

Devasy Patel

Practical 9

20BCE057

Date : 17/04/2023

Aim : Implement a Traditional Recommender System using the Collaborative Filtering technique. Evaluation of Recommender system using RMSE(Root mean square error).

```
In [ ]: import pandas as pd
import numpy
import warnings
from nltk.tokenize import word_tokenize
from nltk.corpus import stopwords
from nltk.stem import PorterStemmer
import nltk
import os
import math
import numpy as np
from numpy.linalg import norm
from sklearn.metrics.pairwise import cosine_similarity
import random as rd
from sklearn.metrics import mean_squared_error, mean_absolute_error
```

User-User Collaborative Filtering (Numerical) - Accuracy

```
In [ ]: data = pd.read_csv("temp1.csv", header=None)

users = ["U"+str(i) for i in range(1, len(data)+1)]
items = ["P"+str(i) for i in range(1, len(data.columns)+1)]
print(data)
```

```
   0  1  2  3  4
0  0  3  0  3  4
1  4  0  0  2  0
2  0  0  3  0  0
3  3  0  4  0  3
4  4  3  0  4  4
```

```
In [ ]: with warnings.catch_warnings():
    warnings.filterwarnings("ignore")
    for user in data.index:
        ind = data.loc[user, :].!=0
        data.loc[user, ind] -= data.loc[user, ind].mean()
    print(data)
```

	0	1	2	3	4
0	0.000000	-0.333333	0.000000	-0.333333	0.666667
1	1.000000	0.000000	0.000000	-1.000000	0.000000
2	0.000000	0.000000	0.000000	0.000000	0.000000
3	-0.333333	0.000000	0.666667	0.000000	-0.333333
4	0.250000	-0.750000	0.000000	0.250000	0.250000

```
In [ ]: cos_sim = pd.DataFrame(cosine_similarity(data,data))
cos_sim = cos_sim.applymap(lambda x: round(x,3))
print(cos_sim)
```

	0	1	2	3	4
0	1.000	0.289	0.0	-0.333	0.471
1	0.289	1.000	0.0	-0.289	-0.000
2	0.000	0.000	0.0	0.000	0.000
3	-0.333	-0.289	0.0	1.000	-0.236
4	0.471	-0.000	0.0	-0.236	1.000

```
In [ ]: def predict(user,product,data,N):
    sim_list = cos_sim[user]
    ind_list = sorted(range(len(sim_list)), key=lambda x: sim_list[x])[-(N+1):-1]
    A=0
    B=0
    for i in ind_list:
        A += sim_list[i] * data.loc[i,product]
        B += sim_list[i]
    if(B==0):
        return 0
    else:
        return A/B

N = 3

users = data.index
no_user = len(users)

products = data.columns
no_products = len(products)

rmse_val = []
mae_val = []
no_ite = 10;

for x in range(no_ite):
    users_range = sorted(rd.sample(range(0,no_user),2))
    products_range = sorted(rd.sample(range(0,no_products),2))
    print("\nUser Sample range : ",users_range)
    print("Products Sample range : ",products_range)
    print("Sample : ")
    print(data.iloc[range(users_range[0],users_range[1]+1),range(products_range[0],
    y_pred = []
    y_true = []

    for user in range(users_range[0],users_range[1]+1):
        rated_products = data.iloc[user,:].index[data.iloc[user,:]!=0]
        for i in range(products_range[0],products_range[1]+1):
            if(i in rated_products):
                y_pred.append(predict(user,i,data,N))
                y_true.append(data.iloc[user,i])

    rmse = math.sqrt(mean_squared_error(y_true, y_pred))
    print("RMSE : "+str(rmse))
    mae = mean_absolute_error(y_true,y_pred)
```

```
    print("MAE : "+str(mae))
    rmse_val.append(rmse)
    mae_val.append(mae)
print("\n\n")
print("-"*50)
print("\nAverage RMSE : "+str(sum(rmse_val)/no_ite))
print("\nAverage MAE : "+str(sum(mae_val)/no_ite))
```

User Sample range : [3, 4]
 Products Sample range : [0, 2]
 Sample :

	0	1	2
3	-0.333333	0.00	0.666667
4	0.250000	-0.75	0.000000

 RMSE : 0.6467130392237664
 MAE : 0.5823809523809523

User Sample range : [1, 2]
 Products Sample range : [1, 4]
 Sample :

	1	2	3	4
1	0.0	0.0	-1.0	0.0
2	0.0	0.0	0.0	0.0

 RMSE : 0.6666666666666665
 MAE : 0.6666666666666665

User Sample range : [2, 4]
 Products Sample range : [1, 2]
 Sample :

	1	2
2	0.00	0.000000
3	0.00	0.666667
4	-0.75	0.000000

 RMSE : 0.5559026693385971
 MAE : 0.5416666666666665

User Sample range : [0, 4]
 Products Sample range : [2, 4]
 Sample :

	2	3	4
0	0.000000	-0.333333	0.666667
1	0.000000	-1.000000	0.000000
2	0.000000	0.000000	0.000000
3	0.666667	0.000000	-0.333333
4	0.000000	0.250000	0.250000

 RMSE : 0.5175455889267379
 MAE : 0.4855406373075546

User Sample range : [0, 4]
 Products Sample range : [2, 3]
 Sample :

	2	3
0	0.000000	-0.333333
1	0.000000	-1.000000
2	0.000000	0.000000
3	0.666667	0.000000
4	0.000000	0.250000

 RMSE : 0.5569631078568679
 MAE : 0.5061677631578947

User Sample range : [2, 4]
 Products Sample range : [1, 3]
 Sample :

	1	2	3
2	0.00	0.000000	0.00
3	0.00	0.666667	0.00
4	-0.75	0.000000	0.25

 RMSE : 0.565194165260439
 MAE : 0.5555555555555555

User Sample range : [1, 2]
 Products Sample range : [1, 3]

```

Sample :
      1      2      3
1  0.0  0.0 -1.0
2  0.0  0.0  0.0
RMSE : 0.6666666666666665
MAE : 0.6666666666666665

User Sample range : [1, 2]
Products Sample range : [2, 4]
Sample :
      2      3      4
1  0.0 -1.0  0.0
2  0.0  0.0  0.0
RMSE : 0.6666666666666665
MAE : 0.6666666666666665

User Sample range : [2, 3]
Products Sample range : [1, 4]
Sample :
      1      2      3      4
2  0.0  0.000000  0.0  0.000000
3  0.0  0.666667  0.0 -0.333333
RMSE : 0.567056288623202
MAE : 0.5561904761904762

User Sample range : [0, 3]
Products Sample range : [1, 3]
Sample :
      1      2      3
0 -0.333333  0.000000 -0.333333
1  0.000000  0.000000 -1.000000
2  0.000000  0.000000  0.000000
3  0.000000  0.666667  0.000000
RMSE : 0.47901931397850245
MAE : 0.39320175438596483

```

Average RMSE : 0.5888394173208111

Average MAE : 0.5620703805645064

Item - Item Collaborative Filtering (Numerical) - Accuracy

```

In [ ]: data = pd.read_csv("temp1.csv", header=None)

users = ["U"+str(i) for i in range(1, len(data)+1)]
items = ["P"+str(i) for i in range(1, len(data.columns)+1)]
print(data)

      0  1  2  3  4
0  0  3  0  3  4
1  4  0  0  2  0
2  0  0  3  0  0
3  3  0  4  0  3
4  4  3  0  4  4

```

```
In [ ]: with warnings.catch_warnings():
        warnings.filterwarnings("ignore")
        for product in data.columns:
            ind = data[product]!=0
            data[product][ind] -= data[product][ind].mean()
        print(data)
```

```

      0  1  2  3  4
0  0.000000  0  0.0  0  0.333333
1  0.333333  0  0.0 -1  0.000000
2  0.000000  0 -0.5  0  0.000000
3 -0.666667  0  0.5  0 -0.666667
4  0.333333  0  0.0  1  0.333333
```

```
In [ ]: cos_sim = pd.DataFrame(cosine_similarity(data.T,data.T))
        cos_sim = cos_sim.applymap(lambda x: round(x,3))
        print(cos_sim)
```

```

      0  1  2  3  4
0  1.000  0.0 -0.577 -0.000  0.833
1  0.000  0.0  0.000  0.000  0.000
2 -0.577  0.0  1.000  0.000 -0.577
3 -0.000  0.0  0.000  1.000  0.289
4  0.833  0.0 -0.577  0.289  1.000
```

```
In [ ]: def predict(user,product,data,N):
        sim_list = cos_sim[product]
        ind_list = sorted(range(len(sim_list)), key=lambda x: sim_list[x])[-(N+1):-1]
        A=0
        B=0
        for i in ind_list:
            A += sim_list[i] * data[user][i]
            B += sim_list[i]
        if(B==0):
            return 0
        else:
            return A/B

# N = int(input("Value of N : "))
N = 3
# user = data.index.get_loc((input("Enter User Name : ")))

users = data.index
no_user = len(users)

products = data.columns
no_products = len(products)

rmse_val = []
mae_val = []
no_ite = 10;

for x in range(no_ite):
    users_range = sorted(rd.sample(range(0,no_user),2))
    products_range = sorted(rd.sample(range(0,no_products),2))
    print("\nUser Sample range : ",users_range)
    print("Products Sample range : ",products_range)
    print("Sample : ")
    print(data.iloc[range(users_range[0],users_range[1]+1),range(products_range[0],
y_pred = []
y_true = []

    for user in range(users_range[0],users_range[1]+1):
        rated_products = data.iloc[user,:].index[data.iloc[user,:]!=0]
```

```

        for i in range(products_range[0],products_range[1]+1):
            if(i in rated_products):
                y_pred.append(predict(user,i,data,N))
                y_true.append(data.iloc[user,i])

    rmse = math.sqrt(mean_squared_error(y_true, y_pred))
    print("RMSE : "+str(rmse))
    mae = mean_absolute_error(y_true,y_pred)
    print("MAE : "+str(mae))
    rmse_val.append(rmse)
    mae_val.append(mae)
print("\n\n")
print("-"*50)
print("\nAverage RMSE : "+str(sum(rmse_val)/no_ite))
print("\nAverage MAE : "+str(sum(mae_val)/no_ite))

```

User Sample range : [2, 3]
Products Sample range : [0, 2]
Sample :
 0 1 2
2 0.000000 0 -0.5
3 -0.666667 0 0.5
RMSE : 1.0452715401237098
MAE : 0.8888888888888888

User Sample range : [0, 2]
Products Sample range : [3, 4]
Sample :
 3 4
0 0 0.333333
1 -1 0.000000
2 0 0.000000
RMSE : 0.7921729649046887
MAE : 0.7525252525252526

User Sample range : [1, 3]
Products Sample range : [2, 4]
Sample :
 2 3 4
1 0.0 -1 0.000000
2 -0.5 0 0.000000
3 0.5 0 -0.666667
RMSE : 0.6972166887783963
MAE : 0.6666666666666666

User Sample range : [2, 3]
Products Sample range : [1, 3]
Sample :
 1 2 3
2 0 -0.5 0
3 0 0.5 0
RMSE : 0.5
MAE : 0.5

User Sample range : [2, 3]
Products Sample range : [1, 2]
Sample :
 1 2
2 0 -0.5
3 0 0.5
RMSE : 0.5
MAE : 0.5

User Sample range : [0, 3]
Products Sample range : [0, 3]
Sample :
 0 1 2 3
0 0.000000 0 0.0 0
1 0.333333 0 0.0 -1
2 0.000000 0 -0.5 0
3 -0.666667 0 0.5 0
RMSE : 0.936897954837013
MAE : 0.8

User Sample range : [0, 3]
Products Sample range : [3, 4]
Sample :
 3 4
0 0 0.333333
1 -1 0.000000


```
2 0 0.000000
3 0 -0.666667
RMSE : 0.7526664726371646
MAE : 0.7239057239057239
```

```
User Sample range : [1, 3]
Products Sample range : [0, 2]
Sample :
      0  1  2
1 0.333333 0 0.0
2 0.000000 0 -0.5
3 -0.666667 0 0.5
RMSE : 0.9204467514322716
MAE : 0.75
```

```
User Sample range : [3, 4]
Products Sample range : [3, 4]
Sample :
      3  4
3 0 -0.666667
4 1 0.333333
RMSE : 0.5642795287738203
MAE : 0.5303030303030302
```

```
User Sample range : [0, 2]
Products Sample range : [2, 4]
Sample :
      2  3  4
0 0.0 0 0.333333
1 0.0 -1 0.000000
2 -0.5 0 0.000000
RMSE : 0.7083021983710461
MAE : 0.6683501683501684
```

Average RMSE : 0.741725409985811

Average MAE : 0.678063973063973

User-User Collaborative Filtering (Dataset) - Accuracy

```
In [ ]: data = pd.read_csv("rating.csv", names=["user", "product", "rating", "time"])
data = data.pivot_table(columns="product", index="user", values="rating")
data = data.iloc[:5000, :1500]
print(data)
```

product	059400232X	089933623X	094339676X	1034385789	\
user					
A001944026UMZ8T3K5QH1	NaN	NaN	NaN	NaN	
A00766851QZZUBOVF4JFT	NaN	NaN	NaN	NaN	
A01255851Z01U93P8RKGE	NaN	NaN	NaN	NaN	
A014623426J5CM7M12MBW	NaN	NaN	NaN	NaN	
A01580702BRW77PSJ9X34	NaN	NaN	NaN	NaN	
...	
A1F81EE548EOA5	NaN	NaN	NaN	NaN	
A1F81U0EZWZ01A	NaN	NaN	NaN	NaN	
A1F83CPW24HZKP	NaN	NaN	NaN	NaN	
A1F898XZRR8C28	NaN	NaN	NaN	NaN	
A1F89D3TC070GE	NaN	NaN	NaN	NaN	

product	1039869017	1085901386	1094441252	1182702627	\
user					
A001944026UMZ8T3K5QH1	NaN	NaN	NaN	NaN	
A00766851QZZUBOVF4JFT	NaN	NaN	NaN	NaN	
A01255851Z01U93P8RKGE	NaN	NaN	NaN	NaN	
A014623426J5CM7M12MBW	NaN	NaN	NaN	NaN	
A01580702BRW77PSJ9X34	NaN	NaN	NaN	NaN	
...	
A1F81EE548EOA5	NaN	NaN	NaN	NaN	
A1F81U0EZWZ01A	NaN	NaN	NaN	NaN	
A1F83CPW24HZKP	NaN	NaN	NaN	NaN	
A1F898XZRR8C28	NaN	NaN	NaN	NaN	
A1F89D3TC070GE	NaN	NaN	NaN	NaN	

product	1254875778	132793040	...	B00000J4CX	B00000J4CY	\
user			...			
A001944026UMZ8T3K5QH1	NaN	NaN	...	NaN	NaN	
A00766851QZZUBOVF4JFT	NaN	NaN	...	NaN	NaN	
A01255851Z01U93P8RKGE	NaN	NaN	...	NaN	NaN	
A014623426J5CM7M12MBW	NaN	NaN	...	NaN	NaN	
A01580702BRW77PSJ9X34	NaN	NaN	...	NaN	NaN	
...	
A1F81EE548EOA5	NaN	NaN	...	NaN	NaN	
A1F81U0EZWZ01A	NaN	NaN	...	NaN	NaN	
A1F83CPW24HZKP	NaN	NaN	...	NaN	NaN	
A1F898XZRR8C28	NaN	NaN	...	NaN	NaN	
A1F89D3TC070GE	NaN	NaN	...	NaN	NaN	

product	B00000J4D6	B00000J4D7	B00000J4DA	B00000J4DB	\
user					
A001944026UMZ8T3K5QH1	NaN	NaN	NaN	NaN	
A00766851QZZUBOVF4JFT	NaN	NaN	NaN	NaN	
A01255851Z01U93P8RKGE	NaN	NaN	NaN	NaN	
A014623426J5CM7M12MBW	NaN	NaN	NaN	NaN	
A01580702BRW77PSJ9X34	NaN	NaN	NaN	NaN	
...	
A1F81EE548EOA5	NaN	NaN	NaN	NaN	
A1F81U0EZWZ01A	NaN	NaN	NaN	NaN	
A1F83CPW24HZKP	NaN	NaN	NaN	NaN	
A1F898XZRR8C28	NaN	NaN	NaN	NaN	
A1F89D3TC070GE	NaN	NaN	NaN	NaN	

product	B00000J4DG	B00000J4DI	B00000J4DQ	B00000J4DR	
user					
A001944026UMZ8T3K5QH1	NaN	NaN	NaN	NaN	
A00766851QZZUBOVF4JFT	NaN	NaN	NaN	NaN	
A01255851Z01U93P8RKGE	NaN	NaN	NaN	NaN	
A014623426J5CM7M12MBW	NaN	NaN	NaN	NaN	
A01580702BRW77PSJ9X34	NaN	NaN	NaN	NaN	
...	

A1F81EE548EOA5	NaN	NaN	NaN	NaN
A1F81UOEZWZ01A	NaN	NaN	NaN	NaN
A1F83CPW24HZKP	NaN	NaN	NaN	NaN
A1F898XZRR8C28	NaN	NaN	NaN	NaN
A1F89D3TC070GE	NaN	NaN	NaN	NaN

[5000 rows x 1500 columns]

```
In [ ]: with warnings.catch_warnings():
         warnings.filterwarnings("ignore")
         for user in data.index:
             ind = data.loc[user,:] != np.nan
             data.loc[user,ind] -= data.loc[user,ind].mean()
         data = data.fillna(0)
         print(data)
```

product	059400232X	089933623X	094339676X	1034385789	\
user					
A001944026UMZ8T3K5QH1	0.0	0.0	0.0	0.0	
A00766851QZZUBOVF4JFT	0.0	0.0	0.0	0.0	
A01255851Z01U93P8RKGE	0.0	0.0	0.0	0.0	
A014623426J5CM7M12MBW	0.0	0.0	0.0	0.0	
A01580702BRW77PSJ9X34	0.0	0.0	0.0	0.0	
...	
A1F81EE548EOA5	0.0	0.0	0.0	0.0	
A1F81U0EZWZ01A	0.0	0.0	0.0	0.0	
A1F83CPW24HZKP	0.0	0.0	0.0	0.0	
A1F898XZRR8C28	0.0	0.0	0.0	0.0	
A1F89D3TC070GE	0.0	0.0	0.0	0.0	

product	1039869017	1085901386	1094441252	1182702627	\
user					
A001944026UMZ8T3K5QH1	0.0	0.0	0.0	0.0	
A00766851QZZUBOVF4JFT	0.0	0.0	0.0	0.0	
A01255851Z01U93P8RKGE	0.0	0.0	0.0	0.0	
A014623426J5CM7M12MBW	0.0	0.0	0.0	0.0	
A01580702BRW77PSJ9X34	0.0	0.0	0.0	0.0	
...	
A1F81EE548EOA5	0.0	0.0	0.0	0.0	
A1F81U0EZWZ01A	0.0	0.0	0.0	0.0	
A1F83CPW24HZKP	0.0	0.0	0.0	0.0	
A1F898XZRR8C28	0.0	0.0	0.0	0.0	
A1F89D3TC070GE	0.0	0.0	0.0	0.0	

product	1254875778	132793040	...	B00000J4CX	B00000J4CY	\
user			...			
A001944026UMZ8T3K5QH1	0.0	0.0	...	0.0	0.0	
A00766851QZZUBOVF4JFT	0.0	0.0	...	0.0	0.0	
A01255851Z01U93P8RKGE	0.0	0.0	...	0.0	0.0	
A014623426J5CM7M12MBW	0.0	0.0	...	0.0	0.0	
A01580702BRW77PSJ9X34	0.0	0.0	...	0.0	0.0	
...	
A1F81EE548EOA5	0.0	0.0	...	0.0	0.0	
A1F81U0EZWZ01A	0.0	0.0	...	0.0	0.0	
A1F83CPW24HZKP	0.0	0.0	...	0.0	0.0	
A1F898XZRR8C28	0.0	0.0	...	0.0	0.0	
A1F89D3TC070GE	0.0	0.0	...	0.0	0.0	

product	B00000J4D6	B00000J4D7	B00000J4DA	B00000J4DB	\
user					
A001944026UMZ8T3K5QH1	0.0	0.0	0.0	0.0	
A00766851QZZUBOVF4JFT	0.0	0.0	0.0	0.0	
A01255851Z01U93P8RKGE	0.0	0.0	0.0	0.0	
A014623426J5CM7M12MBW	0.0	0.0	0.0	0.0	
A01580702BRW77PSJ9X34	0.0	0.0	0.0	0.0	
...	
A1F81EE548EOA5	0.0	0.0	0.0	0.0	
A1F81U0EZWZ01A	0.0	0.0	0.0	0.0	
A1F83CPW24HZKP	0.0	0.0	0.0	0.0	
A1F898XZRR8C28	0.0	0.0	0.0	0.0	
A1F89D3TC070GE	0.0	0.0	0.0	0.0	

product	B00000J4DG	B00000J4DI	B00000J4DQ	B00000J4DR	
user					
A001944026UMZ8T3K5QH1	0.0	0.0	0.0	0.0	
A00766851QZZUBOVF4JFT	0.0	0.0	0.0	0.0	
A01255851Z01U93P8RKGE	0.0	0.0	0.0	0.0	
A014623426J5CM7M12MBW	0.0	0.0	0.0	0.0	
A01580702BRW77PSJ9X34	0.0	0.0	0.0	0.0	
...	

A1F81EE548EOA5	0.0	0.0	0.0	0.0
A1F81UOEZWZ01A	0.0	0.0	0.0	0.0
A1F83CPW24HZKP	0.0	0.0	0.0	0.0
A1F898XZRR8C28	0.0	0.0	0.0	0.0
A1F89D3TC070GE	0.0	0.0	0.0	0.0

[5000 rows x 1500 columns]

```
In [ ]: cos_sim = pd.DataFrame(cosine_similarity(data,data))
cos_sim = cos_sim.applymap(lambda x: round(x,3))
print(cos_sim)
```

	0	1	2	3	4	5	6	7	8	9	...	4990	\
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	
...	
4995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	
4996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	
4997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	
4998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	
4999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	

	4991	4992	4993	4994	4995	4996	4997	4998	4999
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
...
4995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

[5000 rows x 5000 columns]

```
In [ ]: def predict(user,product,data,N):
    sim_list = cos_sim[user]
    ind_list = sorted(range(len(sim_list)), key=lambda x: sim_list[x])[-(N+1):-1]
    A=0
    B=0
    for i in ind_list:
        A += sim_list[i] * data.iloc[i,product]
        B += sim_list[i]
    if(B==0):
        return 0
    else:
        return A/B

# N = int(input("Value of N : "))
N = 20

users = data.index
no_user = len(users)

products = data.columns
no_products = len(products)

users_range = sorted(rd.sample(range(0,no_user),2))
products_range = sorted(rd.sample(range(0,no_products),2))
```

```

rmse_val = []
mae_val = []
no_ite = 10

for x in range(no_ite):

    print("\n\nUser Sample range : ",users_range)
    print("Products Sample range : ",products_range)
    print("Sample : ")
    print(data.iloc[range(users_range[0],users_range[1]+1),range(products_range[0],
y_pred = []
y_true = []

    for user in range(users_range[0],users_range[1]+1):
        rated_products = data.iloc[user,:].index[data.iloc[user,:]!=0]
        for i in range(products_range[0],products_range[1]+1):
            if(i in rated_products):
                y_pred.append(predict(user,i,data,N))
                y_true.append(data.iloc[user,i])
        if(len(y_pred)>0 and len(y_pred)==len(y_true)):
            rmse = math.sqrt(mean_squared_error(y_true, y_pred))
            print("RMSE : "+str(rmse))
            mae = mean_absolute_error(y_true,y_pred)
            print("MAE : "+str(mae))
            rmse_val.append(rmse)
            mae_val.append(mae)

print("\n\n")
print("-"*50)
print("\nAverage RMSE : "+str(sum(rmse_val)/no_ite))
print("\nAverage MAE : "+str(sum(mae_val)/no_ite))

```

User Sample range : [3049, 4466]

Products Sample range : [700, 1172]

Sample :

product	9983814129	998383054X	9983830884	9983833085	9983853027	\
user						
A1981BJUPA3R8C	0.0	0.0	0.0	0.0	0.0	
A1989944VHPI2I	0.0	0.0	0.0	0.0	0.0	
A1989WE0ZSBKNN	0.0	0.0	0.0	0.0	0.0	
A198A15LMKHG8T	0.0	0.0	0.0	0.0	0.0	
A198CPQ6A1VYD2	0.0	0.0	0.0	0.0	0.0	
...	
A1DLFC5GG1RQFL	0.0	0.0	0.0	0.0	0.0	
A1DLMTOTHQ4AST	0.0	0.0	0.0	0.0	0.0	
A1DLQENEM4ANWH	0.0	0.0	0.0	0.0	0.0	
A1DLSQMEALZSIK	0.0	0.0	0.0	0.0	0.0	
A1DLUOL9P1VF4A	0.0	0.0	0.0	0.0	0.0	

product	9983853035	9983877880	9983884313	9983886030	9983890372	\
user						
A1981BJUPA3R8C	0.0	0.0	0.0	0.0	0.0	
A1989944VHPI2I	0.0	0.0	0.0	0.0	0.0	
A1989WE0ZSBKNN	0.0	0.0	0.0	0.0	0.0	
A198A15LMKHG8T	0.0	0.0	0.0	0.0	0.0	
A198CPQ6A1VYD2	0.0	0.0	0.0	0.0	0.0	
...	
A1DLFC5GG1RQFL	0.0	0.0	0.0	0.0	0.0	
A1DLMTOTHQ4AST	0.0	0.0	0.0	0.0	0.0	
A1DLQENEM4ANWH	0.0	0.0	0.0	0.0	0.0	
A1DLSQMEALZSIK	0.0	0.0	0.0	0.0	0.0	
A1DLUOL9P1VF4A	0.0	0.0	0.0	0.0	0.0	

product	...	9990950369	999095061X	9990950636	9990950830	\
user	...					
A1981BJUPA3R8C	...	0.0	0.0	0.0	0.0	
A1989944VHPI2I	...	0.0	0.0	0.0	0.0	
A1989WE0ZSBKNN	...	0.0	0.0	0.0	0.0	
A198A15LMKHG8T	...	0.0	0.0	0.0	0.0	
A198CPQ6A1VYD2	...	0.0	0.0	0.0	0.0	
...	
A1DLFC5GG1RQFL	...	0.0	0.0	0.0	0.0	
A1DLMTOTHQ4AST	...	0.0	0.0	0.0	0.0	
A1DLQENEM4ANWH	...	0.0	0.0	0.0	0.0	
A1DLSQMEALZSIK	...	0.0	0.0	0.0	0.0	
A1DLUOL9P1VF4A	...	0.0	0.0	0.0	0.0	

product	9990974845	9991330038	9991535896	9991546634	9991549358	\
user						
A1981BJUPA3R8C	0.0	0.0	0.0	0.0	0.0	
A1989944VHPI2I	0.0	0.0	0.0	0.0	0.0	
A1989WE0ZSBKNN	0.0	0.0	0.0	0.0	0.0	
A198A15LMKHG8T	0.0	0.0	0.0	0.0	0.0	
A198CPQ6A1VYD2	0.0	0.0	0.0	0.0	0.0	
...	
A1DLFC5GG1RQFL	0.0	0.0	0.0	0.0	0.0	
A1DLMTOTHQ4AST	0.0	0.0	0.0	0.0	0.0	
A1DLQENEM4ANWH	0.0	0.0	0.0	0.0	0.0	
A1DLSQMEALZSIK	0.0	0.0	0.0	0.0	0.0	
A1DLUOL9P1VF4A	0.0	0.0	0.0	0.0	0.0	

product	B00000001Y
user	
A1981BJUPA3R8C	0.0
A1989944VHPI2I	0.0

A1989WE0ZSBKNN	0.0
A198A15LMKHG8T	0.0
A198CPQ6A1VYD2	0.0
...	...
A1DLFC5GG1RQFL	0.0
A1DLMTOTHQ4AST	0.0
A1DLQENEM4ANWH	0.0
A1DLSQMEALZSIK	0.0
A1DLUOL9P1VF4A	0.0

[1418 rows x 473 columns]

User Sample range : [3049, 4466]

Products Sample range : [700, 1172]

Sample :

product	9983814129	998383054X	9983830884	9983833085	9983853027	\
user						
A1981BJUPA3R8C	0.0	0.0	0.0	0.0	0.0	
A1989944VHPI2I	0.0	0.0	0.0	0.0	0.0	
A1989WE0ZSBKNN	0.0	0.0	0.0	0.0	0.0	
A198A15LMKHG8T	0.0	0.0	0.0	0.0	0.0	
A198CPQ6A1VYD2	0.0	0.0	0.0	0.0	0.0	
...	
A1DLFC5GG1RQFL	0.0	0.0	0.0	0.0	0.0	
A1DLMTOTHQ4AST	0.0	0.0	0.0	0.0	0.0	
A1DLQENEM4ANWH	0.0	0.0	0.0	0.0	0.0	
A1DLSQMEALZSIK	0.0	0.0	0.0	0.0	0.0	
A1DLUOL9P1VF4A	0.0	0.0	0.0	0.0	0.0	

product	9983853035	9983877880	9983884313	9983886030	9983890372	\
user						
A1981BJUPA3R8C	0.0	0.0	0.0	0.0	0.0	
A1989944VHPI2I	0.0	0.0	0.0	0.0	0.0	
A1989WE0ZSBKNN	0.0	0.0	0.0	0.0	0.0	
A198A15LMKHG8T	0.0	0.0	0.0	0.0	0.0	
A198CPQ6A1VYD2	0.0	0.0	0.0	0.0	0.0	
...	
A1DLFC5GG1RQFL	0.0	0.0	0.0	0.0	0.0	
A1DLMTOTHQ4AST	0.0	0.0	0.0	0.0	0.0	
A1DLQENEM4ANWH	0.0	0.0	0.0	0.0	0.0	
A1DLSQMEALZSIK	0.0	0.0	0.0	0.0	0.0	
A1DLUOL9P1VF4A	0.0	0.0	0.0	0.0	0.0	

product	...	9990950369	999095061X	9990950636	9990950830	\
user	...					
A1981BJUPA3R8C	...	0.0	0.0	0.0	0.0	
A1989944VHPI2I	...	0.0	0.0	0.0	0.0	
A1989WE0ZSBKNN	...	0.0	0.0	0.0	0.0	
A198A15LMKHG8T	...	0.0	0.0	0.0	0.0	
A198CPQ6A1VYD2	...	0.0	0.0	0.0	0.0	
...	
A1DLFC5GG1RQFL	...	0.0	0.0	0.0	0.0	
A1DLMTOTHQ4AST	...	0.0	0.0	0.0	0.0	
A1DLQENEM4ANWH	...	0.0	0.0	0.0	0.0	
A1DLSQMEALZSIK	...	0.0	0.0	0.0	0.0	
A1DLUOL9P1VF4A	...	0.0	0.0	0.0	0.0	

product	9990974845	9991330038	9991535896	9991546634	9991549358	\
user						
A1981BJUPA3R8C	0.0	0.0	0.0	0.0	0.0	
A1989944VHPI2I	0.0	0.0	0.0	0.0	0.0	
A1989WE0ZSBKNN	0.0	0.0	0.0	0.0	0.0	
A198A15LMKHG8T	0.0	0.0	0.0	0.0	0.0	

A198CPQ6A1VYD2	0.0	0.0	0.0	0.0	0.0
...
A1DLFC5GG1RQFL	0.0	0.0	0.0	0.0	0.0
A1DLMTOTHQ4AST	0.0	0.0	0.0	0.0	0.0
A1DLQENEM4ANWH	0.0	0.0	0.0	0.0	0.0
A1DLSQMEALZSIK	0.0	0.0	0.0	0.0	0.0
A1DLUOL9P1VF4A	0.0	0.0	0.0	0.0	0.0

product B00000001Y

user

A1981BJUPA3R8C	0.0
A1989944VHPI2I	0.0
A1989WE0ZSBKNN	0.0
A198A15LMKHG8T	0.0
A198CPQ6A1VYD2	0.0
...	...
A1DLFC5GG1RQFL	0.0
A1DLMTOTHQ4AST	0.0
A1DLQENEM4ANWH	0.0
A1DLSQMEALZSIK	0.0
A1DLUOL9P1VF4A	0.0

[1418 rows x 473 columns]

User Sample range : [3049, 4466]

Products Sample range : [700, 1172]

Sample :

product	9983814129	998383054X	9983830884	9983833085	9983853027	\
user						
A1981BJUPA3R8C	0.0	0.0	0.0	0.0	0.0	
A1989944VHPI2I	0.0	0.0	0.0	0.0	0.0	
A1989WE0ZSBKNN	0.0	0.0	0.0	0.0	0.0	
A198A15LMKHG8T	0.0	0.0	0.0	0.0	0.0	
A198CPQ6A1VYD2	0.0	0.0	0.0	0.0	0.0	
...	
A1DLFC5GG1RQFL	0.0	0.0	0.0	0.0	0.0	
A1DLMTOTHQ4AST	0.0	0.0	0.0	0.0	0.0	
A1DLQENEM4ANWH	0.0	0.0	0.0	0.0	0.0	
A1DLSQMEALZSIK	0.0	0.0	0.0	0.0	0.0	
A1DLUOL9P1VF4A	0.0	0.0	0.0	0.0	0.0	

product	9983853035	9983877880	9983884313	9983886030	9983890372	\
user						
A1981BJUPA3R8C	0.0	0.0	0.0	0.0	0.0	
A1989944VHPI2I	0.0	0.0	0.0	0.0	0.0	
A1989WE0ZSBKNN	0.0	0.0	0.0	0.0	0.0	
A198A15LMKHG8T	0.0	0.0	0.0	0.0	0.0	
A198CPQ6A1VYD2	0.0	0.0	0.0	0.0	0.0	
...	
A1DLFC5GG1RQFL	0.0	0.0	0.0	0.0	0.0	
A1DLMTOTHQ4AST	0.0	0.0	0.0	0.0	0.0	
A1DLQENEM4ANWH	0.0	0.0	0.0	0.0	0.0	
A1DLSQMEALZSIK	0.0	0.0	0.0	0.0	0.0	
A1DLUOL9P1VF4A	0.0	0.0	0.0	0.0	0.0	

product	...	9990950369	999095061X	9990950636	9990950830	\
user	...					
A1981BJUPA3R8C	...	0.0	0.0	0.0	0.0	
A1989944VHPI2I	...	0.0	0.0	0.0	0.0	
A1989WE0ZSBKNN	...	0.0	0.0	0.0	0.0	
A198A15LMKHG8T	...	0.0	0.0	0.0	0.0	
A198CPQ6A1VYD2	...	0.0	0.0	0.0	0.0	
...	

A1DLFC5GG1RQFL	...	0.0	0.0	0.0	0.0
A1DLMT0THQ4AST	...	0.0	0.0	0.0	0.0
A1DLQENEM4ANWH	...	0.0	0.0	0.0	0.0
A1DLSQMEALZSIK	...	0.0	0.0	0.0	0.0
A1DLUOL9P1VF4A	...	0.0	0.0	0.0	0.0

product	9990974845	9991330038	9991535896	9991546634	9991549358	\
user						
A1981BJUPA3R8C	0.0	0.0	0.0	0.0	0.0	
A1989944VHPI2I	0.0	0.0	0.0	0.0	0.0	
A1989WE0ZSBKNN	0.0	0.0	0.0	0.0	0.0	
A198A15LMKHG8T	0.0	0.0	0.0	0.0	0.0	
A198CPQ6A1VYD2	0.0	0.0	0.0	0.0	0.0	
...	
A1DLFC5GG1RQFL	0.0	0.0	0.0	0.0	0.0	
A1DLMT0THQ4AST	0.0	0.0	0.0	0.0	0.0	
A1DLQENEM4ANWH	0.0	0.0	0.0	0.0	0.0	
A1DLSQMEALZSIK	0.0	0.0	0.0	0.0	0.0	
A1DLUOL9P1VF4A	0.0	0.0	0.0	0.0	0.0	

product	B00000001Y
user	
A1981BJUPA3R8C	0.0
A1989944VHPI2I	0.0
A1989WE0ZSBKNN	0.0
A198A15LMKHG8T	0.0
A198CPQ6A1VYD2	0.0
...	...
A1DLFC5GG1RQFL	0.0
A1DLMT0THQ4AST	0.0
A1DLQENEM4ANWH	0.0
A1DLSQMEALZSIK	0.0
A1DLUOL9P1VF4A	0.0

[1418 rows x 473 columns]

User Sample range : [3049, 4466]
Products Sample range : [700, 1172]
Sample :

product	9983814129	998383054X	9983830884	9983833085	9983853027	\
user						
A1981BJUPA3R8C	0.0	0.0	0.0	0.0	0.0	
A1989944VHPI2I	0.0	0.0	0.0	0.0	0.0	
A1989WE0ZSBKNN	0.0	0.0	0.0	0.0	0.0	
A198A15LMKHG8T	0.0	0.0	0.0	0.0	0.0	
A198CPQ6A1VYD2	0.0	0.0	0.0	0.0	0.0	
...	
A1DLFC5GG1RQFL	0.0	0.0	0.0	0.0	0.0	
A1DLMT0THQ4AST	0.0	0.0	0.0	0.0	0.0	
A1DLQENEM4ANWH	0.0	0.0	0.0	0.0	0.0	
A1DLSQMEALZSIK	0.0	0.0	0.0	0.0	0.0	
A1DLUOL9P1VF4A	0.0	0.0	0.0	0.0	0.0	

product	9983853035	9983877880	9983884313	9983886030	9983890372	\
user						
A1981BJUPA3R8C	0.0	0.0	0.0	0.0	0.0	
A1989944VHPI2I	0.0	0.0	0.0	0.0	0.0	
A1989WE0ZSBKNN	0.0	0.0	0.0	0.0	0.0	
A198A15LMKHG8T	0.0	0.0	0.0	0.0	0.0	
A198CPQ6A1VYD2	0.0	0.0	0.0	0.0	0.0	
...	
A1DLFC5GG1RQFL	0.0	0.0	0.0	0.0	0.0	
A1DLMT0THQ4AST	0.0	0.0	0.0	0.0	0.0	

A1DLQENEM4ANWH	0.0	0.0	0.0	0.0	0.0
A1DLSQMEALZSIK	0.0	0.0	0.0	0.0	0.0
A1DLUOL9P1VF4A	0.0	0.0	0.0	0.0	0.0

product	...	9990950369	999095061X	9990950636	9990950830	\
user	...					
A1981BJUPA3R8C	...	0.0	0.0	0.0	0.0	
A1989944VHPI2I	...	0.0	0.0	0.0	0.0	
A1989WE0ZSBKNN	...	0.0	0.0	0.0	0.0	
A198A15LMKHG8T	...	0.0	0.0	0.0	0.0	
A198CPQ6A1VYD2	...	0.0	0.0	0.0	0.0	
...	
A1DLFC5GG1RQFL	...	0.0	0.0	0.0	0.0	
A1DLMTOTHQ4AST	...	0.0	0.0	0.0	0.0	
A1DLQENEM4ANWH	...	0.0	0.0	0.0	0.0	
A1DLSQMEALZSIK	...	0.0	0.0	0.0	0.0	
A1DLUOL9P1VF4A	...	0.0	0.0	0.0	0.0	

product	9990974845	9991330038	9991535896	9991546634	9991549358	\
user						
A1981BJUPA3R8C	0.0	0.0	0.0	0.0	0.0	
A1989944VHPI2I	0.0	0.0	0.0	0.0	0.0	
A1989WE0ZSBKNN	0.0	0.0	0.0	0.0	0.0	
A198A15LMKHG8T	0.0	0.0	0.0	0.0	0.0	
A198CPQ6A1VYD2	0.0	0.0	0.0	0.0	0.0	
...	
A1DLFC5GG1RQFL	0.0	0.0	0.0	0.0	0.0	
A1DLMTOTHQ4AST	0.0	0.0	0.0	0.0	0.0	
A1DLQENEM4ANWH	0.0	0.0	0.0	0.0	0.0	
A1DLSQMEALZSIK	0.0	0.0	0.0	0.0	0.0	
A1DLUOL9P1VF4A	0.0	0.0	0.0	0.0	0.0	

product	B00000001Y
user	
A1981BJUPA3R8C	0.0
A1989944VHPI2I	0.0
A1989WE0ZSBKNN	0.0
A198A15LMKHG8T	0.0
A198CPQ6A1VYD2	0.0
...	...
A1DLFC5GG1RQFL	0.0
A1DLMTOTHQ4AST	0.0
A1DLQENEM4ANWH	0.0
A1DLSQMEALZSIK	0.0
A1DLUOL9P1VF4A	0.0

[1418 rows x 473 columns]

User Sample range : [3049, 4466]
Products Sample range : [700, 1172]
Sample :

product	9983814129	998383054X	9983830884	9983833085	9983853027	\
user						
A1981BJUPA3R8C	0.0	0.0	0.0	0.0	0.0	
A1989944VHPI2I	0.0	0.0	0.0	0.0	0.0	
A1989WE0ZSBKNN	0.0	0.0	0.0	0.0	0.0	
A198A15LMKHG8T	0.0	0.0	0.0	0.0	0.0	
A198CPQ6A1VYD2	0.0	0.0	0.0	0.0	0.0	
...	
A1DLFC5GG1RQFL	0.0	0.0	0.0	0.0	0.0	
A1DLMTOTHQ4AST	0.0	0.0	0.0	0.0	0.0	
A1DLQENEM4ANWH	0.0	0.0	0.0	0.0	0.0	
A1DLSQMEALZSIK	0.0	0.0	0.0	0.0	0.0	

A1DLUOL9P1VF4A	0.0	0.0	0.0	0.0	0.0
product	9983853035	9983877880	9983884313	9983886030	9983890372 \
user					
A1981BJUPA3R8C	0.0	0.0	0.0	0.0	0.0
A1989944VHPI2I	0.0	0.0	0.0	0.0	0.0
A1989WE0ZSBKNN	0.0	0.0	0.0	0.0	0.0
A198A15LMKHG8T	0.0	0.0	0.0	0.0	0.0
A198CPQ6A1VYD2	0.0	0.0	0.0	0.0	0.0
...
A1DLFC5GG1RQFL	0.0	0.0	0.0	0.0	0.0
A1DLMTOTHQ4AST	0.0	0.0	0.0	0.0	0.0
A1DLQENEM4ANWH	0.0	0.0	0.0	0.0	0.0
A1DLSQMEALZSIK	0.0	0.0	0.0	0.0	0.0
A1DLUOL9P1VF4A	0.0	0.0	0.0	0.0	0.0
product	...	9990950369	999095061X	9990950636	9990950830 \
user	...				
A1981BJUPA3R8C	...	0.0	0.0	0.0	0.0
A1989944VHPI2I	...	0.0	0.0	0.0	0.0
A1989WE0ZSBKNN	...	0.0	0.0	0.0	0.0
A198A15LMKHG8T	...	0.0	0.0	0.0	0.0
A198CPQ6A1VYD2	...	0.0	0.0	0.0	0.0
...
A1DLFC5GG1RQFL	...	0.0	0.0	0.0	0.0
A1DLMTOTHQ4AST	...	0.0	0.0	0.0	0.0
A1DLQENEM4ANWH	...	0.0	0.0	0.0	0.0
A1DLSQMEALZSIK	...	0.0	0.0	0.0	0.0
A1DLUOL9P1VF4A	...	0.0	0.0	0.0	0.0
product	9990974845	9991330038	9991535896	9991546634	9991549358 \
user					
A1981BJUPA3R8C	0.0	0.0	0.0	0.0	0.0
A1989944VHPI2I	0.0	0.0	0.0	0.0	0.0
A1989WE0ZSBKNN	0.0	0.0	0.0	0.0	0.0
A198A15LMKHG8T	0.0	0.0	0.0	0.0	0.0
A198CPQ6A1VYD2	0.0	0.0	0.0	0.0	0.0
...
A1DLFC5GG1RQFL	0.0	0.0	0.0	0.0	0.0
A1DLMTOTHQ4AST	0.0	0.0	0.0	0.0	0.0
A1DLQENEM4ANWH	0.0	0.0	0.0	0.0	0.0
A1DLSQMEALZSIK	0.0	0.0	0.0	0.0	0.0
A1DLUOL9P1VF4A	0.0	0.0	0.0	0.0	0.0
product	B00000001Y				
user					
A1981BJUPA3R8C	0.0				
A1989944VHPI2I	0.0				
A1989WE0ZSBKNN	0.0				
A198A15LMKHG8T	0.0				
A198CPQ6A1VYD2	0.0				
...	...				
A1DLFC5GG1RQFL	0.0				
A1DLMTOTHQ4AST	0.0				
A1DLQENEM4ANWH	0.0				
A1DLSQMEALZSIK	0.0				
A1DLUOL9P1VF4A	0.0				

[1418 rows x 473 columns]

User Sample range : [3049, 4466]
Products Sample range : [700, 1172]
Sample :

product	9983814129	998383054X	9983830884	9983833085	9983853027	\
user						
A1981BJUPA3R8C	0.0	0.0	0.0	0.0	0.0	
A1989944VHPI2I	0.0	0.0	0.0	0.0	0.0	
A1989WE0ZSBKNN	0.0	0.0	0.0	0.0	0.0	
A198A15LMKHG8T	0.0	0.0	0.0	0.0	0.0	
A198CPQ6A1VYD2	0.0	0.0	0.0	0.0	0.0	
...	
A1DLFC5GG1RQFL	0.0	0.0	0.0	0.0	0.0	
A1DLMT0THQ4AST	0.0	0.0	0.0	0.0	0.0	
A1DLQENEM4ANWH	0.0	0.0	0.0	0.0	0.0	
A1DLSQMEALZSIK	0.0	0.0	0.0	0.0	0.0	
A1DLUOL9P1VF4A	0.0	0.0	0.0	0.0	0.0	

product	9983853035	9983877880	9983884313	9983886030	9983890372	\
user						
A1981BJUPA3R8C	0.0	0.0	0.0	0.0	0.0	
A1989944VHPI2I	0.0	0.0	0.0	0.0	0.0	
A1989WE0ZSBKNN	0.0	0.0	0.0	0.0	0.0	
A198A15LMKHG8T	0.0	0.0	0.0	0.0	0.0	
A198CPQ6A1VYD2	0.0	0.0	0.0	0.0	0.0	
...	
A1DLFC5GG1RQFL	0.0	0.0	0.0	0.0	0.0	
A1DLMT0THQ4AST	0.0	0.0	0.0	0.0	0.0	
A1DLQENEM4ANWH	0.0	0.0	0.0	0.0	0.0	
A1DLSQMEALZSIK	0.0	0.0	0.0	0.0	0.0	
A1DLUOL9P1VF4A	0.0	0.0	0.0	0.0	0.0	

product	...	9990950369	999095061X	9990950636	9990950830	\
user	...					
A1981BJUPA3R8C	...	0.0	0.0	0.0	0.0	
A1989944VHPI2I	...	0.0	0.0	0.0	0.0	
A1989WE0ZSBKNN	...	0.0	0.0	0.0	0.0	
A198A15LMKHG8T	...	0.0	0.0	0.0	0.0	
A198CPQ6A1VYD2	...	0.0	0.0	0.0	0.0	
...	
A1DLFC5GG1RQFL	...	0.0	0.0	0.0	0.0	
A1DLMT0THQ4AST	...	0.0	0.0	0.0	0.0	
A1DLQENEM4ANWH	...	0.0	0.0	0.0	0.0	
A1DLSQMEALZSIK	...	0.0	0.0	0.0	0.0	
A1DLUOL9P1VF4A	...	0.0	0.0	0.0	0.0	

product	9990974845	9991330038	9991535896	9991546634	9991549358	\
user						
A1981BJUPA3R8C	0.0	0.0	0.0	0.0	0.0	
A1989944VHPI2I	0.0	0.0	0.0	0.0	0.0	
A1989WE0ZSBKNN	0.0	0.0	0.0	0.0	0.0	
A198A15LMKHG8T	0.0	0.0	0.0	0.0	0.0	
A198CPQ6A1VYD2	0.0	0.0	0.0	0.0	0.0	
...	
A1DLFC5GG1RQFL	0.0	0.0	0.0	0.0	0.0	
A1DLMT0THQ4AST	0.0	0.0	0.0	0.0	0.0	
A1DLQENEM4ANWH	0.0	0.0	0.0	0.0	0.0	
A1DLSQMEALZSIK	0.0	0.0	0.0	0.0	0.0	
A1DLUOL9P1VF4A	0.0	0.0	0.0	0.0	0.0	

product	B00000001Y
user	
A1981BJUPA3R8C	0.0
A1989944VHPI2I	0.0
A1989WE0ZSBKNN	0.0
A198A15LMKHG8T	0.0
A198CPQ6A1VYD2	0.0
...	...

A1DLFC5GG1RQFL	0.0
A1DLMT0THQ4AST	0.0
A1DLQENEM4ANWH	0.0
A1DLSQMEALZSIK	0.0
A1DLUOL9P1VF4A	0.0

[1418 rows x 473 columns]

User Sample range : [3049, 4466]

Products Sample range : [700, 1172]

Sample :

product	9983814129	998383054X	9983830884	9983833085	9983853027	\
user						
A1981BJUPA3R8C	0.0	0.0	0.0	0.0	0.0	
A1989944VHPI2I	0.0	0.0	0.0	0.0	0.0	
A1989WE0ZSBKNN	0.0	0.0	0.0	0.0	0.0	
A198A15LMKHG8T	0.0	0.0	0.0	0.0	0.0	
A198CPQ6A1VYD2	0.0	0.0	0.0	0.0	0.0	
...	
A1DLFC5GG1RQFL	0.0	0.0	0.0	0.0	0.0	
A1DLMT0THQ4AST	0.0	0.0	0.0	0.0	0.0	
A1DLQENEM4ANWH	0.0	0.0	0.0	0.0	0.0	
A1DLSQMEALZSIK	0.0	0.0	0.0	0.0	0.0	
A1DLUOL9P1VF4A	0.0	0.0	0.0	0.0	0.0	

product	9983853035	9983877880	9983884313	9983886030	9983890372	\
user						
A1981BJUPA3R8C	0.0	0.0	0.0	0.0	0.0	
A1989944VHPI2I	0.0	0.0	0.0	0.0	0.0	
A1989WE0ZSBKNN	0.0	0.0	0.0	0.0	0.0	
A198A15LMKHG8T	0.0	0.0	0.0	0.0	0.0	
A198CPQ6A1VYD2	0.0	0.0	0.0	0.0	0.0	
...	
A1DLFC5GG1RQFL	0.0	0.0	0.0	0.0	0.0	
A1DLMT0THQ4AST	0.0	0.0	0.0	0.0	0.0	
A1DLQENEM4ANWH	0.0	0.0	0.0	0.0	0.0	
A1DLSQMEALZSIK	0.0	0.0	0.0	0.0	0.0	
A1DLUOL9P1VF4A	0.0	0.0	0.0	0.0	0.0	

product	...	9990950369	999095061X	9990950636	9990950830	\
user	...					
A1981BJUPA3R8C	...	0.0	0.0	0.0	0.0	
A1989944VHPI2I	...	0.0	0.0	0.0	0.0	
A1989WE0ZSBKNN	...	0.0	0.0	0.0	0.0	
A198A15LMKHG8T	...	0.0	0.0	0.0	0.0	
A198CPQ6A1VYD2	...	0.0	0.0	0.0	0.0	
...	
A1DLFC5GG1RQFL	...	0.0	0.0	0.0	0.0	
A1DLMT0THQ4AST	...	0.0	0.0	0.0	0.0	
A1DLQENEM4ANWH	...	0.0	0.0	0.0	0.0	
A1DLSQMEALZSIK	...	0.0	0.0	0.0	0.0	
A1DLUOL9P1VF4A	...	0.0	0.0	0.0	0.0	

product	9990974845	9991330038	9991535896	9991546634	9991549358	\
user						
A1981BJUPA3R8C	0.0	0.0	0.0	0.0	0.0	
A1989944VHPI2I	0.0	0.0	0.0	0.0	0.0	
A1989WE0ZSBKNN	0.0	0.0	0.0	0.0	0.0	
A198A15LMKHG8T	0.0	0.0	0.0	0.0	0.0	
A198CPQ6A1VYD2	0.0	0.0	0.0	0.0	0.0	
...	
A1DLFC5GG1RQFL	0.0	0.0	0.0	0.0	0.0	
A1DLMT0THQ4AST	0.0	0.0	0.0	0.0	0.0	

A1DLQENEM4ANWH	0.0	0.0	0.0	0.0	0.0
A1DLSQMEALZSIK	0.0	0.0	0.0	0.0	0.0
A1DLUOL9P1VF4A	0.0	0.0	0.0	0.0	0.0

product B00000001Y

user

A1981BJUPA3R8C	0.0
A1989944VHPI2I	0.0
A1989WE0ZSBKNN	0.0
A198A15LMKHG8T	0.0
A198CPQ6A1VYD2	0.0
...	...
A1DLFC5GG1RQFL	0.0
A1DLMTOTHQ4AST	0.0
A1DLQENEM4ANWH	0.0
A1DLSQMEALZSIK	0.0
A1DLUOL9P1VF4A	0.0

[1418 rows x 473 columns]

User Sample range : [3049, 4466]

Products Sample range : [700, 1172]

Sample :

product	9983814129	998383054X	9983830884	9983833085	9983853027	\
user						
A1981BJUPA3R8C	0.0	0.0	0.0	0.0	0.0	
A1989944VHPI2I	0.0	0.0	0.0	0.0	0.0	
A1989WE0ZSBKNN	0.0	0.0	0.0	0.0	0.0	
A198A15LMKHG8T	0.0	0.0	0.0	0.0	0.0	
A198CPQ6A1VYD2	0.0	0.0	0.0	0.0	0.0	
...	
A1DLFC5GG1RQFL	0.0	0.0	0.0	0.0	0.0	
A1DLMTOTHQ4AST	0.0	0.0	0.0	0.0	0.0	
A1DLQENEM4ANWH	0.0	0.0	0.0	0.0	0.0	
A1DLSQMEALZSIK	0.0	0.0	0.0	0.0	0.0	
A1DLUOL9P1VF4A	0.0	0.0	0.0	0.0	0.0	

product	9983853035	9983877880	9983884313	9983886030	9983890372	\
user						
A1981BJUPA3R8C	0.0	0.0	0.0	0.0	0.0	
A1989944VHPI2I	0.0	0.0	0.0	0.0	0.0	
A1989WE0ZSBKNN	0.0	0.0	0.0	0.0	0.0	
A198A15LMKHG8T	0.0	0.0	0.0	0.0	0.0	
A198CPQ6A1VYD2	0.0	0.0	0.0	0.0	0.0	
...	
A1DLFC5GG1RQFL	0.0	0.0	0.0	0.0	0.0	
A1DLMTOTHQ4AST	0.0	0.0	0.0	0.0	0.0	
A1DLQENEM4ANWH	0.0	0.0	0.0	0.0	0.0	
A1DLSQMEALZSIK	0.0	0.0	0.0	0.0	0.0	
A1DLUOL9P1VF4A	0.0	0.0	0.0	0.0	0.0	

product	...	9990950369	999095061X	9990950636	9990950830	\
user	...					
A1981BJUPA3R8C	...	0.0	0.0	0.0	0.0	
A1989944VHPI2I	...	0.0	0.0	0.0	0.0	
A1989WE0ZSBKNN	...	0.0	0.0	0.0	0.0	
A198A15LMKHG8T	...	0.0	0.0	0.0	0.0	
A198CPQ6A1VYD2	...	0.0	0.0	0.0	0.0	
...	
A1DLFC5GG1RQFL	...	0.0	0.0	0.0	0.0	
A1DLMTOTHQ4AST	...	0.0	0.0	0.0	0.0	
A1DLQENEM4ANWH	...	0.0	0.0	0.0	0.0	
A1DLSQMEALZSIK	...	0.0	0.0	0.0	0.0	

A1DLUOL9P1VF4A	...	0.0	0.0	0.0	0.0
product	9990974845	9991330038	9991535896	9991546634	9991549358 \
user					
A1981BJUPA3R8C	0.0	0.0	0.0	0.0	0.0
A1989944VHPI2I	0.0	0.0	0.0	0.0	0.0
A1989WE0ZSBKNN	0.0	0.0	0.0	0.0	0.0
A198A15LMKHG8T	0.0	0.0	0.0	0.0	0.0
A198CPQ6A1VYD2	0.0	0.0	0.0	0.0	0.0
...
A1DLFC5GG1RQFL	0.0	0.0	0.0	0.0	0.0
A1DLMTOTHQ4AST	0.0	0.0	0.0	0.0	0.0
A1DLQENEM4ANWH	0.0	0.0	0.0	0.0	0.0
A1DLSQMEALZSIK	0.0	0.0	0.0	0.0	0.0
A1DLUOL9P1VF4A	0.0	0.0	0.0	0.0	0.0
product	B00000001Y				
user					
A1981BJUPA3R8C	0.0				
A1989944VHPI2I	0.0				
A1989WE0ZSBKNN	0.0				
A198A15LMKHG8T	0.0				
A198CPQ6A1VYD2	0.0				
...	...				
A1DLFC5GG1RQFL	0.0				
A1DLMTOTHQ4AST	0.0				
A1DLQENEM4ANWH	0.0				
A1DLSQMEALZSIK	0.0				
A1DLUOL9P1VF4A	0.0				

[1418 rows x 473 columns]

User Sample range : [3049, 4466]

Products Sample range : [700, 1172]

Sample :

product	9983814129	998383054X	9983830884	9983833085	9983853027 \
user					
A1981BJUPA3R8C	0.0	0.0	0.0	0.0	0.0
A1989944VHPI2I	0.0	0.0	0.0	0.0	0.0
A1989WE0ZSBKNN	0.0	0.0	0.0	0.0	0.0
A198A15LMKHG8T	0.0	0.0	0.0	0.0	0.0
A198CPQ6A1VYD2	0.0	0.0	0.0	0.0	0.0
...
A1DLFC5GG1RQFL	0.0	0.0	0.0	0.0	0.0
A1DLMTOTHQ4AST	0.0	0.0	0.0	0.0	0.0
A1DLQENEM4ANWH	0.0	0.0	0.0	0.0	0.0
A1DLSQMEALZSIK	0.0	0.0	0.0	0.0	0.0
A1DLUOL9P1VF4A	0.0	0.0	0.0	0.0	0.0
product	9983853035	9983877880	9983884313	9983886030	9983890372 \
user					
A1981BJUPA3R8C	0.0	0.0	0.0	0.0	0.0
A1989944VHPI2I	0.0	0.0	0.0	0.0	0.0
A1989WE0ZSBKNN	0.0	0.0	0.0	0.0	0.0
A198A15LMKHG8T	0.0	0.0	0.0	0.0	0.0
A198CPQ6A1VYD2	0.0	0.0	0.0	0.0	0.0
...
A1DLFC5GG1RQFL	0.0	0.0	0.0	0.0	0.0
A1DLMTOTHQ4AST	0.0	0.0	0.0	0.0	0.0
A1DLQENEM4ANWH	0.0	0.0	0.0	0.0	0.0
A1DLSQMEALZSIK	0.0	0.0	0.0	0.0	0.0
A1DLUOL9P1VF4A	0.0	0.0	0.0	0.0	0.0

product	...	9990950369	999095061X	9990950636	9990950830	\
user	...					
A1981BJUPA3R8C	...	0.0	0.0	0.0	0.0	
A1989944VHPI2I	...	0.0	0.0	0.0	0.0	
A1989WE0ZSBKNN	...	0.0	0.0	0.0	0.0	
A198A15LMKHG8T	...	0.0	0.0	0.0	0.0	
A198CPQ6A1VYD2	...	0.0	0.0	0.0	0.0	
...	
A1DLFC5GG1RQFL	...	0.0	0.0	0.0	0.0	
A1DLMT0THQ4AST	...	0.0	0.0	0.0	0.0	
A1DLQENEM4ANWH	...	0.0	0.0	0.0	0.0	
A1DLSQMEALZSIK	...	0.0	0.0	0.0	0.0	
A1DLUOL9P1VF4A	...	0.0	0.0	0.0	0.0	

product	9990974845	9991330038	9991535896	9991546634	9991549358	\
user						
A1981BJUPA3R8C	0.0	0.0	0.0	0.0	0.0	
A1989944VHPI2I	0.0	0.0	0.0	0.0	0.0	
A1989WE0ZSBKNN	0.0	0.0	0.0	0.0	0.0	
A198A15LMKHG8T	0.0	0.0	0.0	0.0	0.0	
A198CPQ6A1VYD2	0.0	0.0	0.0	0.0	0.0	
...	
A1DLFC5GG1RQFL	0.0	0.0	0.0	0.0	0.0	
A1DLMT0THQ4AST	0.0	0.0	0.0	0.0	0.0	
A1DLQENEM4ANWH	0.0	0.0	0.0	0.0	0.0	
A1DLSQMEALZSIK	0.0	0.0	0.0	0.0	0.0	
A1DLUOL9P1VF4A	0.0	0.0	0.0	0.0	0.0	

product	B00000001Y
user	
A1981BJUPA3R8C	0.0
A1989944VHPI2I	0.0
A1989WE0ZSBKNN	0.0
A198A15LMKHG8T	0.0
A198CPQ6A1VYD2	0.0
...	...
A1DLFC5GG1RQFL	0.0
A1DLMT0THQ4AST	0.0
A1DLQENEM4ANWH	0.0
A1DLSQMEALZSIK	0.0
A1DLUOL9P1VF4A	0.0

[1418 rows x 473 columns]

User Sample range : [3049, 4466]
Products Sample range : [700, 1172]
Sample :

product	9983814129	998383054X	9983830884	9983833085	9983853027	\
user						
A1981BJUPA3R8C	0.0	0.0	0.0	0.0	0.0	
A1989944VHPI2I	0.0	0.0	0.0	0.0	0.0	
A1989WE0ZSBKNN	0.0	0.0	0.0	0.0	0.0	
A198A15LMKHG8T	0.0	0.0	0.0	0.0	0.0	
A198CPQ6A1VYD2	0.0	0.0	0.0	0.0	0.0	
...	
A1DLFC5GG1RQFL	0.0	0.0	0.0	0.0	0.0	
A1DLMT0THQ4AST	0.0	0.0	0.0	0.0	0.0	
A1DLQENEM4ANWH	0.0	0.0	0.0	0.0	0.0	
A1DLSQMEALZSIK	0.0	0.0	0.0	0.0	0.0	
A1DLUOL9P1VF4A	0.0	0.0	0.0	0.0	0.0	

product	9983853035	9983877880	9983884313	9983886030	9983890372	\
user						

A1981BJUPA3R8C	0.0	0.0	0.0	0.0	0.0
A1989944VHPI2I	0.0	0.0	0.0	0.0	0.0
A1989WE0ZSBKNN	0.0	0.0	0.0	0.0	0.0
A198A15LMKHG8T	0.0	0.0	0.0	0.0	0.0
A198CPQ6A1VYD2	0.0	0.0	0.0	0.0	0.0
...
A1DLFC5GG1RQFL	0.0	0.0	0.0	0.0	0.0
A1DLMT0THQ4AST	0.0	0.0	0.0	0.0	0.0
A1DLQENEM4ANWH	0.0	0.0	0.0	0.0	0.0
A1DLSQMEALZSIK	0.0	0.0	0.0	0.0	0.0
A1DLUOL9P1VF4A	0.0	0.0	0.0	0.0	0.0

product	...	9990950369	999095061X	9990950636	9990950830	\
user	...					
A1981BJUPA3R8C	...	0.0	0.0	0.0	0.0	
A1989944VHPI2I	...	0.0	0.0	0.0	0.0	
A1989WE0ZSBKNN	...	0.0	0.0	0.0	0.0	
A198A15LMKHG8T	...	0.0	0.0	0.0	0.0	
A198CPQ6A1VYD2	...	0.0	0.0	0.0	0.0	
...	
A1DLFC5GG1RQFL	...	0.0	0.0	0.0	0.0	
A1DLMT0THQ4AST	...	0.0	0.0	0.0	0.0	
A1DLQENEM4ANWH	...	0.0	0.0	0.0	0.0	
A1DLSQMEALZSIK	...	0.0	0.0	0.0	0.0	
A1DLUOL9P1VF4A	...	0.0	0.0	0.0	0.0	

product	9990974845	9991330038	9991535896	9991546634	9991549358	\
user						
A1981BJUPA3R8C	0.0	0.0	0.0	0.0	0.0	
A1989944VHPI2I	0.0	0.0	0.0	0.0	0.0	
A1989WE0ZSBKNN	0.0	0.0	0.0	0.0	0.0	
A198A15LMKHG8T	0.0	0.0	0.0	0.0	0.0	
A198CPQ6A1VYD2	0.0	0.0	0.0	0.0	0.0	
...	
A1DLFC5GG1RQFL	0.0	0.0	0.0	0.0	0.0	
A1DLMT0THQ4AST	0.0	0.0	0.0	0.0	0.0	
A1DLQENEM4ANWH	0.0	0.0	0.0	0.0	0.0	
A1DLSQMEALZSIK	0.0	0.0	0.0	0.0	0.0	
A1DLUOL9P1VF4A	0.0	0.0	0.0	0.0	0.0	

product	B00000001Y
user	
A1981BJUPA3R8C	0.0
A1989944VHPI2I	0.0
A1989WE0ZSBKNN	0.0
A198A15LMKHG8T	0.0
A198CPQ6A1VYD2	0.0
...	...
A1DLFC5GG1RQFL	0.0
A1DLMT0THQ4AST	0.0
A1DLQENEM4ANWH	0.0
A1DLSQMEALZSIK	0.0
A1DLUOL9P1VF4A	0.0

[1418 rows x 473 columns]

Average RMSE : 0.0

Average MAE : 0.0

Item - Item Collaborative Filtering (Dataset)

```
In [ ]: data = pd.read_csv("rating.csv", names=["user", "product", "rating", "time"])
data = data.pivot_table(columns="product", index="user", values="rating")
print(data)
```

product	059400232X	089933623X	094339676X	1034385789	\
user					
A001944026UMZ8T3K5QH1	NaN	NaN	NaN	NaN	
A00766851QZZUBOVF4JFT	NaN	NaN	NaN	NaN	
A01255851Z01U93P8RKGE	NaN	NaN	NaN	NaN	
A014623426J5CM7M12MBW	NaN	NaN	NaN	NaN	
A01580702BRW77PSJ9X34	NaN	NaN	NaN	NaN	
...	
AZZMV5VT9W7Y8	NaN	NaN	NaN	NaN	
AZZP8BC9WE0N8	NaN	NaN	NaN	NaN	
AZZST80YL5P4Q	NaN	NaN	NaN	NaN	
AZZUBI2MEAHI9	NaN	NaN	NaN	NaN	
AZZZEWADNFNUM	NaN	NaN	NaN	NaN	

product	1039869017	1085901386	1094441252	1182702627	\
user					
A001944026UMZ8T3K5QH1	NaN	NaN	NaN	NaN	
A00766851QZZUBOVF4JFT	NaN	NaN	NaN	NaN	
A01255851Z01U93P8RKGE	NaN	NaN	NaN	NaN	
A014623426J5CM7M12MBW	NaN	NaN	NaN	NaN	
A01580702BRW77PSJ9X34	NaN	NaN	NaN	NaN	
...	
AZZMV5VT9W7Y8	NaN	NaN	NaN	NaN	
AZZP8BC9WE0N8	NaN	NaN	NaN	NaN	
AZZST80YL5P4Q	NaN	NaN	NaN	NaN	
AZZUBI2MEAHI9	NaN	NaN	NaN	NaN	
AZZZEWADNFNUM	NaN	NaN	NaN	NaN	

product	1254875778	132793040	...	B00004TDMZ	B00004TDN0	\
user			...			
A001944026UMZ8T3K5QH1	NaN	NaN	...	NaN	NaN	
A00766851QZZUBOVF4JFT	NaN	NaN	...	NaN	NaN	
A01255851Z01U93P8RKGE	NaN	NaN	...	NaN	NaN	
A014623426J5CM7M12MBW	NaN	NaN	...	NaN	NaN	
A01580702BRW77PSJ9X34	NaN	NaN	...	NaN	NaN	
...	
AZZMV5VT9W7Y8	NaN	NaN	...	NaN	NaN	
AZZP8BC9WE0N8	NaN	NaN	...	NaN	NaN	
AZZST80YL5P4Q	NaN	NaN	...	NaN	NaN	
AZZUBI2MEAHI9	NaN	NaN	...	NaN	NaN	
AZZZEWADNFNUM	NaN	NaN	...	NaN	NaN	

product	B00004TDN1	B00004TDN2	B00004TDN3	B00004TDN4	\
user					
A001944026UMZ8T3K5QH1	NaN	NaN	NaN	NaN	
A00766851QZZUBOVF4JFT	NaN	NaN	NaN	NaN	
A01255851Z01U93P8RKGE	NaN	NaN	NaN	NaN	
A014623426J5CM7M12MBW	NaN	NaN	NaN	NaN	
A01580702BRW77PSJ9X34	NaN	NaN	NaN	NaN	
...	
AZZMV5VT9W7Y8	NaN	NaN	NaN	NaN	
AZZP8BC9WE0N8	NaN	NaN	NaN	NaN	
AZZST80YL5P4Q	NaN	NaN	NaN	NaN	
AZZUBI2MEAHI9	NaN	NaN	NaN	NaN	
AZZZEWADNFNUM	NaN	NaN	NaN	NaN	

product	B00004TDN5	B00004TDN7	B00004TDPP	B00004TDRH	
user					
A001944026UMZ8T3K5QH1	NaN	NaN	NaN	NaN	
A00766851QZZUBOVF4JFT	NaN	NaN	NaN	NaN	
A01255851Z01U93P8RKGE	NaN	NaN	NaN	NaN	
A014623426J5CM7M12MBW	NaN	NaN	NaN	NaN	
A01580702BRW77PSJ9X34	NaN	NaN	NaN	NaN	
...	

AZZMV5VT9W7Y8	NaN	NaN	NaN	NaN
AZZP8BC9WE0N8	NaN	NaN	NaN	NaN
AZZST8OYL5P4Q	NaN	NaN	NaN	NaN
AZZUBI2MEAHI9	NaN	NaN	NaN	NaN
AZZZEWADNFNUM	NaN	NaN	NaN	NaN

[44625 rows x 3333 columns]

```
In [ ]: with warnings.catch_warnings():
         warnings.filterwarnings("ignore")
         for product in data.columns:
             ind = data[product]!=np.nan
             data[product][ind] -= data[product][ind].mean()
         data = data.fillna(0)
         print(data)
```

product	059400232X	089933623X	094339676X	1034385789	\
user					
A001944026UMZ8T3K5QH1	0.0	0.0	0.0	0.0	
A00766851QZZUBOVF4JFT	0.0	0.0	0.0	0.0	
A01255851Z01U93P8RKGE	0.0	0.0	0.0	0.0	
A014623426J5CM7M12MBW	0.0	0.0	0.0	0.0	
A01580702BRW77PSJ9X34	0.0	0.0	0.0	0.0	
...	
AZZMV5VT9W7Y8	0.0	0.0	0.0	0.0	
AZZP8BC9WE0N8	0.0	0.0	0.0	0.0	
AZZST80YL5P4Q	0.0	0.0	0.0	0.0	
AZZUBI2MEAHI9	0.0	0.0	0.0	0.0	
AZZZEWADNFNUM	0.0	0.0	0.0	0.0	

product	1039869017	1085901386	1094441252	1182702627	\
user					
A001944026UMZ8T3K5QH1	0.0	0.0	0.0	0.0	
A00766851QZZUBOVF4JFT	0.0	0.0	0.0	0.0	
A01255851Z01U93P8RKGE	0.0	0.0	0.0	0.0	
A014623426J5CM7M12MBW	0.0	0.0	0.0	0.0	
A01580702BRW77PSJ9X34	0.0	0.0	0.0	0.0	
...	
AZZMV5VT9W7Y8	0.0	0.0	0.0	0.0	
AZZP8BC9WE0N8	0.0	0.0	0.0	0.0	
AZZST80YL5P4Q	0.0	0.0	0.0	0.0	
AZZUBI2MEAHI9	0.0	0.0	0.0	0.0	
AZZZEWADNFNUM	0.0	0.0	0.0	0.0	

product	1254875778	132793040	...	B00004TDMZ	B00004TDN0	\
user			...			
A001944026UMZ8T3K5QH1	0.0	0.0	...	0.0	0.0	
A00766851QZZUBOVF4JFT	0.0	0.0	...	0.0	0.0	
A01255851Z01U93P8RKGE	0.0	0.0	...	0.0	0.0	
A014623426J5CM7M12MBW	0.0	0.0	...	0.0	0.0	
A01580702BRW77PSJ9X34	0.0	0.0	...	0.0	0.0	
...	
AZZMV5VT9W7Y8	0.0	0.0	...	0.0	0.0	
AZZP8BC9WE0N8	0.0	0.0	...	0.0	0.0	
AZZST80YL5P4Q	0.0	0.0	...	0.0	0.0	
AZZUBI2MEAHI9	0.0	0.0	...	0.0	0.0	
AZZZEWADNFNUM	0.0	0.0	...	0.0	0.0	

product	B00004TDN1	B00004TDN2	B00004TDN3	B00004TDN4	\
user					
A001944026UMZ8T3K5QH1	0.0	0.0	0.0	0.0	
A00766851QZZUBOVF4JFT	0.0	0.0	0.0	0.0	
A01255851Z01U93P8RKGE	0.0	0.0	0.0	0.0	
A014623426J5CM7M12MBW	0.0	0.0	0.0	0.0	
A01580702BRW77PSJ9X34	0.0	0.0	0.0	0.0	
...	
AZZMV5VT9W7Y8	0.0	0.0	0.0	0.0	
AZZP8BC9WE0N8	0.0	0.0	0.0	0.0	
AZZST80YL5P4Q	0.0	0.0	0.0	0.0	
AZZUBI2MEAHI9	0.0	0.0	0.0	0.0	
AZZZEWADNFNUM	0.0	0.0	0.0	0.0	

product	B00004TDN5	B00004TDN7	B00004TDPP	B00004TDRH	
user					
A001944026UMZ8T3K5QH1	0.0	0.0	0.0	0.0	
A00766851QZZUBOVF4JFT	0.0	0.0	0.0	0.0	
A01255851Z01U93P8RKGE	0.0	0.0	0.0	0.0	
A014623426J5CM7M12MBW	0.0	0.0	0.0	0.0	
A01580702BRW77PSJ9X34	0.0	0.0	0.0	0.0	
...	

AZZMV5VT9W7Y8	0.0	0.0	0.0	0.0
AZZP8BC9WE0N8	0.0	0.0	0.0	0.0
AZZST80YL5P4Q	0.0	0.0	0.0	0.0
AZZUBI2MEAHI9	0.0	0.0	0.0	0.0
AZZEWADNFNUM	0.0	0.0	0.0	0.0

[44625 rows x 3333 columns]

```
In [ ]: cos_sim = pd.DataFrame(cosine_similarity(data.T,data.T))
cos_sim = cos_sim.applymap(lambda x: round(x,3))
print(cos_sim)
```

	0	1	2	3	4	5	6	7	8	9	...	3323	\
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.000	
1	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.000	
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.000	
3	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.000	
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.000	
...	
3328	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	-0.001	
3329	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.000	
3330	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.003	
3331	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.000	
3332	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.000	

	3324	3325	3326	3327	3328	3329	3330	3331	3332
0	0.000	0.000	0.000	0.0	0.000	0.000	0.00	0.0	0.0
1	0.000	0.000	0.000	0.0	0.000	0.000	0.00	0.0	0.0
2	0.000	0.000	0.000	0.0	0.000	0.000	0.00	0.0	0.0
3	0.000	0.000	0.000	0.0	0.000	0.000	0.00	0.0	0.0
4	0.000	0.000	0.000	0.0	0.000	0.000	0.00	0.0	0.0
...
3328	0.024	0.004	0.009	0.0	1.000	-0.007	0.05	0.0	0.0
3329	0.000	0.000	0.010	0.0	-0.007	1.000	0.00	0.0	0.0
3330	0.008	0.000	0.001	0.0	0.050	0.000	1.00	0.0	0.0
3331	0.000	0.000	0.000	0.0	0.000	0.000	0.00	1.0	0.0
3332	0.000	0.000	0.000	0.0	0.000	0.000	0.00	0.0	1.0

[3333 rows x 3333 columns]

```
In [ ]: def predict(user,product,data,N):
sim_list = cos_sim[product]
ind_list = sorted(range(len(sim_list)), key=lambda x: sim_list[x])[-(N+1):-1]
A=0
B=0
for i in ind_list:
    A += sim_list[i] * data.iloc[user,i]
    B += sim_list[i]
if(B==0):
    return 0
else:
    return A/B

# N = int(input("Value of N : "))
N = 20

users = data.index
no_user = len(users)

products = data.columns
no_products = len(products)

users_range = sorted(rd.sample(range(0,no_user),2))
products_range = sorted(rd.sample(range(0,no_products),2))
```

```

rmse_val = []
mae_val = []
no_ite = 10

for x in range(no_ite):

    print("\n\nUser Sample range : ",users_range)
    print("Products Sample range : ",products_range)
    print("Sample : ")
    print(data.iloc[range(users_range[0],users_range[1]+1),range(products_range[0],
y_pred = []
y_true = []

    for user in range(users_range[0],users_range[1]+1):
        rated_products = data.iloc[user,:].index[data.iloc[user,:]!=0]
        for i in range(products_range[0],products_range[1]+1):
            if(i in rated_products):
                y_pred.append(predict(user,i,data,N))
                y_true.append(data.iloc[user,i])
        if(len(y_pred)>0 and len(y_pred)==len(y_true)):
            rmse = math.sqrt(mean_squared_error(y_true, y_pred))
            print("RMSE : "+str(rmse))
            mae = mean_absolute_error(y_true,y_pred)
            print("MAE : "+str(mae))
            rmse_val.append(rmse)
            mae_val.append(mae)

print("\n\n")
print("-"*50)
print("\nAverage RMSE : "+str(sum(rmse_val)/no_ite))
print("\nAverage MAE : "+str(sum(mae_val)/no_ite))

```


User Sample range : [265, 16307]

Products Sample range : [764, 2388]

Sample :

product	9984976734	9984976866	9984977234	9984977595	9984977730	\
user						
A10R7XM20Z0323	0.0	0.0	0.0	0.0	0.0	
A10RDB0FTFA5S3	0.0	0.0	0.0	0.0	0.0	
A10RFZ7WJD1Y2C	0.0	0.0	0.0	0.0	0.0	
A10RHYA8B2K9QT	0.0	0.0	0.0	0.0	0.0	
A10RMMITRBG4W	0.0	0.0	0.0	0.0	0.0	
...	
A2E6WMRJAR02Q1	0.0	0.0	0.0	0.0	0.0	
A2E74YKJXGZCJB	0.0	0.0	0.0	0.0	0.0	
A2E76LB77DZVN2	0.0	0.0	0.0	0.0	0.0	
A2E7CEPDGY42VQ	0.0	0.0	0.0	0.0	0.0	
A2E7DYSIYY3HP3	0.0	0.0	0.0	0.0	0.0	

product	9984977803	9984977986	9984978249	9984978265	9984978370	\
user						
A10R7XM20Z0323	0.0	0.0	0.0	0.0	0.0	
A10RDB0FTFA5S3	0.0	0.0	0.0	0.0	0.0	
A10RFZ7WJD1Y2C	0.0	0.0	0.0	0.0	0.0	
A10RHYA8B2K9QT	0.0	0.0	0.0	0.0	0.0	
A10RMMITRBG4W	0.0	0.0	0.0	0.0	0.0	
...	
A2E6WMRJAR02Q1	0.0	0.0	0.0	0.0	0.0	
A2E74YKJXGZCJB	0.0	0.0	0.0	0.0	0.0	
A2E76LB77DZVN2	0.0	0.0	0.0	0.0	0.0	
A2E7CEPDGY42VQ	0.0	0.0	0.0	0.0	0.0	
A2E7DYSIYY3HP3	0.0	0.0	0.0	0.0	0.0	

product	...	B00001ZWXA	B00001ZWXB	B00001ZWXI	B00001ZX0K	\
user	...					
A10R7XM20Z0323	...	0.0	0.0	0.0	0.0	
A10RDB0FTFA5S3	...	0.0	0.0	0.0	0.0	
A10RFZ7WJD1Y2C	...	0.0	0.0	0.0	0.0	
A10RHYA8B2K9QT	...	0.0	0.0	0.0	0.0	
A10RMMITRBG4W	...	0.0	0.0	0.0	0.0	
...	
A2E6WMRJAR02Q1	...	0.0	0.0	0.0	0.0	
A2E74YKJXGZCJB	...	0.0	0.0	0.0	0.0	
A2E76LB77DZVN2	...	0.0	0.0	0.0	0.0	
A2E7CEPDGY42VQ	...	0.0	0.0	0.0	0.0	
A2E7DYSIYY3HP3	...	0.0	0.0	0.0	0.0	

product	B0000205ZG	B0000205ZQ	B0000205ZZ	B000020629	B0000206CG	\
user						
A10R7XM20Z0323	0.0	0.0	0.0	0.0	0.0	
A10RDB0FTFA5S3	0.0	0.0	0.0	0.0	0.0	
A10RFZ7WJD1Y2C	0.0	0.0	0.0	0.0	0.0	
A10RHYA8B2K9QT	0.0	0.0	0.0	0.0	0.0	
A10RMMITRBG4W	0.0	0.0	0.0	0.0	0.0	
...	
A2E6WMRJAR02Q1	0.0	0.0	0.0	0.0	0.0	
A2E74YKJXGZCJB	0.0	0.0	0.0	0.0	0.0	
A2E76LB77DZVN2	0.0	0.0	0.0	0.0	0.0	
A2E7CEPDGY42VQ	0.0	0.0	0.0	0.0	0.0	
A2E7DYSIYY3HP3	0.0	0.0	0.0	0.0	0.0	

product	B0000206CN
user	
A10R7XM20Z0323	0.0
A10RDB0FTFA5S3	0.0

A10RFZ7WJD1Y2C	0.0
A10RHYA8B2K9QT	0.0
A10RMMITRBG4W	0.0
...	...
A2E6WMRJAR02Q1	0.0
A2E74YKJXGZCJB	0.0
A2E76LB77DZVN2	0.0
A2E7CEPDGY42VQ	0.0
A2E7DYSIYY3HP3	0.0

[16043 rows x 1625 columns]

User Sample range : [265, 16307]
 Products Sample range : [764, 2388]
 Sample :

product	9984976734	9984976866	9984977234	9984977595	9984977730	\
user						
A10R7XM20Z0323	0.0	0.0	0.0	0.0	0.0	
A10RDB0FTFA5S3	0.0	0.0	0.0	0.0	0.0	
A10RFZ7WJD1Y2C	0.0	0.0	0.0	0.0	0.0	
A10RHYA8B2K9QT	0.0	0.0	0.0	0.0	0.0	
A10RMMITRBG4W	0.0	0.0	0.0	0.0	0.0	
...	
A2E6WMRJAR02Q1	0.0	0.0	0.0	0.0	0.0	
A2E74YKJXGZCJB	0.0	0.0	0.0	0.0	0.0	
A2E76LB77DZVN2	0.0	0.0	0.0	0.0	0.0	
A2E7CEPDGY42VQ	0.0	0.0	0.0	0.0	0.0	
A2E7DYSIYY3HP3	0.0	0.0	0.0	0.0	0.0	

product	9984977803	9984977986	9984978249	9984978265	9984978370	\
user						
A10R7XM20Z0323	0.0	0.0	0.0	0.0	0.0	
A10RDB0FTFA5S3	0.0	0.0	0.0	0.0	0.0	
A10RFZ7WJD1Y2C	0.0	0.0	0.0	0.0	0.0	
A10RHYA8B2K9QT	0.0	0.0	0.0	0.0	0.0	
A10RMMITRBG4W	0.0	0.0	0.0	0.0	0.0	
...	
A2E6WMRJAR02Q1	0.0	0.0	0.0	0.0	0.0	
A2E74YKJXGZCJB	0.0	0.0	0.0	0.0	0.0	
A2E76LB77DZVN2	0.0	0.0	0.0	0.0	0.0	
A2E7CEPDGY42VQ	0.0	0.0	0.0	0.0	0.0	
A2E7DYSIYY3HP3	0.0	0.0	0.0	0.0	0.0	

product	...	B00001ZWXA	B00001ZWXB	B00001ZWXI	B00001ZX0K	\
user	...					
A10R7XM20Z0323	...	0.0	0.0	0.0	0.0	
A10RDB0FTFA5S3	...	0.0	0.0	0.0	0.0	
A10RFZ7WJD1Y2C	...	0.0	0.0	0.0	0.0	
A10RHYA8B2K9QT	...	0.0	0.0	0.0	0.0	
A10RMMITRBG4W	...	0.0	0.0	0.0	0.0	
...	
A2E6WMRJAR02Q1	...	0.0	0.0	0.0	0.0	
A2E74YKJXGZCJB	...	0.0	0.0	0.0	0.0	
A2E76LB77DZVN2	...	0.0	0.0	0.0	0.0	
A2E7CEPDGY42VQ	...	0.0	0.0	0.0	0.0	
A2E7DYSIYY3HP3	...	0.0	0.0	0.0	0.0	

product	B0000205ZG	B0000205ZQ	B0000205ZZ	B000020629	B0000206CG	\
user						
A10R7XM20Z0323	0.0	0.0	0.0	0.0	0.0	
A10RDB0FTFA5S3	0.0	0.0	0.0	0.0	0.0	
A10RFZ7WJD1Y2C	0.0	0.0	0.0	0.0	0.0	
A10RHYA8B2K9QT	0.0	0.0	0.0	0.0	0.0	

A10RMMITRBG4W	0.0	0.0	0.0	0.0	0.0
...
A2E6WMRJAR02Q1	0.0	0.0	0.0	0.0	0.0
A2E74YKJXGZCJB	0.0	0.0	0.0	0.0	0.0
A2E76LB77DZVN2	0.0	0.0	0.0	0.0	0.0
A2E7CEPDGY42VQ	0.0	0.0	0.0	0.0	0.0
A2E7DYSIYY3HP3	0.0	0.0	0.0	0.0	0.0

product B0000206CN

user

A10R7XM20Z0323	0.0
A10RDB0FTFA5S3	0.0
A10RFZ7WJD1Y2C	0.0
A10RHYA8B2K9QT	0.0
A10RMMITRBG4W	0.0
...	...
A2E6WMRJAR02Q1	0.0
A2E74YKJXGZCJB	0.0
A2E76LB77DZVN2	0.0
A2E7CEPDGY42VQ	0.0
A2E7DYSIYY3HP3	0.0

[16043 rows x 1625 columns]

User Sample range : [265, 16307]

Products Sample range : [764, 2388]

Sample :

product	9984976734	9984976866	9984977234	9984977595	9984977730	\
---------	------------	------------	------------	------------	------------	---

user

A10R7XM20Z0323	0.0	0.0	0.0	0.0	0.0
A10RDB0FTFA5S3	0.0	0.0	0.0	0.0	0.0
A10RFZ7WJD1Y2C	0.0	0.0	0.0	0.0	0.0
A10RHYA8B2K9QT	0.0	0.0	0.0	0.0	0.0
A10RMMITRBG4W	0.0	0.0	0.0	0.0	0.0
...
A2E6WMRJAR02Q1	0.0	0.0	0.0	0.0	0.0
A2E74YKJXGZCJB	0.0	0.0	0.0	0.0	0.0
A2E76LB77DZVN2	0.0	0.0	0.0	0.0	0.0
A2E7CEPDGY42VQ	0.0	0.0	0.0	0.0	0.0
A2E7DYSIYY3HP3	0.0	0.0	0.0	0.0	0.0

product	9984977803	9984977986	9984978249	9984978265	9984978370	\
---------	------------	------------	------------	------------	------------	---

user

A10R7XM20Z0323	0.0	0.0	0.0	0.0	0.0
A10RDB0FTFA5S3	0.0	0.0	0.0	0.0	0.0
A10RFZ7WJD1Y2C	0.0	0.0	0.0	0.0	0.0
A10RHYA8B2K9QT	0.0	0.0	0.0	0.0	0.0
A10RMMITRBG4W	0.0	0.0	0.0	0.0	0.0
...
A2E6WMRJAR02Q1	0.0	0.0	0.0	0.0	0.0
A2E74YKJXGZCJB	0.0	0.0	0.0	0.0	0.0
A2E76LB77DZVN2	0.0	0.0	0.0	0.0	0.0
A2E7CEPDGY42VQ	0.0	0.0	0.0	0.0	0.0
A2E7DYSIYY3HP3	0.0	0.0	0.0	0.0	0.0

product	...	B00001ZWXA	B00001ZWBX	B00001ZWXI	B00001ZX0K	\
---------	-----	------------	------------	------------	------------	---

user

A10R7XM20Z0323	...	0.0	0.0	0.0	0.0
A10RDB0FTFA5S3	...	0.0	0.0	0.0	0.0
A10RFZ7WJD1Y2C	...	0.0	0.0	0.0	0.0
A10RHYA8B2K9QT	...	0.0	0.0	0.0	0.0
A10RMMITRBG4W	...	0.0	0.0	0.0	0.0
...

A2E6WMRJAR02Q1	...	0.0	0.0	0.0	0.0
A2E74YKJXGZCJB	...	0.0	0.0	0.0	0.0
A2E76LB77DZVN2	...	0.0	0.0	0.0	0.0
A2E7CEPDGY42VQ	...	0.0	0.0	0.0	0.0
A2E7DYSIYY3HP3	...	0.0	0.0	0.0	0.0

product	B0000205ZG	B0000205ZQ	B0000205ZZ	B000020629	B0000206CG	\
user						
A10R7XM20Z0323	0.0	0.0	0.0	0.0	0.0	
A10RDB0FTFA5S3	0.0	0.0	0.0	0.0	0.0	
A10RFZ7WJD1Y2C	0.0	0.0	0.0	0.0	0.0	
A10RHYA8B2K9QT	0.0	0.0	0.0	0.0	0.0	
A10RMMITRBG4W	0.0	0.0	0.0	0.0	0.0	
...	
A2E6WMRJAR02Q1	0.0	0.0	0.0	0.0	0.0	
A2E74YKJXGZCJB	0.0	0.0	0.0	0.0	0.0	
A2E76LB77DZVN2	0.0	0.0	0.0	0.0	0.0	
A2E7CEPDGY42VQ	0.0	0.0	0.0	0.0	0.0	
A2E7DYSIYY3HP3	0.0	0.0	0.0	0.0	0.0	

product	B0000206CN
user	
A10R7XM20Z0323	0.0
A10RDB0FTFA5S3	0.0
A10RFZ7WJD1Y2C	0.0
A10RHYA8B2K9QT	0.0
A10RMMITRBG4W	0.0
...	...
A2E6WMRJAR02Q1	0.0
A2E74YKJXGZCJB	0.0
A2E76LB77DZVN2	0.0
A2E7CEPDGY42VQ	0.0
A2E7DYSIYY3HP3	0.0

[16043 rows x 1625 columns]

User Sample range : [265, 16307]
Products Sample range : [764, 2388]
Sample :

product	9984976734	9984976866	9984977234	9984977595	9984977730	\
user						
A10R7XM20Z0323	0.0	0.0	0.0	0.0	0.0	
A10RDB0FTFA5S3	0.0	0.0	0.0	0.0	0.0	
A10RFZ7WJD1Y2C	0.0	0.0	0.0	0.0	0.0	
A10RHYA8B2K9QT	0.0	0.0	0.0	0.0	0.0	
A10RMMITRBG4W	0.0	0.0	0.0	0.0	0.0	
...	
A2E6WMRJAR02Q1	0.0	0.0	0.0	0.0	0.0	
A2E74YKJXGZCJB	0.0	0.0	0.0	0.0	0.0	
A2E76LB77DZVN2	0.0	0.0	0.0	0.0	0.0	
A2E7CEPDGY42VQ	0.0	0.0	0.0	0.0	0.0	
A2E7DYSIYY3HP3	0.0	0.0	0.0	0.0	0.0	

product	9984977803	9984977986	9984978249	9984978265	9984978370	\
user						
A10R7XM20Z0323	0.0	0.0	0.0	0.0	0.0	
A10RDB0FTFA5S3	0.0	0.0	0.0	0.0	0.0	
A10RFZ7WJD1Y2C	0.0	0.0	0.0	0.0	0.0	
A10RHYA8B2K9QT	0.0	0.0	0.0	0.0	0.0	
A10RMMITRBG4W	0.0	0.0	0.0	0.0	0.0	
...	
A2E6WMRJAR02Q1	0.0	0.0	0.0	0.0	0.0	
A2E74YKJXGZCJB	0.0	0.0	0.0	0.0	0.0	

A2E76LB77DZVN2	0.0	0.0	0.0	0.0	0.0
A2E7CEPDGY42VQ	0.0	0.0	0.0	0.0	0.0
A2E7DYSIYY3HP3	0.0	0.0	0.0	0.0	0.0

product	...	B00001ZWXA	B00001ZWXB	B00001ZWXI	B00001ZX0K	\
user	...					
A10R7XM20Z0323	...	0.0	0.0	0.0	0.0	
A10RDB0FTFA5S3	...	0.0	0.0	0.0	0.0	
A10RFZ7WJD1Y2C	...	0.0	0.0	0.0	0.0	
A10RHYA8B2K9QT	...	0.0	0.0	0.0	0.0	
A10RMMITRBG4W	...	0.0	0.0	0.0	0.0	
...	
A2E6WMRJAR02Q1	...	0.0	0.0	0.0	0.0	
A2E74YKJXGZCJB	...	0.0	0.0	0.0	0.0	
A2E76LB77DZVN2	...	0.0	0.0	0.0	0.0	
A2E7CEPDGY42VQ	...	0.0	0.0	0.0	0.0	
A2E7DYSIYY3HP3	...	0.0	0.0	0.0	0.0	

product	B0000205ZG	B0000205ZQ	B0000205ZZ	B000020629	B0000206CG	\
user						
A10R7XM20Z0323	0.0	0.0	0.0	0.0	0.0	
A10RDB0FTFA5S3	0.0	0.0	0.0	0.0	0.0	
A10RFZ7WJD1Y2C	0.0	0.0	0.0	0.0	0.0	
A10RHYA8B2K9QT	0.0	0.0	0.0	0.0	0.0	
A10RMMITRBG4W	0.0	0.0	0.0	0.0	0.0	
...	
A2E6WMRJAR02Q1	0.0	0.0	0.0	0.0	0.0	
A2E74YKJXGZCJB	0.0	0.0	0.0	0.0	0.0	
A2E76LB77DZVN2	0.0	0.0	0.0	0.0	0.0	
A2E7CEPDGY42VQ	0.0	0.0	0.0	0.0	0.0	
A2E7DYSIYY3HP3	0.0	0.0	0.0	0.0	0.0	

product	B0000206CN
user	
A10R7XM20Z0323	0.0
A10RDB0FTFA5S3	0.0
A10RFZ7WJD1Y2C	0.0
A10RHYA8B2K9QT	0.0
A10RMMITRBG4W	0.0
...	...
A2E6WMRJAR02Q1	0.0
A2E74YKJXGZCJB	0.0
A2E76LB77DZVN2	0.0
A2E7CEPDGY42VQ	0.0
A2E7DYSIYY3HP3	0.0

[16043 rows x 1625 columns]

User Sample range : [265, 16307]
Products Sample range : [764, 2388]
Sample :

product	9984976734	9984976866	9984977234	9984977595	9984977730	\
user						
A10R7XM20Z0323	0.0	0.0	0.0	0.0	0.0	
A10RDB0FTFA5S3	0.0	0.0	0.0	0.0	0.0	
A10RFZ7WJD1Y2C	0.0	0.0	0.0	0.0	0.0	
A10RHYA8B2K9QT	0.0	0.0	0.0	0.0	0.0	
A10RMMITRBG4W	0.0	0.0	0.0	0.0	0.0	
...	
A2E6WMRJAR02Q1	0.0	0.0	0.0	0.0	0.0	
A2E74YKJXGZCJB	0.0	0.0	0.0	0.0	0.0	
A2E76LB77DZVN2	0.0	0.0	0.0	0.0	0.0	
A2E7CEPDGY42VQ	0.0	0.0	0.0	0.0	0.0	

A2E7DYSIYY3HP3	0.0	0.0	0.0	0.0	0.0	
product	9984977803	9984977986	9984978249	9984978265	9984978370	\
user						
A10R7XM20Z0323	0.0	0.0	0.0	0.0	0.0	
A10RDB0FTFA5S3	0.0	0.0	0.0	0.0	0.0	
A10RFZ7WJD1Y2C	0.0	0.0	0.0	0.0	0.0	
A10RHYA8B2K9QT	0.0	0.0	0.0	0.0	0.0	
A10RMMITRBG4W	0.0	0.0	0.0	0.0	0.0	
...	
A2E6WMRJAR02Q1	0.0	0.0	0.0	0.0	0.0	
A2E74YKJXGZCJB	0.0	0.0	0.0	0.0	0.0	
A2E76LB77DZVN2	0.0	0.0	0.0	0.0	0.0	
A2E7CEPDGY42VQ	0.0	0.0	0.0	0.0	0.0	
A2E7DYSIYY3HP3	0.0	0.0	0.0	0.0	0.0	
product	...	B00001ZWXA	B00001ZWXB	B00001ZWXI	B00001ZX0K	\
user	...					
A10R7XM20Z0323	...	0.0	0.0	0.0	0.0	
A10RDB0FTFA5S3	...	0.0	0.0	0.0	0.0	
A10RFZ7WJD1Y2C	...	0.0	0.0	0.0	0.0	
A10RHYA8B2K9QT	...	0.0	0.0	0.0	0.0	
A10RMMITRBG4W	...	0.0	0.0	0.0	0.0	
...	
A2E6WMRJAR02Q1	...	0.0	0.0	0.0	0.0	
A2E74YKJXGZCJB	...	0.0	0.0	0.0	0.0	
A2E76LB77DZVN2	...	0.0	0.0	0.0	0.0	
A2E7CEPDGY42VQ	...	0.0	0.0	0.0	0.0	
A2E7DYSIYY3HP3	...	0.0	0.0	0.0	0.0	
product	B0000205ZG	B0000205ZQ	B0000205ZZ	B000020629	B0000206CG	\
user						
A10R7XM20Z0323	0.0	0.0	0.0	0.0	0.0	
A10RDB0FTFA5S3	0.0	0.0	0.0	0.0	0.0	
A10RFZ7WJD1Y2C	0.0	0.0	0.0	0.0	0.0	
A10RHYA8B2K9QT	0.0	0.0	0.0	0.0	0.0	
A10RMMITRBG4W	0.0	0.0	0.0	0.0	0.0	
...	
A2E6WMRJAR02Q1	0.0	0.0	0.0	0.0	0.0	
A2E74YKJXGZCJB	0.0	0.0	0.0	0.0	0.0	
A2E76LB77DZVN2	0.0	0.0	0.0	0.0	0.0	
A2E7CEPDGY42VQ	0.0	0.0	0.0	0.0	0.0	
A2E7DYSIYY3HP3	0.0	0.0	0.0	0.0	0.0	
product	B0000206CN					
user						
A10R7XM20Z0323	0.0					
A10RDB0FTFA5S3	0.0					
A10RFZ7WJD1Y2C	0.0					
A10RHYA8B2K9QT	0.0					
A10RMMITRBG4W	0.0					
...	...					
A2E6WMRJAR02Q1	0.0					
A2E74YKJXGZCJB	0.0					
A2E76LB77DZVN2	0.0					
A2E7CEPDGY42VQ	0.0					
A2E7DYSIYY3HP3	0.0					

[16043 rows x 1625 columns]

User Sample range : [265, 16307]
Products Sample range : [764, 2388]
Sample :

product	9984976734	9984976866	9984977234	9984977595	9984977730	\
user						
A10R7XM20Z0323	0.0	0.0	0.0	0.0	0.0	
A10RDB0FTFA5S3	0.0	0.0	0.0	0.0	0.0	
A10RFZ7WJD1Y2C	0.0	0.0	0.0	0.0	0.0	
A10RHYA8B2K9QT	0.0	0.0	0.0	0.0	0.0	
A10RMMITRBG4W	0.0	0.0	0.0	0.0	0.0	
...	
A2E6WMRJAR02Q1	0.0	0.0	0.0	0.0	0.0	
A2E74YKJXGZCJB	0.0	0.0	0.0	0.0	0.0	
A2E76LB77DZVN2	0.0	0.0	0.0	0.0	0.0	
A2E7CEPDGY42VQ	0.0	0.0	0.0	0.0	0.0	
A2E7DYSIYY3HP3	0.0	0.0	0.0	0.0	0.0	

product	9984977803	9984977986	9984978249	9984978265	9984978370	\
user						
A10R7XM20Z0323	0.0	0.0	0.0	0.0	0.0	
A10RDB0FTFA5S3	0.0	0.0	0.0	0.0	0.0	
A10RFZ7WJD1Y2C	0.0	0.0	0.0	0.0	0.0	
A10RHYA8B2K9QT	0.0	0.0	0.0	0.0	0.0	
A10RMMITRBG4W	0.0	0.0	0.0	0.0	0.0	
...	
A2E6WMRJAR02Q1	0.0	0.0	0.0	0.0	0.0	
A2E74YKJXGZCJB	0.0	0.0	0.0	0.0	0.0	
A2E76LB77DZVN2	0.0	0.0	0.0	0.0	0.0	
A2E7CEPDGY42VQ	0.0	0.0	0.0	0.0	0.0	
A2E7DYSIYY3HP3	0.0	0.0	0.0	0.0	0.0	

product	...	B00001ZWXA	B00001ZWXB	B00001ZWXI	B00001ZX0K	\
user	...					
A10R7XM20Z0323	...	0.0	0.0	0.0	0.0	
A10RDB0FTFA5S3	...	0.0	0.0	0.0	0.0	
A10RFZ7WJD1Y2C	...	0.0	0.0	0.0	0.0	
A10RHYA8B2K9QT	...	0.0	0.0	0.0	0.0	
A10RMMITRBG4W	...	0.0	0.0	0.0	0.0	
...	
A2E6WMRJAR02Q1	...	0.0	0.0	0.0	0.0	
A2E74YKJXGZCJB	...	0.0	0.0	0.0	0.0	
A2E76LB77DZVN2	...	0.0	0.0	0.0	0.0	
A2E7CEPDGY42VQ	...	0.0	0.0	0.0	0.0	
A2E7DYSIYY3HP3	...	0.0	0.0	0.0	0.0	

product	B0000205ZG	B0000205ZQ	B0000205ZZ	B000020629	B0000206CG	\
user						
A10R7XM20Z0323	0.0	0.0	0.0	0.0	0.0	
A10RDB0FTFA5S3	0.0	0.0	0.0	0.0	0.0	
A10RFZ7WJD1Y2C	0.0	0.0	0.0	0.0	0.0	
A10RHYA8B2K9QT	0.0	0.0	0.0	0.0	0.0	
A10RMMITRBG4W	0.0	0.0	0.0	0.0	0.0	
...	
A2E6WMRJAR02Q1	0.0	0.0	0.0	0.0	0.0	
A2E74YKJXGZCJB	0.0	0.0	0.0	0.0	0.0	
A2E76LB77DZVN2	0.0	0.0	0.0	0.0	0.0	
A2E7CEPDGY42VQ	0.0	0.0	0.0	0.0	0.0	
A2E7DYSIYY3HP3	0.0	0.0	0.0	0.0	0.0	

product	B0000206CN
user	
A10R7XM20Z0323	0.0
A10RDB0FTFA5S3	0.0
A10RFZ7WJD1Y2C	0.0
A10RHYA8B2K9QT	0.0
A10RMMITRBG4W	0.0
...	...

A2E6WMRJAR02Q1	0.0
A2E74YKJXGZCJB	0.0
A2E76LB77DZVN2	0.0
A2E7CEPDGY42VQ	0.0
A2E7DYSIYY3HP3	0.0

[16043 rows x 1625 columns]

User Sample range : [265, 16307]

Products Sample range : [764, 2388]

Sample :

product	9984976734	9984976866	9984977234	9984977595	9984977730	\
user						
A10R7XM20Z0323	0.0	0.0	0.0	0.0	0.0	
A10RDB0FTFA5S3	0.0	0.0	0.0	0.0	0.0	
A10RFZ7WJD1Y2C	0.0	0.0	0.0	0.0	0.0	
A10RHYA8B2K9QT	0.0	0.0	0.0	0.0	0.0	
A10RMMITRBG4W	0.0	0.0	0.0	0.0	0.0	
...	
A2E6WMRJAR02Q1	0.0	0.0	0.0	0.0	0.0	
A2E74YKJXGZCJB	0.0	0.0	0.0	0.0	0.0	
A2E76LB77DZVN2	0.0	0.0	0.0	0.0	0.0	
A2E7CEPDGY42VQ	0.0	0.0	0.0	0.0	0.0	
A2E7DYSIYY3HP3	0.0	0.0	0.0	0.0	0.0	

product	9984977803	9984977986	9984978249	9984978265	9984978370	\
user						
A10R7XM20Z0323	0.0	0.0	0.0	0.0	0.0	
A10RDB0FTFA5S3	0.0	0.0	0.0	0.0	0.0	
A10RFZ7WJD1Y2C	0.0	0.0	0.0	0.0	0.0	
A10RHYA8B2K9QT	0.0	0.0	0.0	0.0	0.0	
A10RMMITRBG4W	0.0	0.0	0.0	0.0	0.0	
...	
A2E6WMRJAR02Q1	0.0	0.0	0.0	0.0	0.0	
A2E74YKJXGZCJB	0.0	0.0	0.0	0.0	0.0	
A2E76LB77DZVN2	0.0	0.0	0.0	0.0	0.0	
A2E7CEPDGY42VQ	0.0	0.0	0.0	0.0	0.0	
A2E7DYSIYY3HP3	0.0	0.0	0.0	0.0	0.0	

product	...	B00001ZWXA	B00001ZWXB	B00001ZWXI	B00001ZX0K	\
user	...					
A10R7XM20Z0323	...	0.0	0.0	0.0	0.0	
A10RDB0FTFA5S3	...	0.0	0.0	0.0	0.0	
A10RFZ7WJD1Y2C	...	0.0	0.0	0.0	0.0	
A10RHYA8B2K9QT	...	0.0	0.0	0.0	0.0	
A10RMMITRBG4W	...	0.0	0.0	0.0	0.0	
...	
A2E6WMRJAR02Q1	...	0.0	0.0	0.0	0.0	
A2E74YKJXGZCJB	...	0.0	0.0	0.0	0.0	
A2E76LB77DZVN2	...	0.0	0.0	0.0	0.0	
A2E7CEPDGY42VQ	...	0.0	0.0	0.0	0.0	
A2E7DYSIYY3HP3	...	0.0	0.0	0.0	0.0	

product	B0000205ZG	B0000205ZQ	B0000205ZZ	B000020629	B0000206CG	\
user						
A10R7XM20Z0323	0.0	0.0	0.0	0.0	0.0	
A10RDB0FTFA5S3	0.0	0.0	0.0	0.0	0.0	
A10RFZ7WJD1Y2C	0.0	0.0	0.0	0.0	0.0	
A10RHYA8B2K9QT	0.0	0.0	0.0	0.0	0.0	
A10RMMITRBG4W	0.0	0.0	0.0	0.0	0.0	
...	
A2E6WMRJAR02Q1	0.0	0.0	0.0	0.0	0.0	
A2E74YKJXGZCJB	0.0	0.0	0.0	0.0	0.0	

A2E76LB77DZVN2	0.0	0.0	0.0	0.0	0.0
A2E7CEPDGY42VQ	0.0	0.0	0.0	0.0	0.0
A2E7DYSIYY3HP3	0.0	0.0	0.0	0.0	0.0

product B0000206CN

user

A10R7XM20Z0323	0.0
A10RDB0FTFA5S3	0.0
A10RFZ7WJD1Y2C	0.0
A10RHYA8B2K9QT	0.0
A10RMMITRBG4W	0.0
...	...
A2E6WMRJAR02Q1	0.0
A2E74YKJXGZCJB	0.0
A2E76LB77DZVN2	0.0
A2E7CEPDGY42VQ	0.0
A2E7DYSIYY3HP3	0.0

[16043 rows x 1625 columns]

User Sample range : [265, 16307]

Products Sample range : [764, 2388]

Sample :

product	9984976734	9984976866	9984977234	9984977595	9984977730	\
user						
A10R7XM20Z0323	0.0	0.0	0.0	0.0	0.0	
A10RDB0FTFA5S3	0.0	0.0	0.0	0.0	0.0	
A10RFZ7WJD1Y2C	0.0	0.0	0.0	0.0	0.0	
A10RHYA8B2K9QT	0.0	0.0	0.0	0.0	0.0	
A10RMMITRBG4W	0.0	0.0	0.0	0.0	0.0	
...	
A2E6WMRJAR02Q1	0.0	0.0	0.0	0.0	0.0	
A2E74YKJXGZCJB	0.0	0.0	0.0	0.0	0.0	
A2E76LB77DZVN2	0.0	0.0	0.0	0.0	0.0	
A2E7CEPDGY42VQ	0.0	0.0	0.0	0.0	0.0	
A2E7DYSIYY3HP3	0.0	0.0	0.0	0.0	0.0	

product	9984977803	9984977986	9984978249	9984978265	9984978370	\
user						
A10R7XM20Z0323	0.0	0.0	0.0	0.0	0.0	
A10RDB0FTFA5S3	0.0	0.0	0.0	0.0	0.0	
A10RFZ7WJD1Y2C	0.0	0.0	0.0	0.0	0.0	
A10RHYA8B2K9QT	0.0	0.0	0.0	0.0	0.0	
A10RMMITRBG4W	0.0	0.0	0.0	0.0	0.0	
...	
A2E6WMRJAR02Q1	0.0	0.0	0.0	0.0	0.0	
A2E74YKJXGZCJB	0.0	0.0	0.0	0.0	0.0	
A2E76LB77DZVN2	0.0	0.0	0.0	0.0	0.0	
A2E7CEPDGY42VQ	0.0	0.0	0.0	0.0	0.0	
A2E7DYSIYY3HP3	0.0	0.0	0.0	0.0	0.0	

product	...	B00001ZWXA	B00001ZWXB	B00001ZWXI	B00001ZX0K	\
user	...					
A10R7XM20Z0323	...	0.0	0.0	0.0	0.0	
A10RDB0FTFA5S3	...	0.0	0.0	0.0	0.0	
A10RFZ7WJD1Y2C	...	0.0	0.0	0.0	0.0	
A10RHYA8B2K9QT	...	0.0	0.0	0.0	0.0	
A10RMMITRBG4W	...	0.0	0.0	0.0	0.0	
...	
A2E6WMRJAR02Q1	...	0.0	0.0	0.0	0.0	
A2E74YKJXGZCJB	...	0.0	0.0	0.0	0.0	
A2E76LB77DZVN2	...	0.0	0.0	0.0	0.0	
A2E7CEPDGY42VQ	...	0.0	0.0	0.0	0.0	

A2E7DYSIYY3HP3	...	0.0	0.0	0.0	0.0
----------------	-----	-----	-----	-----	-----

product	B0000205ZG	B0000205ZQ	B0000205ZZ	B000020629	B0000206CG \
user					
A10R7XM20Z0323	0.0	0.0	0.0	0.0	0.0
A10RDB0FTFA5S3	0.0	0.0	0.0	0.0	0.0
A10RFZ7WJD1Y2C	0.0	0.0	0.0	0.0	0.0
A10RHYA8B2K9QT	0.0	0.0	0.0	0.0	0.0
A10RMMITRBG4W	0.0	0.0	0.0	0.0	0.0
...
A2E6WMRJAR02Q1	0.0	0.0	0.0	0.0	0.0
A2E74YKJXGZCJB	0.0	0.0	0.0	0.0	0.0
A2E76LB77DZVN2	0.0	0.0	0.0	0.0	0.0
A2E7CEPDGY42VQ	0.0	0.0	0.0	0.0	0.0
A2E7DYSIYY3HP3	0.0	0.0	0.0	0.0	0.0

product	B0000206CN
user	
A10R7XM20Z0323	0.0
A10RDB0FTFA5S3	0.0
A10RFZ7WJD1Y2C	0.0
A10RHYA8B2K9QT	0.0
A10RMMITRBG4W	0.0
...	...
A2E6WMRJAR02Q1	0.0
A2E74YKJXGZCJB	0.0
A2E76LB77DZVN2	0.0
A2E7CEPDGY42VQ	0.0
A2E7DYSIYY3HP3	0.0

[16043 rows x 1625 columns]

User Sample range : [265, 16307]
Products Sample range : [764, 2388]
Sample :

product	9984976734	9984976866	9984977234	9984977595	9984977730 \
user					
A10R7XM20Z0323	0.0	0.0	0.0	0.0	0.0
A10RDB0FTFA5S3	0.0	0.0	0.0	0.0	0.0
A10RFZ7WJD1Y2C	0.0	0.0	0.0	0.0	0.0
A10RHYA8B2K9QT	0.0	0.0	0.0	0.0	0.0
A10RMMITRBG4W	0.0	0.0	0.0	0.0	0.0
...
A2E6WMRJAR02Q1	0.0	0.0	0.0	0.0	0.0
A2E74YKJXGZCJB	0.0	0.0	0.0	0.0	0.0
A2E76LB77DZVN2	0.0	0.0	0.0	0.0	0.0
A2E7CEPDGY42VQ	0.0	0.0	0.0	0.0	0.0
A2E7DYSIYY3HP3	0.0	0.0	0.0	0.0	0.0

product	9984977803	9984977986	9984978249	9984978265	9984978370 \
user					
A10R7XM20Z0323	0.0	0.0	0.0	0.0	0.0
A10RDB0FTFA5S3	0.0	0.0	0.0	0.0	0.0
A10RFZ7WJD1Y2C	0.0	0.0	0.0	0.0	0.0
A10RHYA8B2K9QT	0.0	0.0	0.0	0.0	0.0
A10RMMITRBG4W	0.0	0.0	0.0	0.0	0.0
...
A2E6WMRJAR02Q1	0.0	0.0	0.0	0.0	0.0
A2E74YKJXGZCJB	0.0	0.0	0.0	0.0	0.0
A2E76LB77DZVN2	0.0	0.0	0.0	0.0	0.0
A2E7CEPDGY42VQ	0.0	0.0	0.0	0.0	0.0
A2E7DYSIYY3HP3	0.0	0.0	0.0	0.0	0.0

product	...	B00001ZWXA	B00001ZWXB	B00001ZWXI	B00001ZX0K	\
user	...					
A10R7XM20Z0323	...	0.0	0.0	0.0	0.0	
A10RDB0FTFA5S3	...	0.0	0.0	0.0	0.0	
A10RFZ7WJD1Y2C	...	0.0	0.0	0.0	0.0	
A10RHYA8B2K9QT	...	0.0	0.0	0.0	0.0	
A10RMMITRBG4W	...	0.0	0.0	0.0	0.0	
...	
A2E6WMRJAR02Q1	...	0.0	0.0	0.0	0.0	
A2E74YKJXGZCJB	...	0.0	0.0	0.0	0.0	
A2E76LB77DZVN2	...	0.0	0.0	0.0	0.0	
A2E7CEPDGY42VQ	...	0.0	0.0	0.0	0.0	
A2E7DYSIYY3HP3	...	0.0	0.0	0.0	0.0	

product	B0000205ZG	B0000205ZQ	B0000205ZZ	B000020629	B0000206CG	\
user						
A10R7XM20Z0323	0.0	0.0	0.0	0.0	0.0	
A10RDB0FTFA5S3	0.0	0.0	0.0	0.0	0.0	
A10RFZ7WJD1Y2C	0.0	0.0	0.0	0.0	0.0	
A10RHYA8B2K9QT	0.0	0.0	0.0	0.0	0.0	
A10RMMITRBG4W	0.0	0.0	0.0	0.0	0.0	
...	
A2E6WMRJAR02Q1	0.0	0.0	0.0	0.0	0.0	
A2E74YKJXGZCJB	0.0	0.0	0.0	0.0	0.0	
A2E76LB77DZVN2	0.0	0.0	0.0	0.0	0.0	
A2E7CEPDGY42VQ	0.0	0.0	0.0	0.0	0.0	
A2E7DYSIYY3HP3	0.0	0.0	0.0	0.0	0.0	

product	B0000206CN
user	
A10R7XM20Z0323	0.0
A10RDB0FTFA5S3	0.0
A10RFZ7WJD1Y2C	0.0
A10RHYA8B2K9QT	0.0
A10RMMITRBG4W	0.0
...	...
A2E6WMRJAR02Q1	0.0
A2E74YKJXGZCJB	0.0
A2E76LB77DZVN2	0.0
A2E7CEPDGY42VQ	0.0
A2E7DYSIYY3HP3	0.0

[16043 rows x 1625 columns]

User Sample range : [265, 16307]
Products Sample range : [764, 2388]
Sample :

product	9984976734	9984976866	9984977234	9984977595	9984977730	\
user						
A10R7XM20Z0323	0.0	0.0	0.0	0.0	0.0	
A10RDB0FTFA5S3	0.0	0.0	0.0	0.0	0.0	
A10RFZ7WJD1Y2C	0.0	0.0	0.0	0.0	0.0	
A10RHYA8B2K9QT	0.0	0.0	0.0	0.0	0.0	
A10RMMITRBG4W	0.0	0.0	0.0	0.0	0.0	
...	
A2E6WMRJAR02Q1	0.0	0.0	0.0	0.0	0.0	
A2E74YKJXGZCJB	0.0	0.0	0.0	0.0	0.0	
A2E76LB77DZVN2	0.0	0.0	0.0	0.0	0.0	
A2E7CEPDGY42VQ	0.0	0.0	0.0	0.0	0.0	
A2E7DYSIYY3HP3	0.0	0.0	0.0	0.0	0.0	

product	9984977803	9984977986	9984978249	9984978265	9984978370	\
user						

A10R7XM20Z0323	0.0	0.0	0.0	0.0	0.0
A10RDB0FTFA5S3	0.0	0.0	0.0	0.0	0.0
A10RFZ7WJD1Y2C	0.0	0.0	0.0	0.0	0.0
A10RHYA8B2K9QT	0.0	0.0	0.0	0.0	0.0
A10RMMITRBG4W	0.0	0.0	0.0	0.0	0.0
...
A2E6WMRJAR02Q1	0.0	0.0	0.0	0.0	0.0
A2E74YKJXGZCJB	0.0	0.0	0.0	0.0	0.0
A2E76LB77DZVN2	0.0	0.0	0.0	0.0	0.0
A2E7CEPDGY42VQ	0.0	0.0	0.0	0.0	0.0
A2E7DYSIYY3HP3	0.0	0.0	0.0	0.0	0.0

product	...	B00001ZWXA	B00001ZWXB	B00001ZWXI	B00001ZX0K	\
user	...					
A10R7XM20Z0323	...	0.0	0.0	0.0	0.0	
A10RDB0FTFA5S3	...	0.0	0.0	0.0	0.0	
A10RFZ7WJD1Y2C	...	0.0	0.0	0.0	0.0	
A10RHYA8B2K9QT	...	0.0	0.0	0.0	0.0	
A10RMMITRBG4W	...	0.0	0.0	0.0	0.0	
...	
A2E6WMRJAR02Q1	...	0.0	0.0	0.0	0.0	
A2E74YKJXGZCJB	...	0.0	0.0	0.0	0.0	
A2E76LB77DZVN2	...	0.0	0.0	0.0	0.0	
A2E7CEPDGY42VQ	...	0.0	0.0	0.0	0.0	
A2E7DYSIYY3HP3	...	0.0	0.0	0.0	0.0	

product	B0000205ZG	B0000205ZQ	B0000205ZZ	B000020629	B0000206CG	\
user						
A10R7XM20Z0323	0.0	0.0	0.0	0.0	0.0	
A10RDB0FTFA5S3	0.0	0.0	0.0	0.0	0.0	
A10RFZ7WJD1Y2C	0.0	0.0	0.0	0.0	0.0	
A10RHYA8B2K9QT	0.0	0.0	0.0	0.0	0.0	
A10RMMITRBG4W	0.0	0.0	0.0	0.0	0.0	
...	
A2E6WMRJAR02Q1	0.0	0.0	0.0	0.0	0.0	
A2E74YKJXGZCJB	0.0	0.0	0.0	0.0	0.0	
A2E76LB77DZVN2	0.0	0.0	0.0	0.0	0.0	
A2E7CEPDGY42VQ	0.0	0.0	0.0	0.0	0.0	
A2E7DYSIYY3HP3	0.0	0.0	0.0	0.0	0.0	

product	B0000206CN
user	
A10R7XM20Z0323	0.0
A10RDB0FTFA5S3	0.0
A10RFZ7WJD1Y2C	0.0
A10RHYA8B2K9QT	0.0
A10RMMITRBG4W	0.0
...	...
A2E6WMRJAR02Q1	0.0
A2E74YKJXGZCJB	0.0
A2E76LB77DZVN2	0.0
A2E7CEPDGY42VQ	0.0
A2E7DYSIYY3HP3	0.0

[16043 rows x 1625 columns]

Average RMSE : 0.0

Average MAE : 0.0