```
C:\Users\rkn_16\AppData\Local\Programs\Python\Python37\python.exe G:/eclipse/Work_space/Bitbucket/codechef/IRAssignment2/recommendersystems/cur_decomposition.py
**********  C - Matrix
**********
[[2.08239608 2.08239608 2.08239608 ... 0.         0.         0.        ]
 [0.         0.         0.         ... 0.         0.         0.        ]
 [0.         0.         0.         ... 0.         0.         0.        ]
 ...
 [0.         0.         0.         ... 0.         0.         0.        ]
 [2.08239608 2.08239608 2.08239608 ... 0.         0.         0.        ]
 [1.66591687 1.66591687 1.66591687 ... 0.         0.         0.        ]]
**********  R - Matrix
**********
[[1.85664633 0.         1.85664633 ... 0.         0.         0.        ]
 [1.85664633 0.         1.85664633 ... 0.         0.         0.        ]
 [1.85664633 0.         1.85664633 ... 0.         0.         0.        ]
 ...
 [0.         0.         0.         ... 0.         0.         0.        ]
 [0.         0.         0.         ... 0.         0.         0.        ]
 [0.         0.         0.         ... 0.         0.         0.        ]]
**********  W - Matrix
**********
[[5. 5. 5. ... 0. 0. 0.]
 [5. 5. 5. ... 0. 0. 0.]
 [5. 5. 5. ... 0. 0. 0.]
 ...
 [0. 0. 0. ... 0. 0. 0.]
 [0. 0. 0. ... 0. 0. 0.]
 [0. 0. 0. ... 0. 0. 0.]]
C:\Users\rkn_16\AppData\Local\Programs\Python\Python37\lib\site-packages\scipy\sparse\linalg\eigen\arpack\arpack.py:1254: RuntimeWarning: k >= N - 1 for N * N square matrix.
```

```
Attempting to use scipy.linalg.eig instead.
  RuntimeWarning)
**********  Y - Matrix
  **********
[[-0.09316597  0.03124965 -0.02750883 ...  0.01749598  0.01749598
  -0.00048886]
 [-0.09316597  0.03124965 -0.02750883 ...  0.0122735   0.0122735
  -0.01555371]
 [-0.09316597  0.03124965 -0.02750883 ... -0.01978905 -0.01978905
  -0.01116285]
 ...
 [-0.00032695 -0.00292549  0.00154896 ... -0.09510885 -0.09510885
   0.08955371]
 [-0.00125296 -0.00065393  0.0071127  ...  0.02909032  0.02909032
  -0.07448606]
 [-0.00093972 -0.00049045  0.00533453 ...  0.03450597  0.03450597
  -0.06998594]]
**********  Z - Matrix
  **********
[[0.00105852 0.         0.         ... 0.         0.
  0.        ]
 [0.         0.00392125 0.         ... 0.         0.
  0.        ]
 [0.         0.         0.00411174 ... 0.         0.
  0.        ]
 ...
 [0.         0.         0.         ... 0.         0.
  0.        ]
 [0.         0.         0.         ... 0.         0.
  0.        ]
 [0.         0.         0.         ... 0.         0.
  0.        ]]
**********  X.T - Matrix
  **********
[[-7.31345435e-02 -7.31345435e-02 -7.31345435e-02 ... -1.29290505e-03
  -3.18397840e-03 -1.28705894e-03]
 [ 2.75006406e-02  2.75006406e-02  2.75006406e-02 ... -7.80870823e-03
```

```
54   -8.61054835e-04 -8.48734194e-04]
55  [ 3.31968427e-02  3.31968427e-02  3.31968427e-02 ...  1.
   16931889e-02
56   -4.39646248e-03  7.06713149e-03]
57  ...
58  [ 4.26310543e-03 -3.68894814e-02  3.55500795e-02 ...  8.
   63305455e-03
59    8.79318448e-14  7.47393835e-13]
60  [-7.21570070e-03  5.07522185e-02  3.83066169e-02 ... -1.
   25665364e-03
61   -7.89266106e-13 -8.52890226e-13]
62  [-5.51498581e-01  6.16636159e-01  8.97517407e-02 ... -5.
   06412054e-04
63   -1.40940471e-11 -3.97949815e-12]]
64 ************************  U - Matrix
     **********************************
65 [[ 5.77098795e+06  4.54939936e+09 -9.24658632e+09 ...  2.
   49744853e+10
66   -2.67977556e-01 -2.69428241e-01]
67  [-6.78327591e+06  3.30111121e+09 -8.55482743e+09 ...  2.
   46141511e+10
68   -1.09141749e-01 -2.67004261e-01]
69  [-3.90263262e+07  1.94468245e+09 -2.36279653e+10 ...  3.
   93239463e+10
70    7.64793740e-02 -5.97584298e-01]
71  ...
72  [-6.43077116e+08  3.85396938e+10  3.94060713e+10 ...  4.
   95774523e+11
73    5.52534222e-01 -1.21754354e+00]
74  [-1.86539017e+09  2.59663544e+11 -3.13208186e+11 ...  2.
   83886649e+12
75   -2.41680361e+00 -1.84246839e+01]
76  [ 1.37899079e+09 -2.95290654e+11  3.55401675e+11 ... -3.
   28627295e+12
77    4.35232463e+00  2.00474806e+01]]
78 ************************  CUR - Matrix
     **********************************
79 [[ 50.43179534   6.42359948  12.83709776 ...   0
   .           1.04212862
80    -1.57485922]
81  [-53.48560207   0.80452226   9.75720798 ...   0
   .          -0.12068187
82     0.49639797]
83  [-33.88808773 -10.17467201  14.32905276 ...   0
   .          -1.89845877
```

```
 84    -1.57204222]
 85  ...
 86  [ 28.37489944  -6.25963766   6.51160343 ...   0
    .          -3.29026958
 87    -0.27213974]
 88  [ 19.57304814   1.06259023   2.16089561 ...   0
    .           0.29091066
 89    -0.29112358]
 90  [ 59.32324219 -10.48896924  14.15798093 ...   0
    .          -6.06982422
 91    -0.73044381]]
 92 ************************  Base + Test - CUR - Matrix
      *********************************
 93 [[-45.43179534  -3.42359948  -8.83709776 ...   0
    .          -1.04212862
 94     1.57485922]
 95  [ 57.48560207  -0.80452226  -9.75720798 ...   0
    .           0.12068187
 96    -0.49639797]
 97  [ 33.88808773  10.17467201 -14.32905276 ...   0
    .           1.89845877
 98     1.57204222]
 99  ...
100  [-23.37489944   6.25963766  -6.51160343 ...   0
    .           3.29026958
101     0.27213974]
102  [-19.57304814  -1.06259023  -2.16089561 ...   0
    .          -0.29091066
103     0.29112358]
104  [-59.32324219  15.48896924 -14.15798093 ...   0
    .           6.06982422
105     0.73044381]]
106 RMSE Value =  50.76072008626858
107 Pearson =  0.9999999938548649
108 Precision =  0.62
109 Time taken =  15.832558155059814
110 ************************  C - Matrix
      *********************************
111 [[2.08239608 2.08239608 2.08239608 ... 0.         0
    .         0.        ]
112  [0.         0.         0.         ... 0.         0
    .         0.        ]
113  [0.         0.         0.         ... 0.         0
    .         0.        ]
114  ...
```

```
115  [0.          0.          0.          ... 0.          0
    .          0.         ]
116  [2.08239608 2.08239608 2.08239608 ... 0.          0
    .          0.         ]
117  [1.66591687 1.66591687 1.66591687 ... 0.          0
    .          0.         ]]
118 ************************  R - Matrix
      **********************************
119 [[ 2.49150589  1.99320471  0.          ...  0.          0.
120    0.         ]
121  [ 2.49150589  1.99320471  0.          ...  0.          0.
122    0.         ]
123  [ 2.49150589  1.99320471  0.          ...  0.          0.
124    0.         ]
125  ...
126  [15.86237007  0.          0.          ...  0.          0.
127    0.         ]
128  [ 0.          0.          0.          ...  0.          0.
129    0.         ]
130  [ 0.          0.          0.          ...  0.          0.
131    0.         ]]
132 ************************  W - Matrix
      **********************************
133 [[5. 5. 5. ... 0. 0. 0.]
134  [5. 5. 5. ... 0. 0. 0.]
135  [5. 5. 5. ... 0. 0. 0.]
136  ...
137  [0. 0. 0. ... 0. 0. 0.]
138  [0. 0. 0. ... 0. 0. 0.]
139  [0. 0. 0. ... 0. 0. 0.]]
140 ************************  Y - Matrix
      **********************************
141 [[ 0.09492454  0.04548638 -0.00365378 ...  0.02206027 -0.
    01160211
142    0.02045768]
143  [ 0.09492454  0.04548638 -0.00365378 ...  0.02206027 -0.
    01160211
144    0.02045768]
145  [ 0.09492454  0.04548638 -0.00365378 ...  0.02206027 -0.
    01160211
146    0.02045768]
147  ...
148  [ 0.0003293  -0.00193859  0.00091831 ...  0.00338568  0.
    0082028
149    0.0056374 ]
```

```
150  [ 0.00019052 -0.00041316  0.00035451 ...  0.0055765   0.
    006153
151   -0.0053087 ]
152  [ 0.00156225 -0.00345104 -0.00889261 ...  0.01151612  0.
    00089787
153   -0.00635252]]
154 ************************  Z - Matrix
      **********************************
155 [[0.00109796 0.         0.         ... 0.         0
    .         0.        ]
156  [0.         0.00386614 0.         ... 0.         0
    .         0.        ]
157  [0.         0.         0.00408092 ... 0.         0
    .         0.        ]
158  ...
159  [0.         0.         0.         ... 0.01755063 0
    .         0.        ]
160  [0.         0.         0.         ... 0.         0.
    0175903  0.        ]
161  [0.         0.         0.         ... 0.         0
    .         0.01770073]]
162 ************************  X.T - Matrix
      **********************************
163 [[-0.07310321 -0.07310321 -0.07310321 ... -0.00405139 -0.
    00278934
164   -0.00158766]
165  [ 0.02664529  0.02664529  0.02664529 ...  0.01161515  0.
    0079651
166    0.00134966]
167  [ 0.06062724  0.06062724  0.06062724 ...  0.0220744   0.
    02163333
168    0.01140666]
169  ...
170  [ 0.05533814  0.05533814  0.05533814 ... -0.00865026  0.
    0179582
171   -0.00144636]
172  [ 0.00823756  0.00823756  0.00823756 ...  0.03710279  0.
    03189375
173    0.00107648]
174  [-0.02661958 -0.02661958 -0.02661958 ... -0.00902333 -0.
    00458256
175   -0.01709814]]
176 ************************  U - Matrix
      **********************************
177 [[ 1.33280052e-04  1.33280052e-04  1.33280052e-04 ... -5.
```

```
59533176e-05
   6.61194886e-05  4.15318766e-05]
 [ 1.33280052e-04  1.33280052e-04  1.33280052e-04 ... -5.
59533176e-05
   6.61194886e-05  4.15318766e-05]
 [ 1.33280052e-04  1.33280052e-04  1.33280052e-04 ... -5.
59533176e-05
   6.61194886e-05  4.15318766e-05]
 ...
 [ 7.29702821e-06  7.29702821e-06  7.29702821e-06 ...  5.
22866913e-06
   1.02917023e-05 -7.87918649e-06]
 [ 1.43084478e-06  1.43084478e-06  1.43084478e-06 ...  1.
13439287e-05
   3.34433675e-06 -5.34576586e-06]
 [ 4.41387783e-05  4.41387783e-05  4.41387783e-05 ... -3.
71039111e-05
   1.39259397e-05 -1.85250551e-05]]
********************  CUR - Matrix
  **********************************
[[-1.61212353e+00 -1.54941610e+00  2.01803592e-01 ...  0.
00000000e+00
  -1.81825219e-01  9.16536114e-03]
 [-1.13418809e+00  1.01762787e-01 -3.27880419e-01 ...  0.
00000000e+00
   5.93075404e-02 -3.74508266e-03]
 [-5.85080457e-01  3.64740476e-01 -2.25417517e-01 ...  0.
00000000e+00
   1.15313330e-02  1.33060024e-04]
 ...
 [-1.08466559e+00  2.49565716e-01  3.10669962e-01 ...  0.
00000000e+00
  -6.44443090e-02  4.54951762e-03]
 [-2.27932432e+00  1.44809360e-01  3.99464115e-01 ...  0.
00000000e+00
   2.31887502e-02 -2.99227065e-02]
 [-3.94441867e-01 -9.72343181e-01 -6.02575405e-01 ...  0.
00000000e+00
   6.41690304e-02  1.37887732e-02]]
********************  Base + Test - CUR - Matrix
  **********************************
[[ 6.61212353e+00  4.54941610e+00  3.79819641e+00 ...  0.
00000000e+00
   1.81825219e-01 -9.16536114e-03]
 [ 5.13418809e+00 -1.01762787e-01  3.27880419e-01 ...  0.
```

```
00000000e+00
  -5.93075404e-02  3.74508266e-03]
 [ 5.85080457e-01 -3.64740476e-01  2.25417517e-01 ...  0.
00000000e+00
  -1.15313330e-02 -1.33060024e-04]
 ...
 [ 6.08466559e+00 -2.49565716e-01 -3.10669962e-01 ...  0.
00000000e+00
   6.44443090e-02 -4.54951762e-03]
 [ 2.27932432e+00 -1.44809360e-01 -3.99464115e-01 ...  0.
00000000e+00
  -2.31887502e-02  2.99227065e-02]
 [ 3.94441867e-01  5.97234318e+00  6.02575405e-01 ...  0.
00000000e+00
  -6.41690304e-02 -1.37887732e-02]]
RMSE Value =  1.1273531247663118
Pearson =  0.999999999996969
Precision =  0.4594594594594595
Time taken =  16.248882055282593

Process finished with exit code 0

```