Execution results.

1. **SVD realization.**

```
Original matrix:
 [[ 3  5]
 [-1  3]]


U:
 [[ 0.92387953 -0.38268343]
 [ 0.38268343  0.92387953]]


V.T:
 [[ 0.38268343  0.92387953]
 [-0.92387953  0.38268343]]


Sigma:
 [[6.24264069 0.        ]
 [0.         2.24264069]]


Reconstructed matrix:
 [[ 3.  5.]
 [-1.  3.]]


Process finished with exit code 0
```

2. Recommendation algorithm.

```
movieId  1       2       3       4       ...  193583  193585  193587  193609
userId                                   ...
1        4.0     NaN     4.0     NaN     ...  NaN     NaN     NaN     NaN
2        NaN     NaN     NaN     NaN     ...  NaN     NaN     NaN     NaN
3        NaN     NaN     NaN     NaN     ...  NaN     NaN     NaN     NaN
4        NaN     NaN     NaN     NaN     ...  NaN     NaN     NaN     NaN
5        4.0     NaN     NaN     NaN     ...  NaN     NaN     NaN     NaN
...      ...     ...     ...     ...     ...  ...     ...     ...     ...
606      2.5     NaN     NaN     NaN     ...  NaN     NaN     NaN     NaN
607      4.0     NaN     NaN     NaN     ...  NaN     NaN     NaN     NaN
608      2.5     2.0     2.0     NaN     ...  NaN     NaN     NaN     NaN
609      3.0     NaN     NaN     NaN     ...  NaN     NaN     NaN     NaN
610      5.0     NaN     NaN     NaN     ...  NaN     NaN     NaN     NaN

[610 rows x 9724 columns]
```

```
movieId  260   296   356   1196   1210   2571
userId
1        5.0   3.0   4.0   5.0    5.0    5.0
4        5.0   1.0   NaN   5.0    NaN    1.0
6        NaN   2.0   5.0   NaN    NaN    NaN
18       4.0   4.0   4.5   4.0    4.5    4.5
19       4.0   NaN   2.0   4.0    3.0    4.0
...      ...   ...   ...   ...    ...    ...
603      4.0   5.0   3.0   3.0    3.0    5.0
605      5.0   2.0   3.0   NaN    5.0    NaN
606      4.5   5.0   4.0   4.5    4.5    5.0
608      3.5   5.0   3.0   4.0    4.0    5.0
610      5.0   5.0   3.0   5.0    5.0    5.0

[134 rows x 6 columns]
```
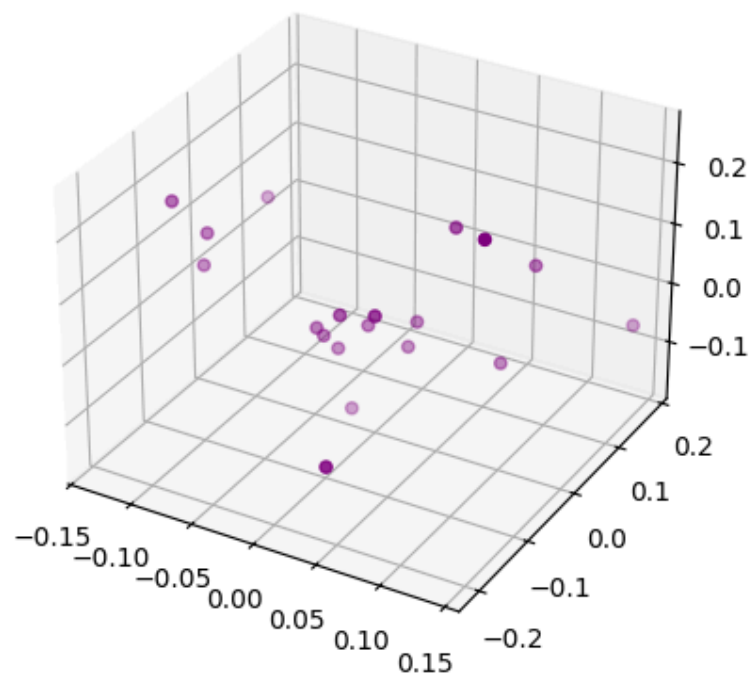
```
Users(U): [[-0.11701519 -0.0486775   0.10423191]
 [ 0.11847179 -0.08575014  0.25393107]
 [ 0.04659884 -0.2114704  -0.06167357]
 [-0.03369839 -0.03431137 -0.01493453]
 [-0.11315672  0.06023676  0.09295234]
 [ 0.          0.          0.        ]
 [-0.00176799 -0.06557723  0.04769789]
 [ 0.0223581   0.03028765 -0.01808238]
 [ 0.14094734  0.18267287 -0.0629276 ]
 [-0.02632272 -0.00939526 -0.06325497]
 [ 0.          0.          0.        ]
 [ 0.0808657   0.0546264  -0.07019834]
 [ 0.05670146  0.0201186   0.16508456]
 [-0.12109341 -0.04722163  0.04750486]
 [-0.02915682 -0.03123462 -0.02748431]
 [ 0.09201204  0.09678061  0.06990315]
 [ 0.01555938  0.02934068 -0.06364908]
 [-0.01879314 -0.00076514 -0.16784247]
 [-0.13257457 -0.07801818  0.16788099]
 [-0.00475961 -0.0016749  -0.01720317]
 [-0.05804253 -0.12877441  0.02109279]
 [ 0.15642742 -0.0874789   0.00269698]
 [-0.05516555  0.1449462   0.06380476]
 [-0.07978081  0.11678833  0.02377067]
 [ 0.05583846  0.06600087 -0.03290081]
 [ 0.04613378 -0.10703474 -0.0306504 ]
 [ 0.02480749  0.09899566 -0.10530416]
 [ 0.2407498  -0.20119048 -0.03362347]
 [-0.02039617 -0.0028409  -0.13670009]
 [ 0.          0.          0.        ]
 [-0.06997642 -0.04425275 -0.17210174]
 [-0.0701431   0.00121406 -0.19379991]
 [-0.12727059  0.11871351  0.02478733]
```
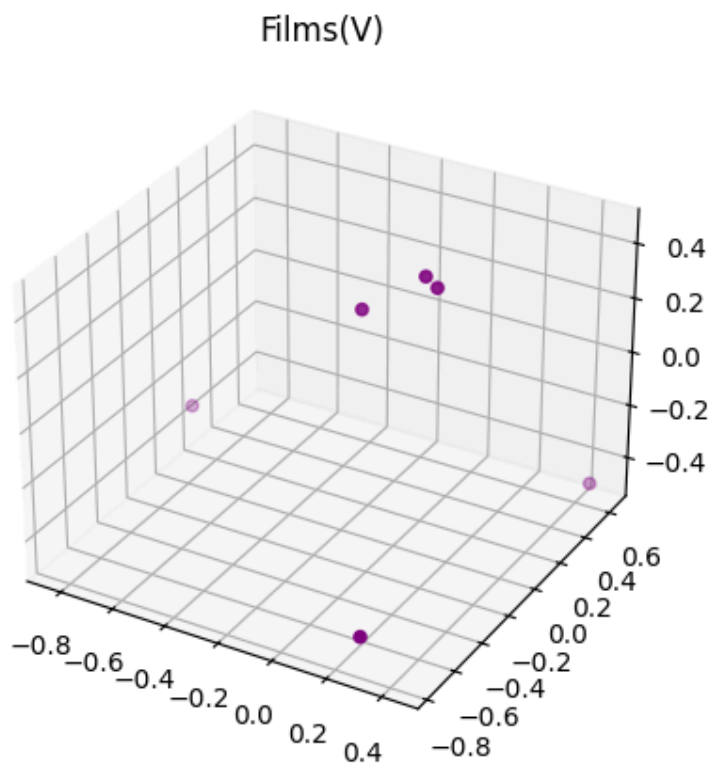
etc.

```
Films(V): [[ 0.09296504  0.03512916  0.45685515]
 [ 0.43669991  0.63524784 -0.48020396]
 [ 0.2693743  -0.76001901 -0.42360706]
 [ 0.12853428  0.04926365  0.41995691]
 [-0.08870624 -0.06453129  0.33327777]
 [-0.83886728  0.10490964 -0.30627881]]


Process finished with exit code 0
```


Users(U)

Films(V)

3. Recommended movies for users.

```
movieId  1        2        3        5       ...  134130  134853  139385  152081
userId                                      ...
1        4.0      2.5      4.0      2.5     ...  2.5     2.5     2.5     2.5
2        2.5      2.5      2.5      2.5     ...  2.5     2.5     2.5     2.5
3        2.5      2.5      2.5      2.5     ...  2.5     2.5     2.5     2.5
4        2.5      2.5      2.5      2.5     ...  2.5     2.5     2.5     2.5
5        4.0      2.5      2.5      2.5     ...  2.5     2.5     2.5     2.5
...      ...      ...      ...      ...     ...  ...     ...     ...     ...
606      2.5      2.5      2.5      2.5     ...  2.5     2.5     2.5     2.5
607      4.0      2.5      2.5      2.5     ...  2.5     2.5     2.5     2.5
608      2.5      2.0      2.0      2.5     ...  2.5     2.5     2.5     2.5
609      3.0      2.5      2.5      2.5     ...  2.5     2.5     2.5     2.5
610      5.0      2.5      2.5      2.5     ...  3.5     3.5     4.5     4.0

[610 rows x 882 columns]
```

```
movieId        1         2         3      ...    134853    139385    152081
userId                                    ...
1        3.707850  2.827957  2.777893     ...  2.519666  2.546472  2.474860
2        2.534508  2.527637  2.462568     ...  2.594338  2.581645  2.578815
3        2.461544  2.484399  2.480570     ...  2.496945  2.495217  2.497033
4        2.785833  2.468483  2.589668     ...  2.439404  2.479003  2.424688
5        2.984992  2.719260  2.610321     ...  2.454375  2.441215  2.455616
...           ...       ...       ...     ...       ...       ...       ...
606      3.360156  2.570422  2.615463     ...  2.800334  2.847969  2.699724
607      3.557016  2.909906  2.743169     ...  2.457527  2.447922  2.443379
608      3.438024  2.857826  2.590427     ...  3.032143  3.004250  2.930417
609      2.819440  2.650936  2.559732     ...  2.479629  2.466619  2.478874
610      3.524923  2.862275  2.515367     ...  3.474040  3.437344  3.298317

[610 rows x 882 columns]
```

```
movieId        1         2         3      ...    134853    139385    152081
userId                                    ...
1             NaN  2.827957       NaN     ...  2.519666  2.546472  2.474860
2        2.534508  2.527637  2.462568     ...  2.594338  2.581645  2.578815
3        2.461544  2.484399  2.480570     ...  2.496945  2.495217  2.497033
4        2.785833  2.468483  2.589668     ...  2.439404  2.479003  2.424688
5             NaN  2.719260  2.610321     ...  2.454375  2.441215  2.455616
...           ...       ...       ...     ...       ...       ...       ...
606           NaN  2.570422  2.615463     ...  2.800334  2.847969  2.699724
607           NaN  2.909906  2.743169     ...  2.457527  2.447922  2.443379
608           NaN       NaN       NaN     ...  3.032143  3.004250  2.930417
609           NaN  2.650936  2.559732     ...  2.479629  2.466619  2.478874
610           NaN  2.862275  2.515367     ...       NaN       NaN       NaN

[610 rows x 882 columns]
```

```
Recommended movies for 1:
                                          title                                           genres
1939                          Matrix, The (1999)                          Action|Sci-Fi|Thriller
2226                            Fight Club (1999)                       Action|Crime|Drama|Thriller
3638  Lord of the Rings: The Fellowship of the Ring,...                             Adventure|Fantasy
4137     Lord of the Rings: The Two Towers, The (2002)                             Adventure|Fantasy
4427  Pirates of the Caribbean: The Curse of the Bla...           Action|Adventure|Comedy|Fantasy
4800  Lord of the Rings: The Return of the King, The...            Action|Adventure|Drama|Fantasy
6315                            Departed, The (2006)                            Crime|Drama|Thriller
6710                         Dark Knight, The (2008)                           Action|Crime|Drama|IMAX
6772                                WALL·E (2008)     Adventure|Animation|Children|Romance|Sci-Fi
7372                              Inception (2010)  Action|Crime|Drama|Mystery|Sci-Fi|Thriller|IMAX

Process finished with exit code 0
```