0         0
Map 8 ..... container  SUCCEEDED 17      17          0         0         0         0
Reducer 2 .... container  SUCCEEDED 11      11          0         0         0         0
Reducer 3 .... container  SUCCEEDED 1        1          0         0         0         0
Reducer 5 .... container  SUCCEEDED 10      10          0         0         0         0
Reducer 7 .... container  SUCCEEDED 5        5          0         0         0         0
Reducer 9 .... container  SUCCEEDED 10      10          0         0         0         0
-----
VERTICES: 00/00 [=====] 100% ELAPSED TIME: 467.26 s
-----
OK
count  y_year
41396  2005
41636  2006
54273  2007
64243  2008
74072  2009
74468  2010
86155  2011
130991 2012
244829 2013
266390 2014
191743 2015
Time taken: 468.394 seconds, Fetched: 11 row(s)
hive>
```

## Visualization:



This Bar Graph shows that customers who reviewed both Music and Digital Music Categories increased over the years with the most being in the year 2014 and then there was a decrease in 2015.

## Game Category

```
SELECT count(y.customer_id) AS count,
y.year
FROM amazon_review.amazon_review_filtered_data y,
(SELECT distinct(customer_id)
FROM amazon_review.amazon_review_filtered_data
WHERE product_category='Video_Games'
AND year>=2005 intersect SELECT distinct(customer_id)
FROM amazon_review.amazon_review_filtered_data
WHERE product_category='Digital_Video_Games'
AND year>=2005)z
WHERE y.customer_id=z.customer_id
AND y.year>=2005
```

AND y.product\_category IN ('Video\_Games','Digital\_Video\_Games')

GROUP BY year

ORDER BY year;

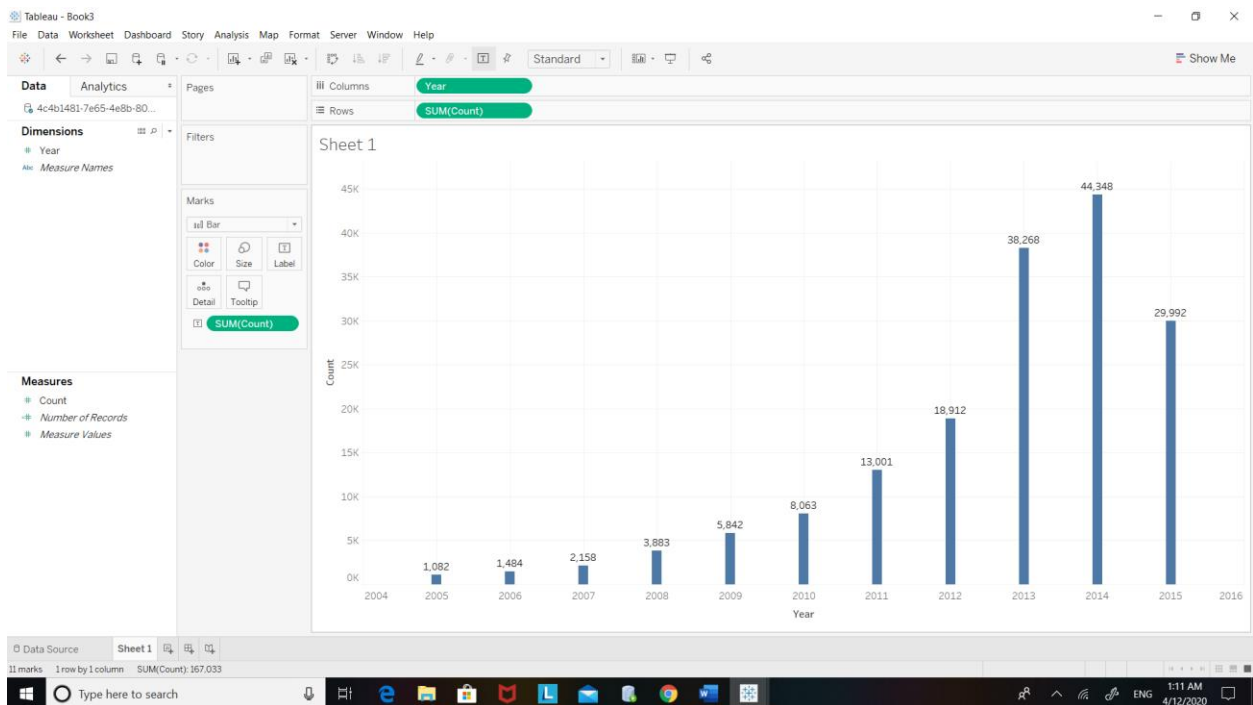
```
ec2-3-81-117-63.compute-1.amazonaws.com (hadoop)
Terminal Sessions View X server Tools Games Settings Macros Help
Quick connect...
/home/hadoop/
Name
...
.ssh
.bash_profile
.bashrc
Remote monitoring
Follow terminal folder

> FROM amazon_review.amazon_review_filtered_data
> WHERE product_category='Video Games'
> AND year=2005 intersect SELECT distinct(customer_id)
> FROM amazon_review.amazon_review_filtered_data
> WHERE product_category='Digital_Video_Games'
> AND year=2005)z
> WHERE y.customer_id=z.customer_id
> AND y.year=2005
> AND y.product_category IN ('Video_Games','Digital_Video_Games')
> GROUP BY year
> ORDER BY year;

Query ID = hadoop_20200411211602_5aac4251-4239-4e2b-8763-41b7b32b49aa
Total jobs = 1
Launching Job 1 out of 1
1oz session was closed. Reopening...
Session re-established.
Status: Running (Executing on YARN cluster with App id application_1506631615195_0012)

VERTICES   MODE   STATUS   TOTAL   COMPLETED   RUNNING   PENDING   FAILED   KILLED
Map 1 ..... container   SUCCEEDED   17       17           0           0           0           0
Map 4 ..... container   SUCCEEDED   17       17           0           0           0           0
Map 8 ..... container   SUCCEEDED   17       17           0           0           0           0
Reducer 2 ..... container   SUCCEEDED   11       11           0           0           0           0
Reducer 3 ..... container   SUCCEEDED   1        1           0           0           0           0
Reducer 5 ..... container   SUCCEEDED   10       10           0           0           0           0
Reducer 7 ..... container   SUCCEEDED   5         5           0           0           0           0
Reducer 9 ..... container   SUCCEEDED   10       10           0           0           0           0
VERTICES: 08/08 [=====] 100% ELAPSED TIME: 468.62 s

OK
count    y.year
1082     2005
1484     2006
2158     2007
3883     2008
5842     2009
8063     2010
13001    2011
18912    2012
38268    2013
44348    2014
29992    2015
Time taken: 481.674 seconds, Fetched: 11 row(s)
hive>
```



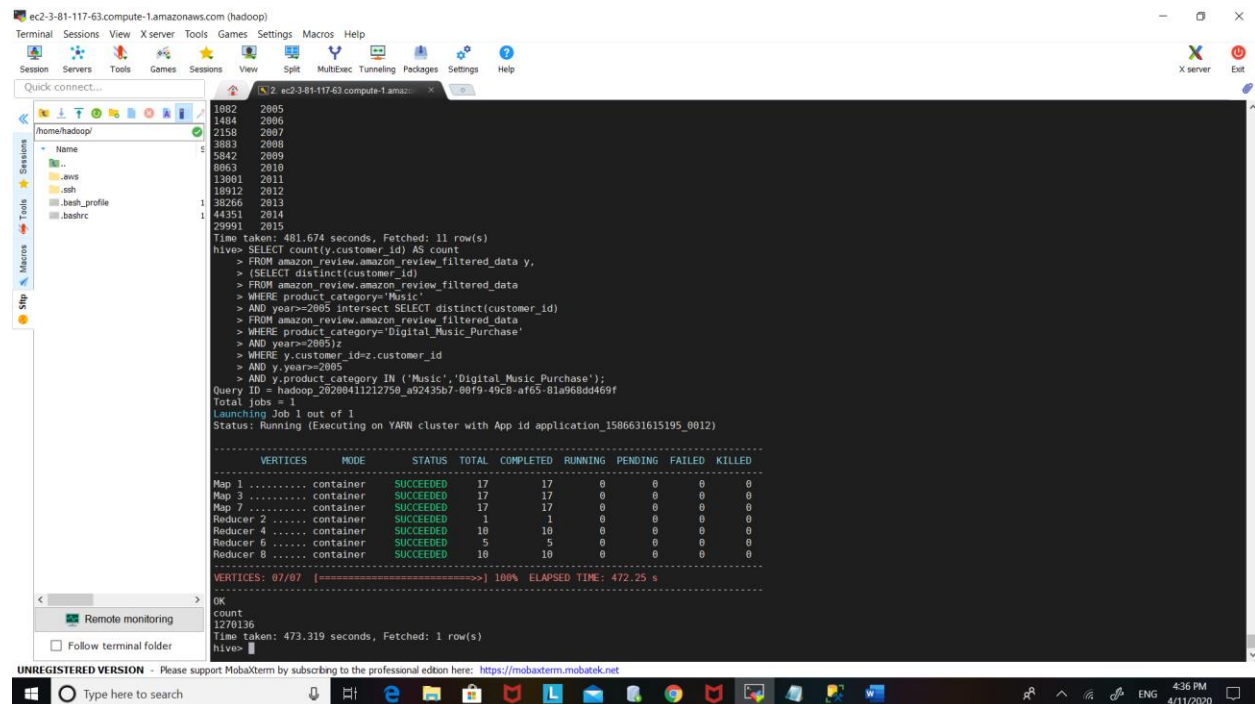
The number of customers reviewing Game Category shows a similar pattern to the Music Category with the highest number being in the year 2014 and then a decrease in number in 2015.

## Total Number of Same Users reviewing in both categories

### Users reviewing Music and Digital\_Music\_Purchase categories:

```
SELECT count(y.customer_id) AS count
FROM amazon_review.amazon_review_filtered_data y,
(SELECT distinct(customer_id)
FROM amazon_review.amazon_review_filtered_data
WHERE product_category='Music'
AND year>=2005 intersect SELECT distinct(customer_id)
FROM amazon_review.amazon_review_filtered_data
WHERE product_category='Digital_Music_Purchase'
AND year>=2005)z
WHERE y.customer_id=z.customer_id
AND y.year>=2005
AND y.product_category IN ('Music','Digital_Music_Purchase');
```

### Output:



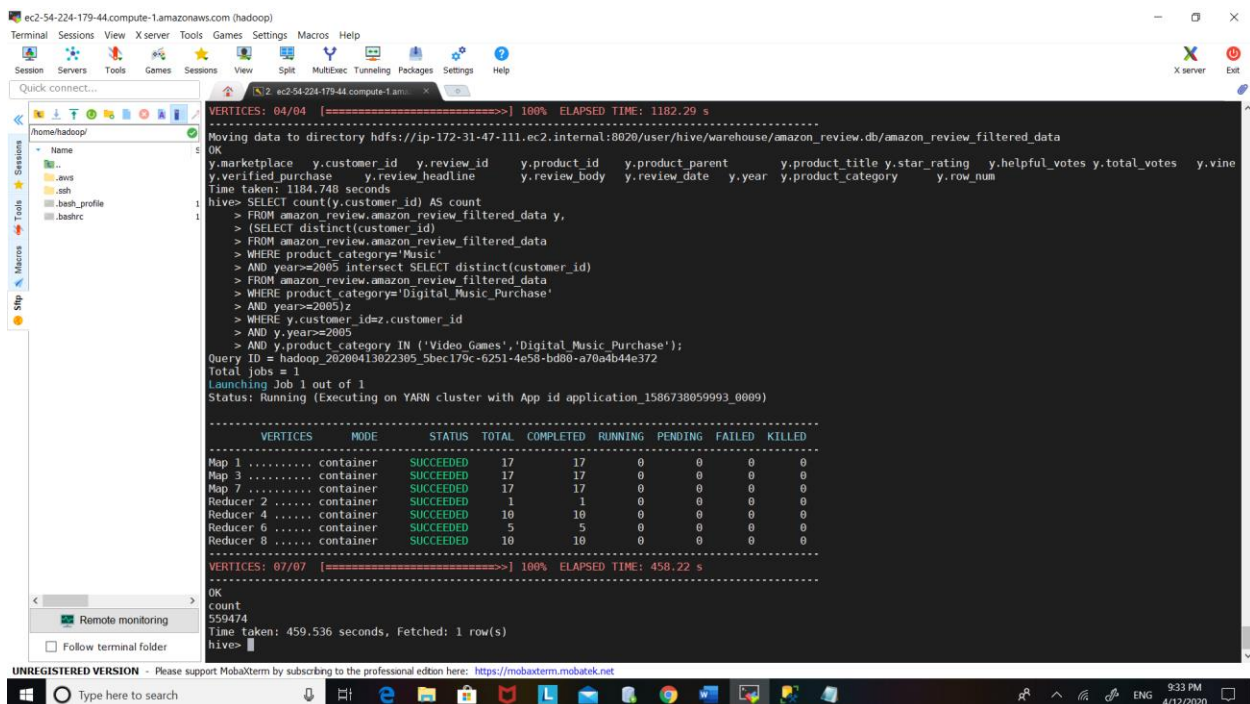
```
ec2-3-81-117-63.compute-1.amazonaws.com (hadoop)
Terminal Sessions View X server Tools Games Settings Macros Help
Session Servers Tools Games Sessions View Split MultExec Tunneling Packages Settings Help
Quick connect...
/home/hadoop/
Name
..
.aws
.ssh
.bash_profile
.bashrc
1882 2005
1804 2006
2158 2007
3883 2008
5842 2009
8862 2010
13001 2011
18912 2012
30266 2013
44351 2014
29991 2015
Time taken: 481.674 seconds, Fetched: 11 row(s)
hive> SELECT count(y.customer_id) AS count
> FROM amazon_review.amazon_review_filtered_data y,
> (SELECT distinct(customer_id)
> FROM amazon_review.amazon_review_filtered_data
> WHERE product_category='Music'
> AND year>=2005 intersect SELECT distinct(customer_id)
> FROM amazon_review.amazon_review_filtered_data
> WHERE product_category='Digital_Music_Purchase'
> AND year>=2005)z
> WHERE y.customer_id=z.customer_id
> AND y.year>=2005
> AND y.product_category IN ('Music','Digital_Music_Purchase');
Query ID = hadoop_20200411212750_a52435b7-00f9-49cb-af65-81a96baa469f
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1506631615195_0012)

VERTICES      MODE        STATUS  TOTAL  COMPLETED  RUNNING  PENDING  FAILED  KILLED
Map 1 ..... container  SUCCEEDED  17      17          0         0         0         0
Map 3 ..... container  SUCCEEDED  17      17          0         0         0         0
Map 7 ..... container  SUCCEEDED  17      17          0         0         0         0
Reducer 2 .... container  SUCCEEDED   1        1          0         0         0         0
Reducer 4 .... container  SUCCEEDED  10       10          0         0         0         0
Reducer 6 .... container  SUCCEEDED   5         5          0         0         0         0
Reducer 8 .... container  SUCCEEDED  10       10          0         0         0         0
VERTICES: 07/07 [=====] 100% ELAPSED TIME: 472.25 s
OK
count
1270136
Time taken: 473.319 seconds, Fetched: 1 row(s)
hive>
```

Users reviewing video\_games and Digital\_Video\_Games categories:

```
SELECT count(y.customer_id) AS count
FROM amazon_review.amazon_review_filtered_data y,
(SELECT distinct(customer_id)
FROM amazon_review.amazon_review_filtered_data
WHERE product_category='Video_Games'
AND year>=2005 intersect SELECT distinct(customer_id)
FROM amazon_review.amazon_review_filtered_data
WHERE product_category='Digital_Video_Games'
AND year>=2005)z
WHERE y.customer_id=z.customer_id
AND y.year>=2005
AND y.product_category IN ('Video_Games','Digital_Video_Games');
```

Output:



```
VERTICES: 04/04 [=====] 100% ELAPSED TIME: 1182.29 s
Moving data to directory hdfs://ip-172-31-47-111.ec2.internal:8020/user/hive/warehouse/amazon_review.db/amazon_review_filtered_data
OK
y.marketplace y.customer_id y.review_id y.product_id y.product_parent y.product_title y.star_rating y.helpful_votes y.total_votes y.vine
y.verified_purchase y.review_headline y.review_body y.review_date y.year y.product_category y.row_num
Time taken: 1184.748 seconds
hive> SELECT count(y.customer_id) AS count
> FROM amazon_review.amazon_review_filtered_data y,
> (SELECT distinct(customer_id)
> FROM amazon_review.amazon_review_filtered_data
> WHERE product_category='Music'
> AND year>=2005 intersect SELECT distinct(customer_id)
> FROM amazon_review.amazon_review_filtered_data
> WHERE product_category='Digital_Music_Purchase'
> AND year>=2005)z
> WHERE y.customer_id=z.customer_id
> AND y.year>=2005
> AND y.product_category IN ('Video_Games','Digital_Music_Purchase');
Query ID = hadoop_26290413022305_5bec179c-6251-4e58-bd80-a70a4b44e372
Total jobs = 1
Launching Job 1 out of 1
Status: Running (Executing on YARN cluster with App id application_1586738059993_0009)

-----
VERTICES    MODE    STATUS    TOTAL    COMPLETED    RUNNING    PENDING    FAILED    KILLED
-----
Map 1 ..... container    SUCCEEDED    17         17         0         0         0         0
Map 3 ..... container    SUCCEEDED    17         17         0         0         0         0
Map 7 ..... container    SUCCEEDED    17         17         0         0         0         0
Reducer 2 ... container    SUCCEEDED     1          1         0         0         0         0
Reducer 4 ... container    SUCCEEDED    10         10         0         0         0         0
Reducer 6 ... container    SUCCEEDED     5          5         0         0         0         0
Reducer 8 ... container    SUCCEEDED    10         10         0         0         0         0
-----
VERTICES: 07/07 [=====] 100% ELAPSED TIME: 458.22 s
OK
count
559474
Time taken: 459.536 seconds, Fetched: 1 row(s)
hive>
```

Can you identify similar items in both categories? Do they get same rating?

Create Views to secure data



```
CREATE view music_category AS  
(SELECT product_id,  
round(avg(star_rating),  
2) AS Music_Ranking  
FROM amazon_review.amazon_review_filtered_data  
WHERE product_category='Music'  
AND year>= 2005  
GROUP BY product_id);
```

```
CREATE view digital_music_category AS  
(SELECT product_id,  
round(avg(star_rating),  
2) AS Digital_Music_Ranking  
FROM amazon_review.amazon_review_filtered_data  
WHERE product_category='Digital_Music_Purchase'  
AND year>= 2005  
GROUP BY product_id);
```

```
CREATE view video_game_category AS  
(SELECT product_id,  
round(avg(star_rating),  
2) AS Game_Ranking  
FROM amazon_review.amazon_review_filtered_data  
WHERE product_category='Video_Games'  
AND year>= 2005  
GROUP BY product_id);
```

```
CREATE view digital_video_game_category AS  
(SELECT product_id,
```

round(avg(star\_rating),

2) AS Digital\_Game\_Ranking

FROM amazon\_review.amazon\_review\_filtered\_data

WHERE product\_category='Digital\_Video\_Games'

AND year>= 2005

GROUP BY product\_id);

### Analysis between Music and Digital Music Category

SELECT x.product\_id ,

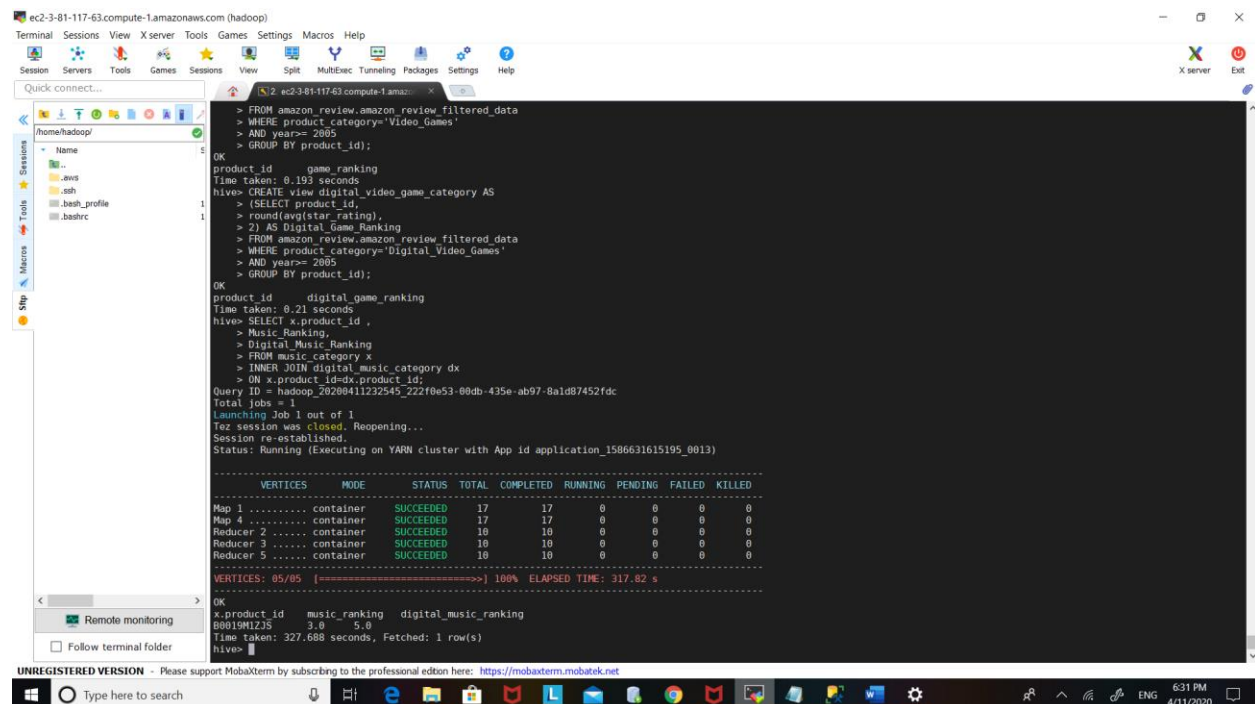
Music\_Ranking,

Digital\_Music\_Ranking

FROM music\_category x

INNER JOIN digital\_music\_category dx

ON x.product\_id=dx.product\_id;



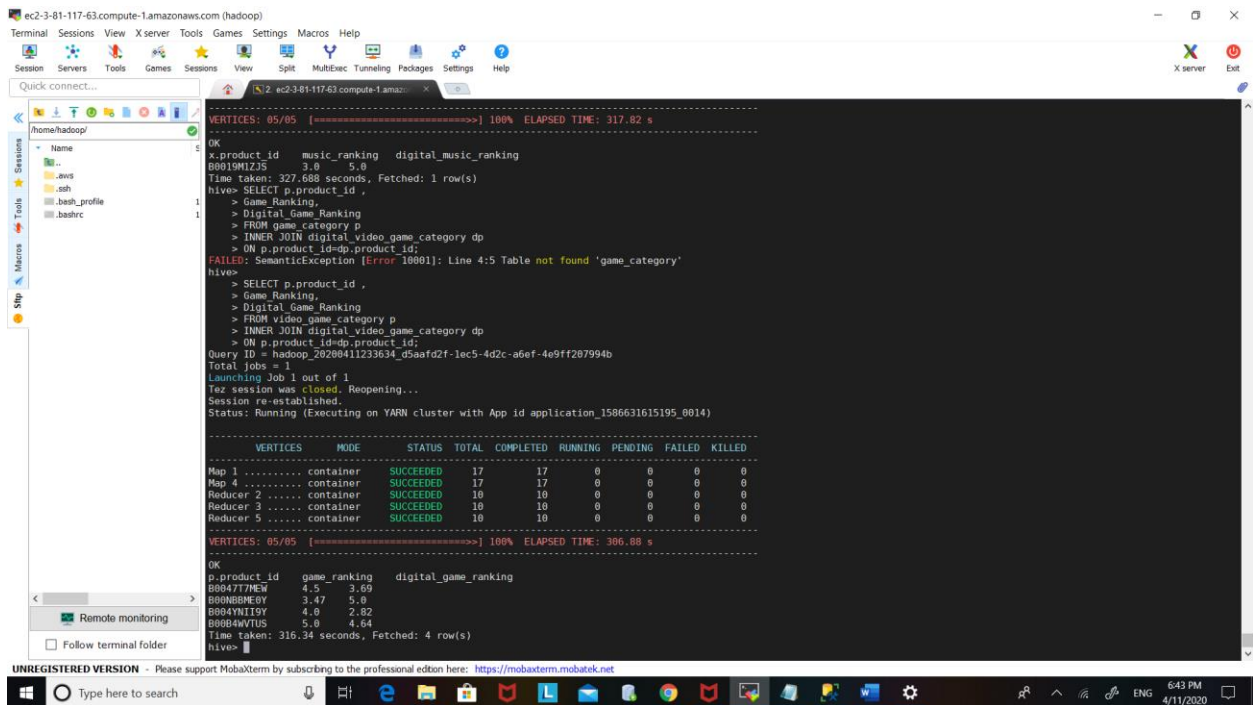
```
> FROM amazon_review.amazon_review_filtered_data
> WHERE product_category='Video_Games'
> AND year>= 2005
> GROUP BY product_id);
OK
product_id  game_ranking
Time taken: 0.193 seconds
hive> CREATE view digital_video_game_category AS
> (SELECT product_id,
> round(avg(star_rating),
> 2) AS Digital_Game_Ranking
> FROM amazon_review.amazon_review_filtered_data
> WHERE product_category='Digital_Video_Games'
> AND year>= 2005
> GROUP BY product_id);
OK
product_id  digital_game_ranking
Time taken: 0.21 seconds
hive> SELECT x.product_id ,
> Music_Ranking,
> Digital_Music_Ranking
> FROM music_category x
> INNER JOIN digital_music_category dx
> ON x.product_id=dx.product_id;
Query ID = hadoop_20200411232545_222f0e53-80db-435e-ab97-8a1d87452fdc
Total jobs = 1
Launching Job 1 out of 1
Tez session was closed. Reopening...
Session re-established.
Status: Running (Executing on YARN cluster with App id application_1506631615195_0013)

-----
VERTICES      MODE        STATUS  TOTAL  COMPLETED  RUNNING  PENDING  FAILED  KILLED
-----
Map 1 ..... container  SUCCEEDED  17      17           0         0         0         0
Reducer 2 ..... container  SUCCEEDED  10      10           0         0         0         0
Reducer 3 ..... container  SUCCEEDED  10      10           0         0         0         0
Reducer 5 ..... container  SUCCEEDED  10      10           0         0         0         0
-----
VERTICES: 05/05  [=====] 100% ELAPSED TIME: 317.82 s
-----
OK
x.product_id  music_ranking  digital_music_ranking
00019M1215    3.0           5.0
Time taken: 327.688 seconds, Fetched: 1 row(s)
hive>
```

From this we can interpret that the same product has different rating in Music and Digital Music Category.

## Analysis between Video Games and Digital Video Games

```
SELECT p.product_id ,  
  
Game_Ranking,  
  
Digital_Game_Ranking  
  
FROM video_game_category p  
  
INNER JOIN digital_video_game_category dp  
  
ON p.product_id=dp.product_id;
```



```
VERTICES: 05/05 [=====] 100% ELAPSED TIME: 317.82 s  
OK  
x.product_id  music_ranking  digital_music_ranking  
B0019H1Z3S    3.0          5.0  
Time taken: 327.688 seconds, Fetched: 1 row(s)  
hive> SELECT p.product_id ,  
> Game_Ranking,  
> Digital_Game_Ranking  
> FROM game_category p  
> INNER JOIN digital_video_game_category dp  
> ON p.product_id=dp.product_id;  
FAILED: SemanticException [Error 10001]: Line 4:5 Table not found 'game_category'  
hive>  
> SELECT p.product_id ,  
> Game_Ranking,  
> Digital_Game_Ranking  
> FROM video_game_category p  
> INNER JOIN digital_video_game_category dp  
> ON p.product_id=dp.product_id;  
Query ID = hadoop_20200411233634_d5aafd2f-1ec5-4d2c-a6ef-4e9ff207994b  
Total jobs = 1  
Launching Job 1 out of 1  
Tez session was closed. Reopening...  
Session re-established.  
Status: Running (Executing on YARN cluster with App id application_1506631615195_0014)  
  
-----  
VERTICES  MODE  STATUS  TOTAL  COMPLETED  RUNNING  PENDING  FAILED  KILLED  
-----  
Map 1 ..... container  SUCCEEDED  17      17          0         0         0         0  
Map 4 ..... container  SUCCEEDED  17      17          0         0         0         0  
Reducer 2 ..... container  SUCCEEDED  10      10          0         0         0         0  
Reducer 3 ..... container  SUCCEEDED  10      10          0         0         0         0  
Reducer 5 ..... container  SUCCEEDED  10      10          0         0         0         0  
-----  
VERTICES: 05/05 [=====] 100% ELAPSED TIME: 306.88 s  
OK  
p.product_id  game_ranking  digital_game_ranking  
B00477MEW     4.5          3.69  
B00NBNEGY     3.47         5.0  
B00AVN1S9Y    4.0          2.82  
B00B4WYTUS    5.0          4.64  
Time taken: 316.34 seconds, Fetched: 4 row(s)  
hive>
```

We can see that the products have different ratings in Video Game and Digital Video Game Category.

## Hive Advanced Functions

### Ranking based on products under different product categories

To calculate rank to find out popular products

```
SELECT p.product_id,  
  
p.product_category,  
  
p.star_rank
```

```

FROM

(SELECT y.product_id,

y.product_category,

Row_number()

OVER (partition by y.product_category

ORDER BY y.avg_rating desc) AS star_rank

FROM

(SELECT product_id,

product_category,

avg(star_rating) AS avg_rating

FROM amazon_review.amazon_review_filtered_data

WHERE year>= 2005

GROUP BY product_id,product_category)as y)as p

WHERE p.star_rank<=5;

```

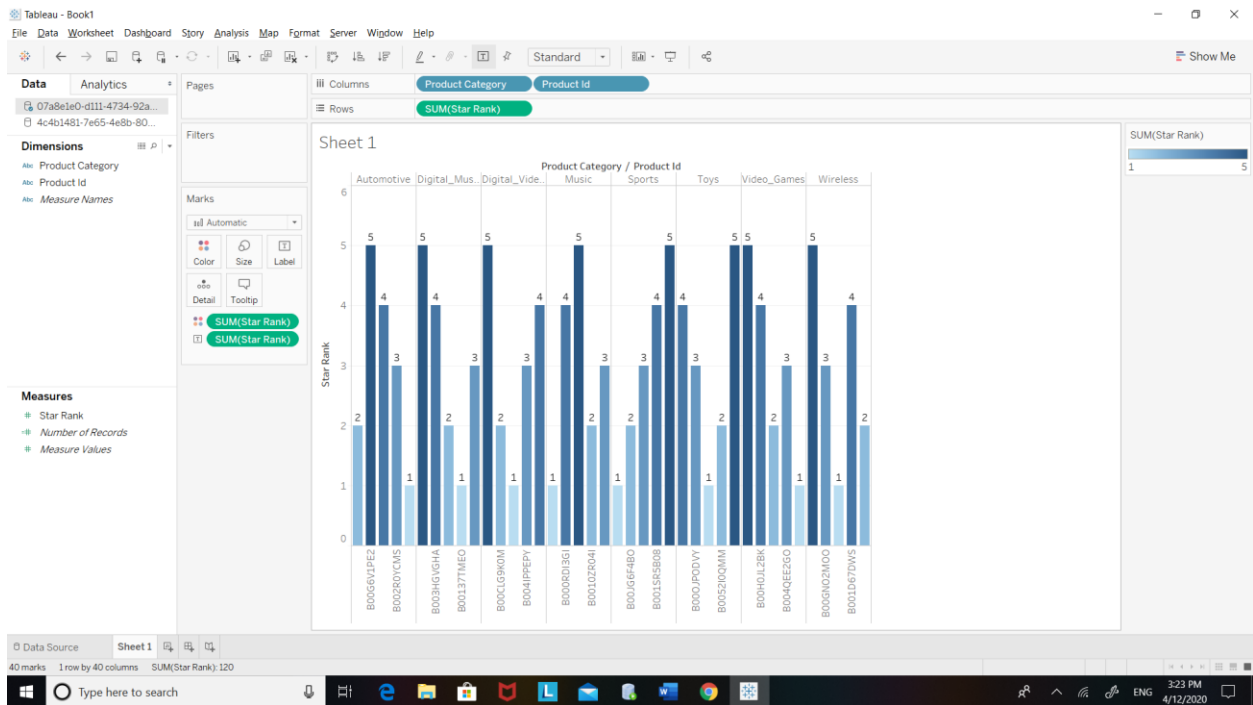
### Output:

```

VERTICES: 03/03 [=====] 100% ELAPSED TIME: 194.57 s
OK
p-product_id    p-product_category    p-star_rank
000PYJ0A08      Digital_Video_Games   1
000Q0Q0K0G      Digital_Video_Games   2
000F0U0C0M      Digital_Video_Games   3
00080W03H5      Digital_Video_Games   4
000E0V07VLC     Digital_Video_Games   5
000034H1TA      Toys                  1
0010U5E3GK      Toys                  2
0008K6CZD4      Toys                  3
0000K4X0P0      Toys                  4
0000K4X006      Toys                  5
000CQW6Z0U      Video_Games           1
00091ZPVFM      Video_Games           2
000A5T83J1      Video_Games           3
0000HLV5RE      Video_Games           4
0008031VUW      Video_Games           5
00085W7CCT      Digital_Music_Purchase 1
000AML80FC      Digital_Music_Purchase 2
000AMLDM30      Digital_Music_Purchase 3
000AMLEB6      Digital_Music_Purchase 4
0008STT1B7      Digital_Music_Purchase 5
000000T90      Music                 1
0007EZN7I6      Music                 2
000800ETC3      Music                 3
0007EVRK06      Music                 4
000000F2BX      Music                 5
00091HDXGQ      Sports                1
00091HB7E6      Sports                2
00091GV0G1      Sports                3
00091F4TZM      Sports                4
00091CM88A      Sports                5
000LPRNFU0      Wireless              1
000P7Z0B7C      Wireless              2
0004AHR168      Wireless              3
000VYXR88      Wireless              4
000HBLKNS      Wireless              5
0000ALG8W      Automotive            1
000H13E94J      Automotive            2
000H134JV5      Automotive            3
0000ALT0C      Automotive            4
0003Y0BN3W      Automotive            5
Time taken: 195.32 seconds, Fetched: 40 row(s)
hive>

```

## Visualization:

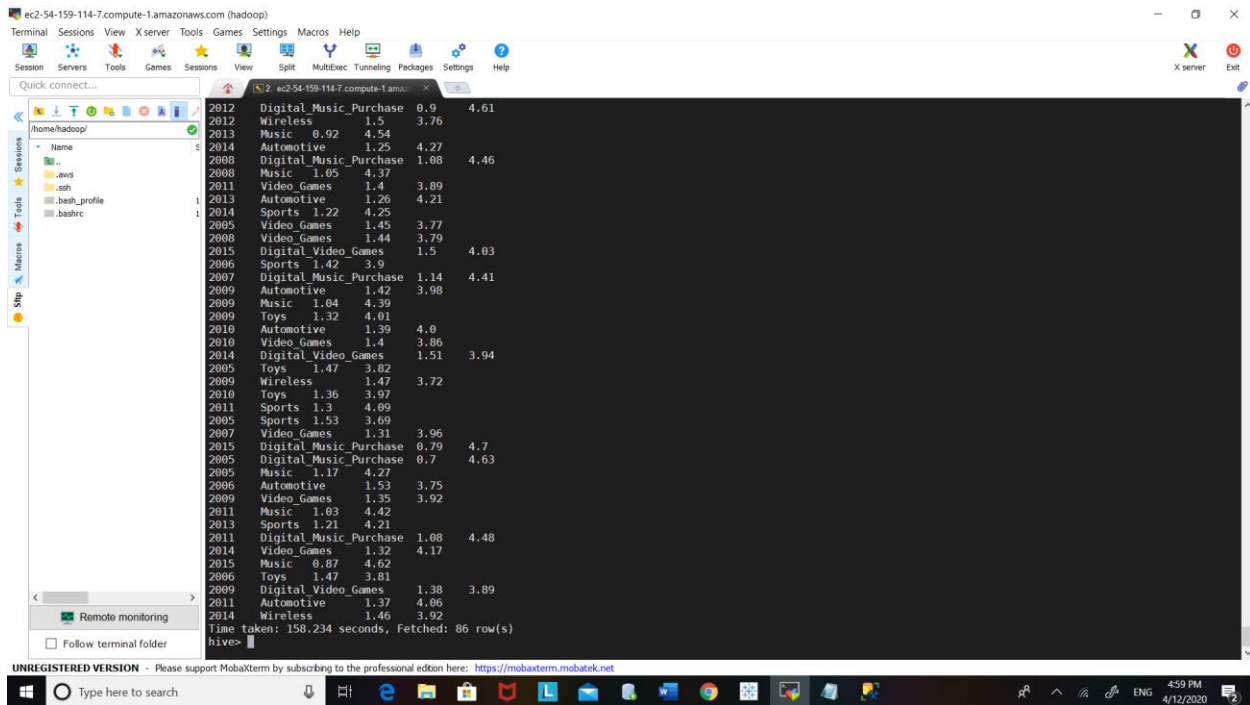


The Visualization shows the ratings for various products. The light shade of blue is to depict a low rating and the darker shade depicts a higher rating.

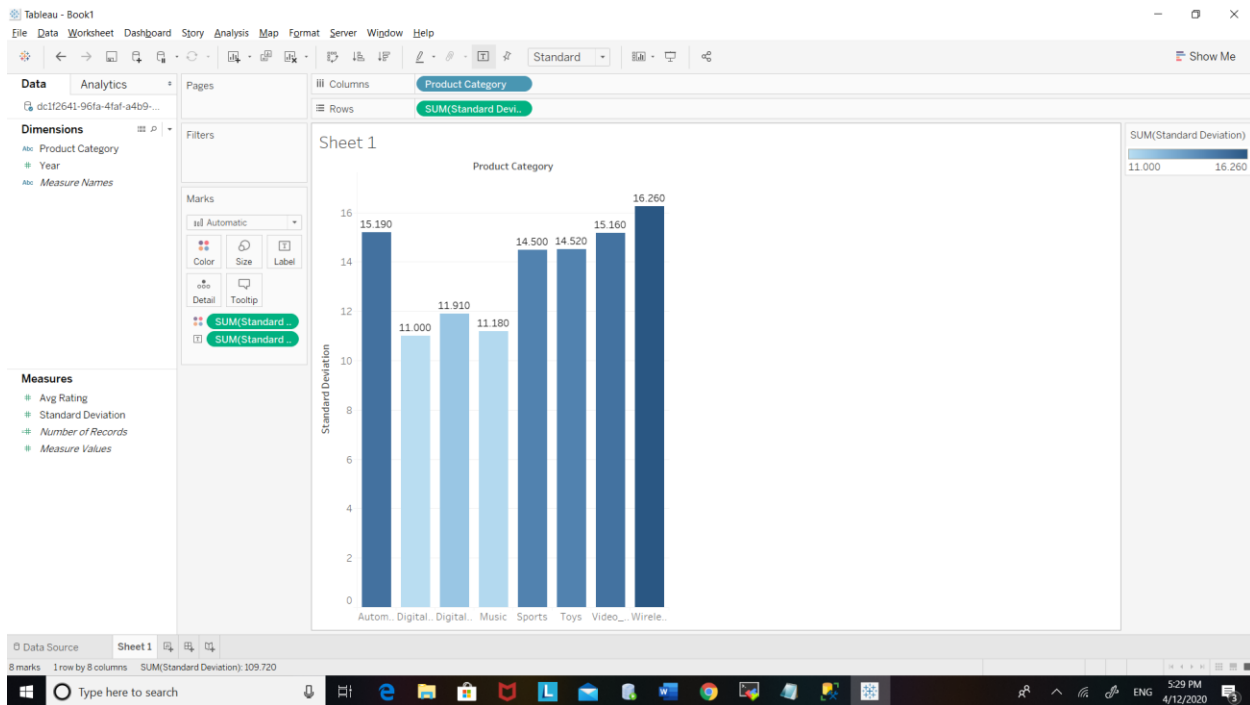
## Calculate Standard Deviation

```
SELECT year,  
product_category,  
round(stddev(star_rating),2)as Standard_Deviation,  
round(avg(star_rating),2) as Average_Rating  
FROM amazon_review.amazon_review_filtered_data  
WHERE year>= 2005  
GROUP BY product_category,year;
```

## Output:



## Visualization:



The graph shows the standard deviation for customers for various products.

Compared the growth of the products by calculating moving average

```
SELECT y.product_category,y.year,y.count,

(case

WHEN row_number()

OVER (partition by y.product_category order by y.year) > 4 THEN

round(AVG(y.count)

OVER (PARTITION BY y.product_category

ORDER BY y.year ROWS 4 PRECEDING)) end) AS five_year_moving_avg

FROM

(SELECT product_category,

year,

count(review_id) AS count

FROM amazon_review.amazon_review_filtered_data

GROUP BY product_category,year

ORDER BY year desc) AS y

WHERE y.year>= 2005;
```

ec2-3-81-117-63.compute-1.amazonaws.com (hadoop)

Terminal Sessions View X server Tools Games Settings Macros Help

Session Servers Tools Games Sessions View Split Multitab Tunneling Packages Settings Help

Quick connect...

ec2-3-81-117-63.compute-1.amazonaws.com

product_category	year	count	five_year_moving_avg
Digital_Music_Purchase	2015	348713	387083.0
Digital_Music_Purchase	2005	255886	NULL
Digital_Music_Purchase	2006	284395	NULL
Digital_Music_Purchase	2007	223646	NULL
Digital_Music_Purchase	2008	193915	NULL
Digital_Music_Purchase	2009	204704	216367.0
Digital_Music_Purchase	2010	190795	203509.0
Digital_Music_Purchase	2011	201767	202983.0
Digital_Music_Purchase	2012	251106	208475.0
Digital_Music_Purchase	2013	490751	269443.0
Digital_Music_Purchase	2014	613321	351148.0
Digital_Music_Purchase	2015	497943	412578.0
Sports	2005	4514	NULL
Sports	2006	9529	NULL
Sports	2007	29541	NULL
Sports	2008	48925	NULL
Sports	2009	68361	28974.0
Sports	2010	98593	47790.0
Sports	2011	286667	87217.0
Sports	2012	372950	155899.0
Sports	2013	941254	325965.0
Sports	2014	1512147	626322.0
Sports	2015	1571100	928824.0
Wireless	2005	11835	NULL
Wireless	2006	19855	NULL
Wireless	2007	47737	NULL
Wireless	2008	63655	NULL
Wireless	2009	92972	47411.0
Wireless	2010	162804	77445.0
Wireless	2011	319851	137444.0
Wireless	2012	677733	263443.0
Wireless	2013	1762021	683116.0
Wireless	2014	2626138	1149549.0
Wireless	2015	2995049	1716158.0
Automotive	2005	660	NULL
Automotive	2006	2190	NULL
Automotive	2007	8885	NULL
Automotive	2008	13851	NULL
Automotive	2009	23951	9907.0
Automotive	2010	51050	15907.0
Automotive	2011	104420	40433.0
Automotive	2012	219822	82621.0
Automotive	2013	618000	201050.0
Automotive	2014	1175373	432135.0
Automotive	2015	1385041	682931.0

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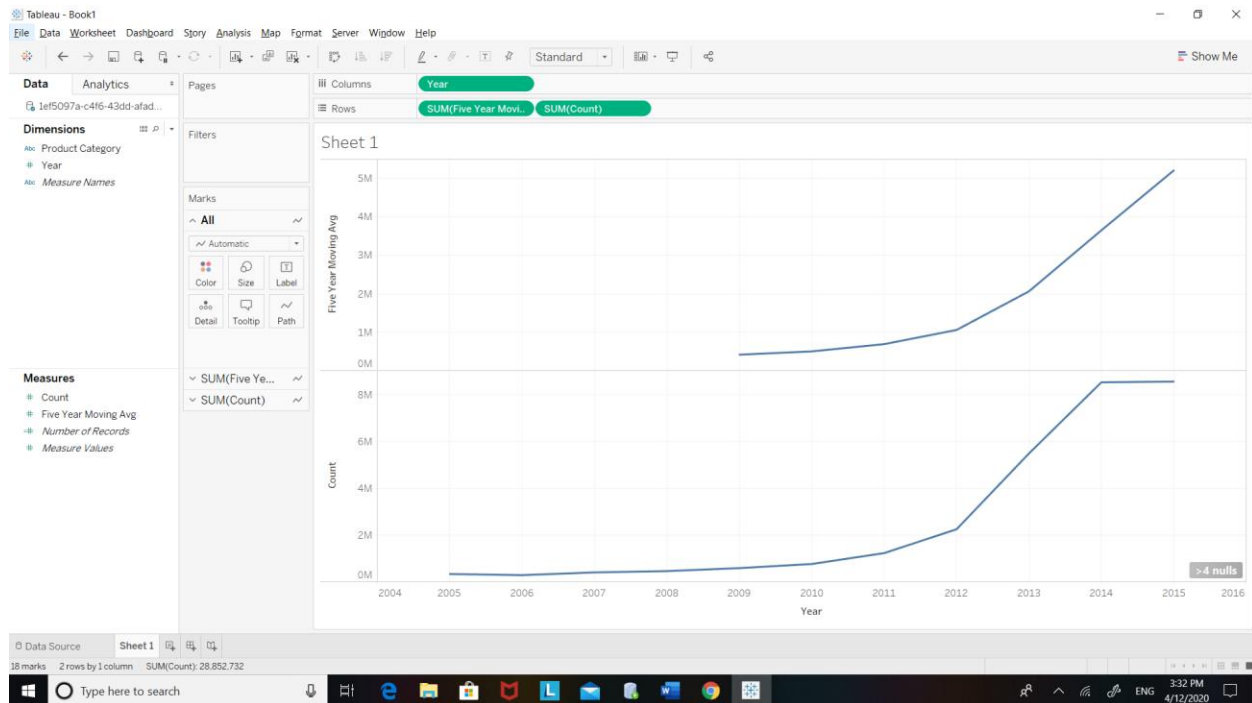
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Type here to search

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The Growth of Products with respect to moving average is as shown in the visualization above added to that increase in count of customers.

### Maximum Rating of a Product in specific product category

```
SELECT product_category,
round(avg(star_rating),2) AS avg_rating
FROM amazon_review.amazon_review_filtered_data
WHERE year>=2005
GROUP BY product_category
HAVING avg(star_rating)in (
(SELECT max(x.avg_stars)
FROM
(SELECT product_category,
avg(star_rating) AS avg_stars
FROM amazon_review.amazon_review_filtered_data
WHERE year>= 2005
GROUP BY product_category)AS x));
```

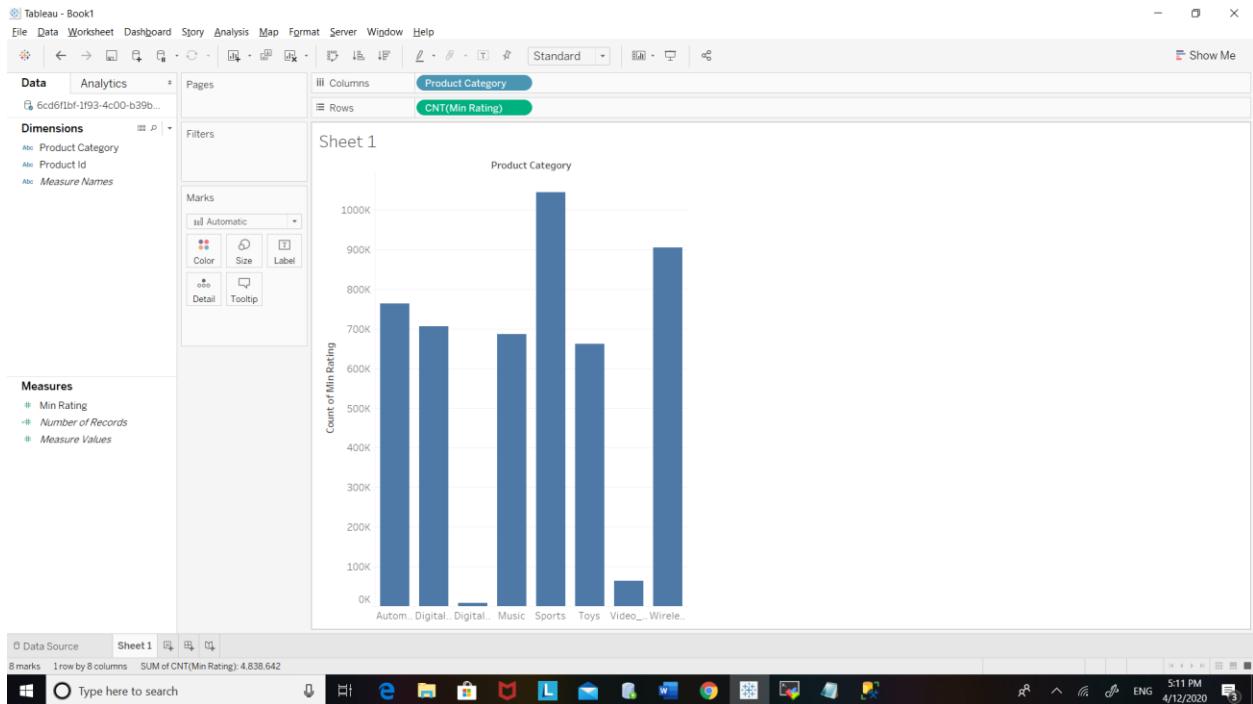
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ec2-3-81-117-63.compute-1.amazonaws.com (hadoop)
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Terminal Sessions View X server Tools Games Settings Macros Help
Quick connect...
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0013R8X14U Toys 5.0
0013SRTX2W Digital_Music_Purchase 5.0
0013SZ0944 Digital_Music_Purchase 5.0
0013THN8PA Digital_Music_Purchase 4.83
0013T0DH18 Sports 2.0
0013TTT9CS Toys 4.0
0013VMT1A Video_Games 5.0
0013VP19NC Toys 5.0
0013XTJ9MJ Wireless 1.0
0013XX1HPW Toys 5.0
0013Y29XVC Wireless 5.0
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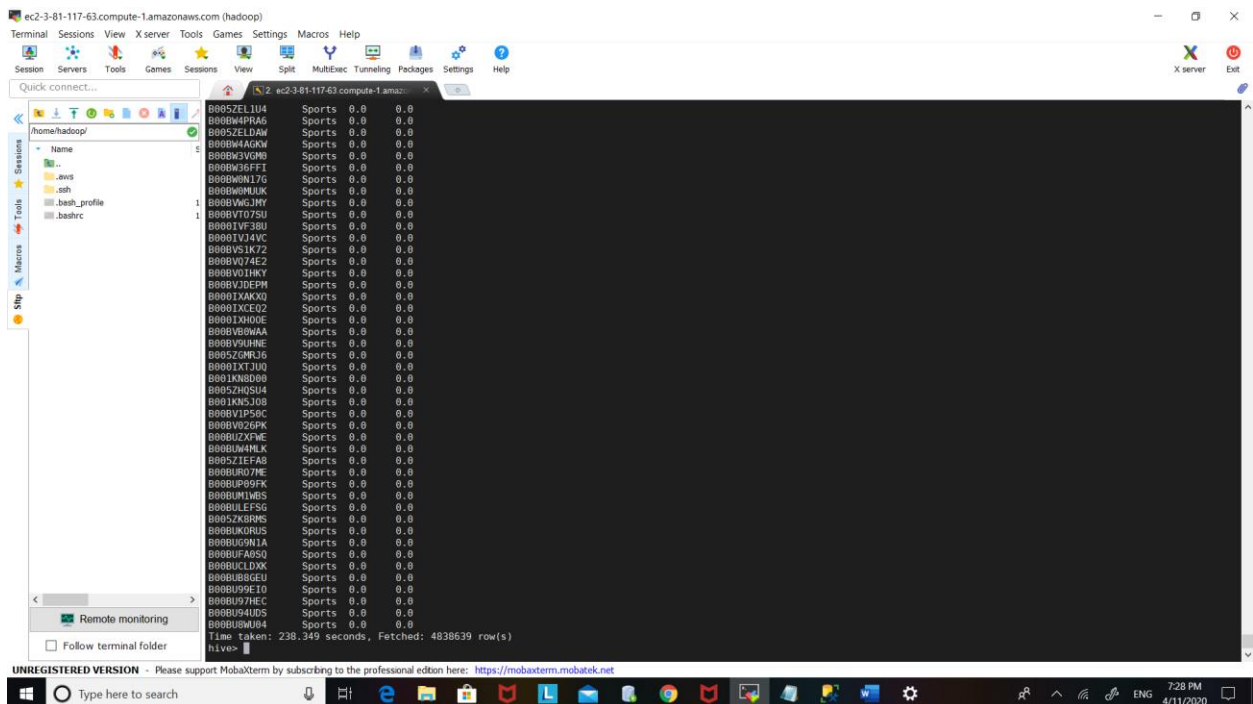


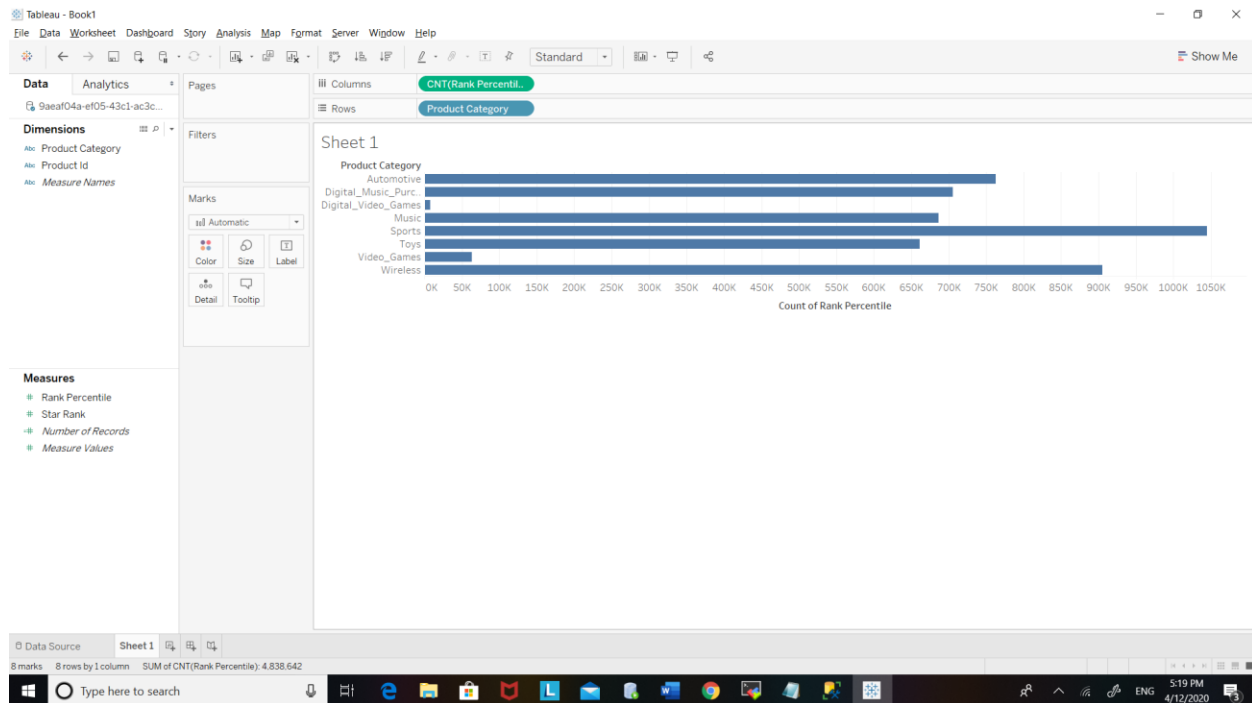
The above graph shows the minimum rating per product.

Products having highest percentile of star ratings given by customers:

SELECT x.product\_id, x.product\_category, x.star\_rank,

**Output:**





From the above graph we can conclude that Digital Video Game has the least percentile count and Sports Category has the highest.

## Conclusion:

After running various queries and analyzing them we could draw several conclusions.

Some being as simple as the Number of Customers increasing over time to the same product having different ratings over two categories.

Visualizations using Tableau were completed for most of the queries.

These Visualizations made it easy to read the output and draw conclusions.

Digital Video Game has the least percentile of star ratings given by customers and Sports has the highest.

The Year 2014 had the most no of customers, the most number of reviews and verified and unverified users.

The Year 2015 saw a drop in the number for the aforementioned categories.

Similarly Digital Video Game had the minimum rating for the star rating among the various categories and Sports had the maximum star rating among all the categories.

The least rated products and highest rated products could also be separated using the queries.

We could come to a conclusion that there are Users who are reviewing products in more than one category.

We used Aggregate function to show various results on the various categories.

Standard deviation, Max and Min rating were found for each categories and their visualizations were completed to improve the knowledge of the business by making it easy to understand the various effects.

We could co-relate various categories like, Music and Video Games.

The dataset was cleaned, partitioned and various inferences were thus drawn with the help of hive Queries and Visualizations were completed as well to complete the Project Part 1 on the Amazon dataset.

## **References:**

Class Notes

Class Mates : Prathamesh Namjoshi

Anuja Ghavate

W3 Schools

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