Movie_Recommender_System

June 25, 2023

```python
[2]: import pandas as pd
     import numpy as np
     import matplotlib
     import seaborn as sns
     import matplotlib.pyplot as plt
     from wordcloud import WordCloud, STOPWORDS
     import matplotlib.style as style
     from scipy.sparse import csr_matrix
     from  sklearn.neighbors import NearestNeighbors
     from sklearn.metrics.pairwise import linear_kernel


     sns.set(font_scale=1.5)
     style.use('seaborn-pastel')
     sns.set(style="whitegrid")
     sns.set_style("dark")
```

/var/folders/pf/ph4d8py534v_jtd6mlwjn3ym0000gn/T/ipykernel_1666/1060725704.py:13
: MatplotlibDeprecationWarning: The seaborn styles shipped by Matplotlib are
deprecated since 3.6, as they no longer correspond to the styles shipped by
seaborn. However, they will remain available as 'seaborn-v0_8-<style>'.
Alternatively, directly use the seaborn API instead.
  style.use('seaborn-pastel')

```python
[3]: movies = pd.read_csv('/Users/golnoush/Desktop/University/term6/IT/movies.csv')
     ratings = pd.read_csv('/Users/golnoush/Desktop/University/term6/IT/ratings.csv')
```

```python
[57]: movies.head()
```

```
[57]:    movieId                                title  \
       0        1                     Toy Story (1995)
       1        2                       Jumanji (1995)
       2        3              Grumpier Old Men (1995)
       3        4             Waiting to Exhale (1995)
       4        5   Father of the Bride Part II (1995)


                                                genres
       0  Adventure|Animation|Children|Comedy|Fantasy
       1                   Adventure|Children|Fantasy
```

```
2                            Comedy|Romance
3                      Comedy|Drama|Romance
4                                    Comedy
```

[38]: `movies.tail()`

[38]:

	movieId	title	genres
10324	146684	Cosmic Scrat-tastrophe (2015)	Animation|Children|Comedy
10325	146878	Le Grand Restaurant (1966)	Comedy
10326	148238	A Very Murray Christmas (2015)	Comedy
10327	148626	The Big Short (2015)	Drama
10328	149532	Marco Polo: One Hundred Eyes (2015)	(no genres listed)

[39]: `ratings.head()`

[39]:

	userId	movieId	rating	timestamp
0	1	16	4.0	1217897793
1	1	24	1.5	1217895807
2	1	32	4.0	1217896246
3	1	47	4.0	1217896556
4	1	50	4.0	1217896523

[5]: `ratings.tail()`

[5]:

	userId	movieId	rating	timestamp
105334	668	142488	4.0	1451535844
105335	668	142507	3.5	1451535889
105336	668	143385	4.0	1446388585
105337	668	144976	2.5	1448656898
105338	668	148626	4.5	1451148148

[52]: `ratings.rating.describe()`

[52]:
```
count    105339.000000
mean          3.516850
std           1.044872
min           0.500000
25%           3.000000
50%           3.500000
75%           4.000000
max           5.000000
Name: rating, dtype: float64
```

[36]: `dataset = pd.merge(movies, ratings,  how='left', on='movieId')`

[37]: `dataset.head()`

```
[37]:    movieId            title                                    genres  \
      0        1  Toy Story (1995)  Adventure|Animation|Children|Comedy|Fantasy
      1        1  Toy Story (1995)  Adventure|Animation|Children|Comedy|Fantasy
      2        1  Toy Story (1995)  Adventure|Animation|Children|Comedy|Fantasy
      3        1  Toy Story (1995)  Adventure|Animation|Children|Comedy|Fantasy
      4        1  Toy Story (1995)  Adventure|Animation|Children|Comedy|Fantasy

         userId  rating     timestamp
      0     2.0     5.0  8.590469e+08
      1     5.0     4.0  1.303501e+09
      2     8.0     5.0  8.586109e+08
      3    11.0     4.0  8.508158e+08
      4    14.0     4.0  8.517663e+08
```

```
[8]: dataset.tail()
```

```
[8]:         movieId                                  title            genres  \
     105334   148238            A Very Murray Christmas (2015)            Comedy
     105335   148626                     The Big Short (2015)             Drama
     105336   148626                     The Big Short (2015)             Drama
     105337   148626                     The Big Short (2015)             Drama
     105338   149532  Marco Polo: One Hundred Eyes (2015)  (no genres listed)

             userId  rating   timestamp
     105334     475     3.0  1451213043
     105335     458     4.0  1452014749
     105336     576     4.5  1451687664
     105337     668     4.5  1451148148
     105338     475     4.0  1451223429
```
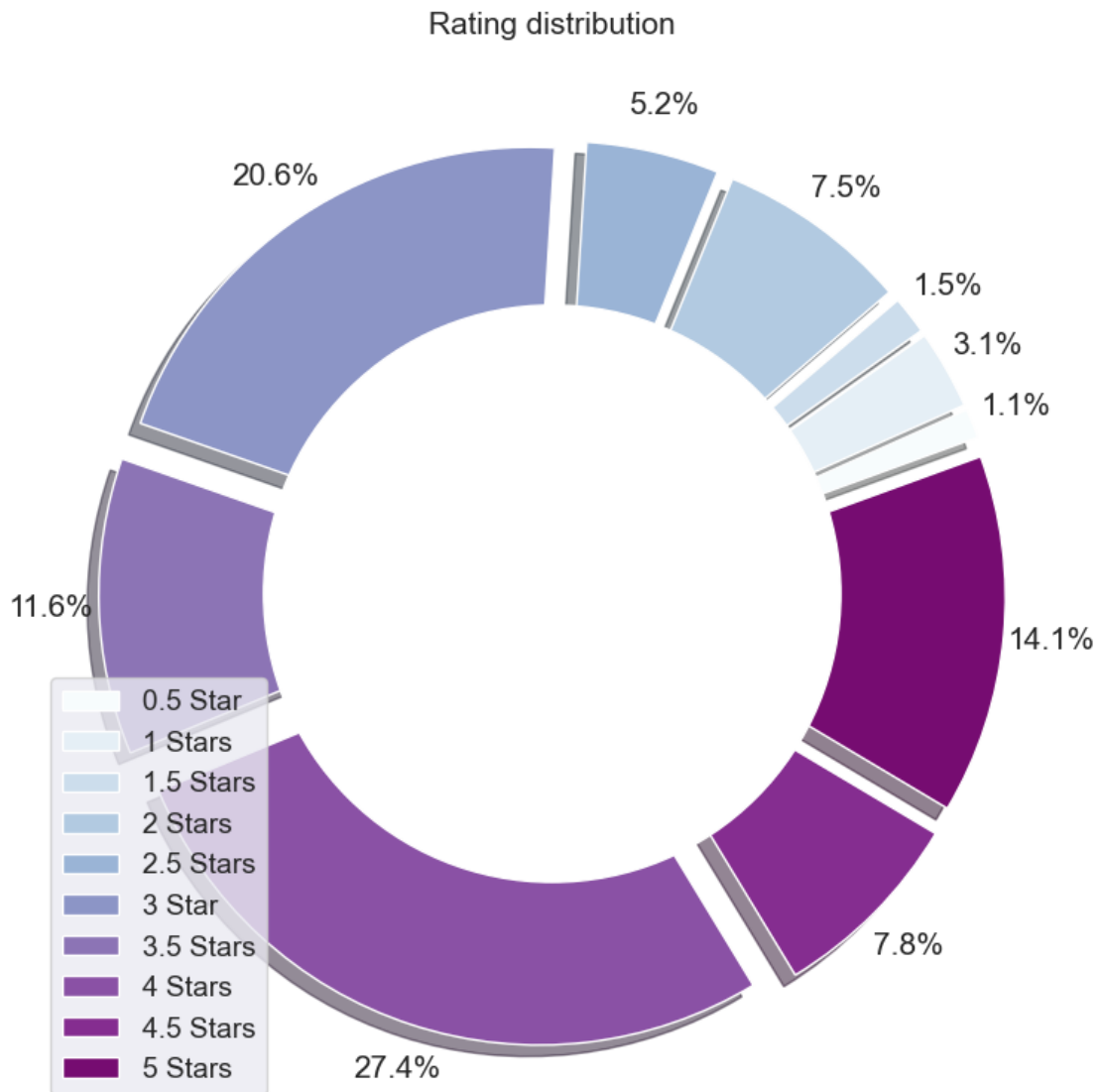
```
[9]: movies_ratings = dataset.copy()
     grouped = pd.DataFrame(movies_ratings.groupby(['rating'])['title'].count())
     grouped.rename(columns={'title':'rating_count'}, inplace=True)
     #movies_ratings
     #grouped
     fig = plt.figure(figsize=(15,15))
     ax = fig.add_subplot(122)
     labels = ['0.5 Star', '1 Stars', '1.5 Stars', '2 Stars', '2.5 Stars', '3 Star',␣
      ↪'3.5 Stars', '4 Stars', '4.5 Stars', '5 Stars']
     theme = plt.get_cmap('BuPu')
     ax.set_prop_cycle("color", [theme(1. * i / len(labels))
                                 for i in range(len(labels))])
     sns.set(font_scale=1.25)
     pie = ax.pie(grouped['rating_count'],
                 autopct='%1.1f%%',
                 shadow=True,
                 startangle=20,
```

```
                    pctdistance=1.115,
                    explode=(0.1, 0.1, 0.1, 0.1, 0.1, 0.1, 0.1, 0.1, 0.1, 0.1))
centre_circle = plt.Circle((0,0),0.70,fc='white')
fig = plt.gcf()
fig.gca().add_artist(centre_circle)
plt.legend(pie[0], labels, loc="lower left")
ax.set_title('Rating distribution\n', fontsize=15)
plt.tight_layout()
plt.show()
```

Rating distribution


```
[10]:  df = movies.copy()
       dict_count = {}
```
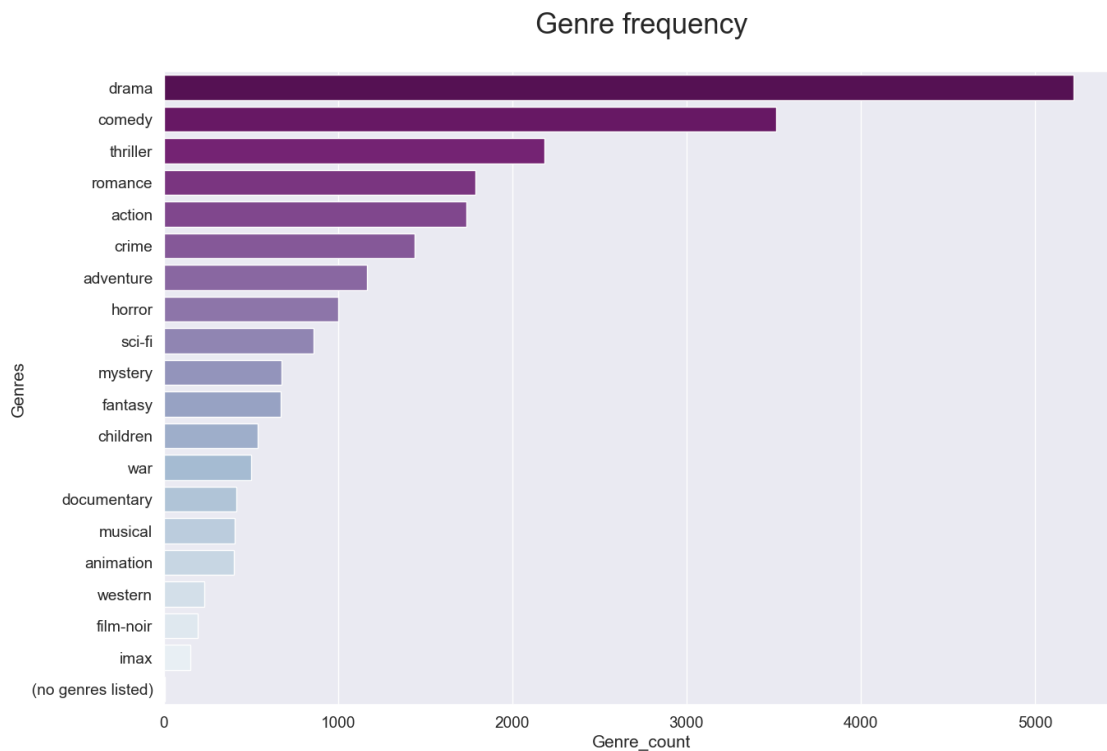
```
all_genres = set(','.join([genres.replace('|',',').lower() for genres in df.
 ↪genres]).split(','))
for genre in all_genres:
        dict_count[genre] = ','.join([genres.replace('|',',').lower() for␣
 ↪genres in df.genres]).count(genre)
sorted_dict = sorted(dict_count.items(), key=lambda x: x[1],reverse=True)
sorted_dict
genre, frequency = zip(*sorted_dict)

fig = plt.figure(4, figsize=(15,10))

sns.barplot(x=list(frequency), y=list(genre), palette='BuPu_r')
plt.title('Genre frequency\n',fontsize=25)
plt.xlabel('Genre_count', fontsize=15)
plt.ylabel('Genres', fontsize=15)

plt.show()
```

Genre frequency


```
[11]: genres = []
for genre in movies.genres:
    x = genre.split('|')
    #print(x)
    for i in x:
```

```
            if(i not in genres):
                genres.append(str(i))
```

[12]: `genres`

[12]: ['Adventure',
        'Animation',
        'Children',
        'Comedy',
        'Fantasy',
        'Romance',
        'Drama',
        'Action',
        'Crime',
        'Thriller',
        'Horror',
        'Mystery',
        'Sci-Fi',
        'IMAX',
        'War',
        'Musical',
        'Documentary',
        'Western',
        'Film-Noir',
        '(no genres listed)']

[13]: `movies.title.describe()`

[13]: count   10329
      unique   10327
      top   War of the Worlds (2005)
      freq   2
      Name: title, dtype: object

[14]:
```
titles = []
for title in movies.title:
    if(title not in titles):
        titles.append(str(title))
```

[47]: `titles`

[47]: ['Toy Story (1995)',
        'Jumanji (1995)',
        'Grumpier Old Men (1995)',
        'Waiting to Exhale (1995)',
        'Father of the Bride Part II (1995)',
        'Heat (1995)',

'Sabrina (1995)',
'Tom and Huck (1995)',
'Sudden Death (1995)',
'GoldenEye (1995)',
'American President, The (1995)',
'Dracula: Dead and Loving It (1995)',
'Balto (1995)',
'Nixon (1995)',
'Cutthroat Island (1995)',
'Casino (1995)',
'Sense and Sensibility (1995)',
'Four Rooms (1995)',
'Ace Ventura: When Nature Calls (1995)',
'Money Train (1995)',
'Get Shorty (1995)',
'Copycat (1995)',
'Assassins (1995)',
'Powder (1995)',
'Leaving Las Vegas (1995)',
'Othello (1995)',
'Now and Then (1995)',
'Persuasion (1995)',
'City of Lost Children, The (Cité des enfants perdus, La) (1995)',
'Shanghai Triad (Yao a yao yao dao waipo qiao) (1995)',
'Dangerous Minds (1995)',
'Twelve Monkeys (a.k.a. 12 Monkeys) (1995)',
'Wings of Courage (1995)',
'Babe (1995)',
'Carrington (1995)',
'Dead Man Walking (1995)',
'Clueless (1995)',
'Cry, the Beloved Country (1995)',
'Richard III (1995)',
'Dead Presidents (1995)',
'Restoration (1995)',
'Mortal Kombat (1995)',
'To Die For (1995)',
'How to Make an American Quilt (1995)',
'Seven (a.k.a. Se7en) (1995)',
'Pocahontas (1995)',
'When Night Is Falling (1995)',
'Usual Suspects, The (1995)',
'Mighty Aphrodite (1995)',
'Lamerica (1994)',
'Big Green, The (1995)',
'Georgia (1995)',
'Home for the Holidays (1995)',

'Postman, The (Postino, Il) (1994)',
'Confessional, The (Confessionnal, Le) (1995)',
'Indian in the Cupboard, The (1995)',
'Eye for an Eye (1996)',
"Mr. Holland's Opus (1995)",
"Don't Be a Menace to South Central While Drinking Your Juice in the Hood (1996)",
'Two if by Sea (1996)',
'Bio-Dome (1996)',
'Lawnmower Man 2: Beyond Cyberspace (1996)',
'French Twist (Gazon maudit) (1995)',
'Friday (1995)',
'From Dusk Till Dawn (1996)',
'Fair Game (1995)',
'Kicking and Screaming (1995)',
'Misérables, Les (1995)',
'Bed of Roses (1996)',
'Big Bully (1996)',
'Screamers (1995)',
'Crossing Guard, The (1995)',
'Juror, The (1996)',
'White Balloon, The (Badkonake sefid) (1995)',
"Things to Do in Denver When You're Dead (1995)",
"Antonia's Line (Antonia) (1995)",
'Once Upon a Time… When We Were Colored (1995)',
'Last Summer in the Hamptons (1995)',
'Angels and Insects (1995)',
'White Squall (1996)',
'Dunston Checks In (1996)',
'Black Sheep (1996)',
'Nick of Time (1995)',
'Journey of August King, The (1995)',
'Mary Reilly (1996)',
'Vampire in Brooklyn (1995)',
'Beautiful Girls (1996)',
'Broken Arrow (1996)',
'In the Bleak Midwinter (1995)',
'Hate (Haine, La) (1995)',
'City Hall (1996)',
'Bottle Rocket (1996)',
'Mr. Wrong (1996)',
'Unforgettable (1996)',
'Happy Gilmore (1996)',
'Bridges of Madison County, The (1995)',
'Muppet Treasure Island (1996)',
'Catwalk (1996)',
'Braveheart (1995)',

'Taxi Driver (1976)',
'Rumble in the Bronx (Hont faan kui) (1995)',
'Before and After (1996)',
"Margaret's Museum (1995)",
'Happiness Is in the Field (Bonheur est dans le pré, Le) (1995)',
'Anne Frank Remembered (1995)',
"Young Poisoner's Handbook, The (1995)",
'If Lucy Fell (1996)',
'Boys of St. Vincent, The (1992)',
'Boomerang (1992)',
'Chungking Express (Chung Hing sam lam) (1994)',
"Star Maker, The (Uomo delle stelle, L') (1995)",
'Flirting With Disaster (1996)',
'NeverEnding Story III, The (1994)',
'Pie in the Sky (1996)',
'Frankie Starlight (1995)',
'Jade (1995)',
'Down Periscope (1996)',
'Man of the Year (1995)',
'Neon Bible, The (1995)',
'Up Close and Personal (1996)',
'Birdcage, The (1996)',
'Brothers McMullen, The (1995)',
'Bad Boys (1995)',
'Amazing Panda Adventure, The (1995)',
'Basketball Diaries, The (1995)',
'Amateur (1994)',
'Apollo 13 (1995)',
'Rob Roy (1995)',
'Addiction, The (1995)',
'Batman Forever (1995)',
'Beauty of the Day (Belle de jour) (1967)',
'Beyond Rangoon (1995)',
'Blue in the Face (1995)',
'Canadian Bacon (1995)',
'Casper (1995)',
'Clockers (1995)',
'Congo (1995)',
'Crimson Tide (1995)',
'Crumb (1994)',
'Desperado (1995)',
'Devil in a Blue Dress (1995)',
'Die Hard: With a Vengeance (1995)',
'Doom Generation, The (1995)',
'First Knight (1995)',
'Free Willy 2: The Adventure Home (1995)',
'Hackers (1995)',

'Jeffrey (1995)',
'Johnny Mnemonic (1995)',
'Judge Dredd (1995)',
'Jury Duty (1995)',
'Kids (1995)',
'Living in Oblivion (1995)',
'Lord of Illusions (1995)',
'Love & Human Remains (1993)',
'Mad Love (1995)',
'Mallrats (1995)',
'Mighty Morphin Power Rangers: The Movie (1995)',
'Moonlight and Valentino (1995)',
'Mute Witness (1994)',
'Nadja (1994)',
'Net, The (1995)',
'Nine Months (1995)',
'Party Girl (1995)',
'Prophecy, The (1995)',
'Safe (1995)',
'Scarlet Letter, The (1995)',
'Showgirls (1995)',
'Smoke (1995)',
'Something to Talk About (1995)',
'Species (1995)',
'Strange Days (1995)',
'Umbrellas of Cherbourg, The (Parapluies de Cherbourg, Les) (1964)',
'Tie That Binds, The (1995)',
'Three Wishes (1995)',
'Total Eclipse (1995)',
'To Wong Foo, Thanks for Everything! Julie Newmar (1995)',
'Under Siege 2: Dark Territory (1995)',
'Unstrung Heroes (1995)',
'Unzipped (1995)',
'Walk in the Clouds, A (1995)',
'Waterworld (1995)',
"White Man's Burden (1995)",
'Wild Bill (1995)',
'Browning Version, The (1994)',
'Bushwhacked (1995)',
'Burnt by the Sun (Utomlyonnye solntsem) (1994)',
'Before the Rain (Pred dozhdot) (1994)',
'Before Sunrise (1995)',
'Billy Madison (1995)',
'Babysitter, The (1995)',
'Boys on the Side (1995)',
'Cure, The (1995)',
'Castle Freak (1995)',

'Circle of Friends (1995)',
'Clerks (1994)',
'Don Juan DeMarco (1995)',
'Disclosure (1994)',
'Dream Man (1995)',
'Drop Zone (1994)',
'Destiny Turns on the Radio (1995)',
'Death and the Maiden (1994)',
'Dolores Claiborne (1995)',
'Dumb & Dumber (Dumb and Dumber) (1994)',
'Eat Drink Man Woman (Yin shi nan nu) (1994)',
'Exotica (1994)',
'Exit to Eden (1994)',
'Ed Wood (1994)',
'French Kiss (1995)',
'Forget Paris (1995)',
'Far From Home: The Adventures of Yellow Dog (1995)',
'Goofy Movie, A (1995)',
'Hideaway (1995)',
'Fluke (1995)',
'Farinelli: il castrato (1994)',
'Gordy (1995)',
'The Glass Shield (1994)',
'Hoop Dreams (1994)',
'Heavenly Creatures (1994)',
'Houseguest (1994)',
'Immortal Beloved (1994)',
'Heavyweights (Heavy Weights) (1995)',
'Hunted, The (1995)',
'I.Q. (1994)',
'Interview with the Vampire: The Vampire Chronicles (1994)',
'Jefferson in Paris (1995)',
'Jerky Boys, The (1995)',
'Junior (1994)',
'Just Cause (1995)',
"Kid in King Arthur's Court, A (1995)",
'Kiss of Death (1995)',
'Star Wars: Episode IV - A New Hope (1977)',
'Little Women (1994)',
'Little Princess, A (1995)',
'Ladybird Ladybird (1994)',
'Like Water for Chocolate (Como agua para chocolate) (1992)',
'Legends of the Fall (1994)',
'Major Payne (1995)',
'Little Odessa (1994)',
'My Crazy Life (Mi vida loca) (1993)',
'Love Affair (1994)',

'Losing Isaiah (1995)',
'Madness of King George, The (1994)',
"Mary Shelley's Frankenstein (Frankenstein) (1994)",
'Man of the House (1995)',
'Mixed Nuts (1994)',
'Milk Money (1994)',
'Miracle on 34th Street (1994)',
'Miami Rhapsody (1995)',
'My Family (1995)',
'Murder in the First (1995)',
"Nobody's Fool (1994)",
'Nell (1994)',
'New Jersey Drive (1995)',
'Natural Born Killers (1994)',
'Only You (1994)',
'Once Were Warriors (1994)',
'Poison Ivy II (1996)',
'Outbreak (1995)',
'Léon: The Professional (a.k.a. The Professional) (Léon) (1994)',
'Perez Family, The (1995)',
'Pulp Fiction (1994)',
'Pushing Hands (Tui shou) (1992)',
'Priest (1994)',
'Quiz Show (1994)',
'Picture Bride (Bijo photo) (1994)',
'Queen Margot (Reine Margot, La) (1994)',
'Quick and the Dead, The (1995)',
'Roommates (1995)',
'Ready to Wear (Pret-A-Porter) (1994)',
'Three Colors: Red (Trois couleurs: Rouge) (1994)',
'Three Colors: Blue (Trois couleurs: Bleu) (1993)',
'Three Colors: White (Trzy kolory: Bialy) (1994)',
'Red Firecracker, Green Firecracker (Pao Da Shuang Deng) (1994)',
'Stuart Saves His Family (1995)',
'Swan Princess, The (1994)',
'Secret of Roan Inish, The (1994)',
'Specialist, The (1994)',
'Stargate (1994)',
'Santa Clause, The (1994)',
'Shawshank Redemption, The (1994)',
'Shallow Grave (1994)',
'Suture (1993)',
'Strawberry and Chocolate (Fresa y chocolate) (1993)',
'Swimming with Sharks (1995)',
'Sum of Us, The (1994)',
"National Lampoon's Senior Trip (1995)",
'To Live (Huozhe) (1994)',

'Tank Girl (1995)',
'Tales from the Crypt Presents: Demon Knight (1995)',
'Star Trek: Generations (1994)',
'Tales from the Hood (1995)',
'Tom & Viv (1994)',
'Village of the Damned (1995)',
'Tommy Boy (1995)',
'Vanya on 42nd Street (1994)',
'Underneath (1995)',
'Walking Dead, The (1995)',
"What's Eating Gilbert Grape (1993)",
'Virtuosity (1995)',
'While You Were Sleeping (1995)',
'War, The (1994)',
'Double Happiness (1994)',
"Muriel's Wedding (1994)",
'Baby-Sitters Club, The (1995)',
'Ace Ventura: Pet Detective (1994)',
'Adventures of Priscilla, Queen of the Desert, The (1994)',
'Backbeat (1993)',
'Bitter Moon (1992)',
'Bullets Over Broadway (1994)',
'Clear and Present Danger (1994)',
'Client, The (1994)',
'Corrina, Corrina (1994)',
'Crooklyn (1994)',
'Crow, The (1994)',
'Cobb (1994)',
'Flintstones, The (1994)',
'Forrest Gump (1994)',
'Four Weddings and a Funeral (1994)',
'Higher Learning (1995)',
'I Love Trouble (1994)',
'It Could Happen to You (1994)',
'Jungle Book, The (1994)',
'Wonderful, Horrible Life of Leni Riefenstahl, The (Macht der Bilder: Leni
Riefenstahl, Die) (1993)',
'Lion King, The (1994)',
'Little Buddha (1993)',
"Wes Craven's New Nightmare (Nightmare on Elm Street Part 7: Freddy's Finale,
A) (1994)",
'Mask, The (1994)',
'Maverick (1994)',
'Mrs. Parker and the Vicious Circle (1994)',
'Naked Gun 33 1/3: The Final Insult (1994)',
'Paper, The (1994)',
'Reality Bites (1994)',

'Red Rock West (1992)',
'Richie Rich (1994)',
'Safe Passage (1994)',
'River Wild, The (1994)',
'Speed (1994)',
'Speechless (1994)',
'Timecop (1994)',
'True Lies (1994)',
'When a Man Loves a Woman (1994)',
'Wolf (1994)',
'Wyatt Earp (1994)',
'Bad Company (1995)',
'Man of No Importance, A (1994)',
'S.F.W. (1994)',
'Low Down Dirty Shame, A (1994)',
'Boys Life (1995)',
'Colonel Chabert, Le (1994)',
'Faster Pussycat! Kill! Kill! (1965)',
"Jason's Lyric (1994)",
'Secret Adventures of Tom Thumb, The (1993)',
'Street Fighter (1994)',
'Fall Time (1995)',
'Brother Minister: The Assassination of Malcolm X (1994)',
'Highlander III: The Sorcerer (a.k.a. Highlander: The Final Dimension) (1994)',
'In the Mouth of Madness (1995)',
'8 Seconds (1994)',
'Above the Rim (1994)',
'Addams Family Values (1993)',
'Age of Innocence, The (1993)',
'Airheads (1994)',
'Air Up There, The (1994)',
'Another Stakeout (1993)',
'Bad Girls (1994)',
'Barcelona (1994)',
'Being Human (1993)',
'Beverly Hillbillies, The (1993)',
'Beverly Hills Cop III (1994)',
'Black Beauty (1994)',
'Blink (1994)',
'Blown Away (1994)',
'Blue Chips (1994)',
'Blue Sky (1994)',
'Body Snatchers (1993)',
'Boxing Helena (1993)',
'Bronx Tale, A (1993)',
'Cabin Boy (1994)',
'Calendar Girl (1993)',

"Carlito's Way (1993)",
"City Slickers II: The Legend of Curly's Gold (1994)",
'Clean Slate (1994)',
'Cliffhanger (1993)',
'Coneheads (1993)',
'Color of Night (1994)',
'Cops and Robbersons (1994)',
'Cowboy Way, The (1994)',
'Dangerous Game (1993)',
'Dave (1993)',
'Dazed and Confused (1993)',
'Demolition Man (1993)',
'Endless Summer 2, The (1994)',
'Even Cowgirls Get the Blues (1993)',
'Fatal Instinct (1993)',
'Farewell My Concubine (Ba wang bie ji) (1993)',
'Favor, The (1994)',
'Fearless (1993)',
'Fear of a Black Hat (1994)',
'With Honors (1994)',
'Flesh and Bone (1993)',
"Widows' Peak (1994)",
'For Love or Money (1993)',
'Firm, The (1993)',
'Free Willy (1993)',
'Fresh (1994)',
'Fugitive, The (1993)',
'Geronimo: An American Legend (1993)',
'Getaway, The (1994)',
'Getting Even with Dad (1994)',
'Go Fish (1994)',
'Guilty as Sin (1993)',
'Hard Target (1993)',
'Heaven & Earth (1993)',
'Hot Shots! Part Deux (1993)',
'Live Nude Girls (1995)',
'Englishman Who Went Up a Hill But Came Down a Mountain, The (1995)',
'House of the Spirits, The (1993)',
'House Party 3 (1994)',
'Hudsucker Proxy, The (1994)',
"I'll Do Anything (1994)",
'In the Army Now (1994)',
'In the Line of Fire (1993)',
'In the Name of the Father (1993)',
'Inkwell, The (1994)',
"What's Love Got to Do with It? (1993)",
'Judgment Night (1993)',

'Jurassic Park (1993)',
'Kalifornia (1993)',
'Killing Zoe (1994)',
'King of the Hill (1993)',
'Last Action Hero (1993)',
'Life with Mikey (1993)',
'Lightning Jack (1994)',
'M. Butterfly (1993)',
'Made in America (1993)',
'Malice (1993)',
'Man Without a Face, The (1993)',
'Manhattan Murder Mystery (1993)',
'Menace II Society (1993)',
'Executive Decision (1996)',
'In the Realm of the Senses (Ai no corrida) (1976)',
'What Happened Was… (1994)',
'Much Ado About Nothing (1993)',
'Mr. Jones (1993)',
'Mr. Wonderful (1993)',
'Mrs. Doubtfire (1993)',
'Naked (1993)',
'Next Karate Kid, The (1994)',
'No Escape (1994)',
'North (1994)',
'Orlando (1992)',
'Perfect World, A (1993)',
'Philadelphia (1993)',
'Piano, The (1993)',
'Poetic Justice (1993)',
'Program, The (1993)',
'Puppet Masters, The (1994)',
'Radioland Murders (1994)',
'Ref, The (1994)',
'Remains of the Day, The (1993)',
'Renaissance Man (1994)',
'Rising Sun (1993)',
'Road to Wellville, The (1994)',
'RoboCop 3 (1993)',
'Robin Hood: Men in Tights (1993)',
'Romeo Is Bleeding (1993)',
'Romper Stomper (1992)',
'Ruby in Paradise (1993)',
'Rudy (1993)',
'Saint of Fort Washington, The (1993)',
'Savage Nights (Nuits fauves, Les) (1992)',
"Schindler's List (1993)",
'Scout, The (1994)',

'Searching for Bobby Fischer (1993)',
'Secret Garden, The (1993)',
'Serial Mom (1994)',
'Shadow, The (1994)',
'Shadowlands (1993)',
'Short Cuts (1993)',
'Simple Twist of Fate, A (1994)',
'Sirens (1994)',
'Six Degrees of Separation (1993)',
'Sleepless in Seattle (1993)',
'Sliver (1993)',
'Blade Runner (1982)',
'Son in Law (1993)',
'So I Married an Axe Murderer (1993)',
'Striking Distance (1993)',
'Harem (1985)',
'Super Mario Bros. (1993)',
'Surviving the Game (1994)',
'Terminal Velocity (1994)',
'Thirty-Two Short Films About Glenn Gould (1993)',
'Threesome (1994)',
'Nightmare Before Christmas, The (1993)',
'Three Musketeers, The (1993)',
'Tombstone (1993)',
'Trial by Jury (1994)',
'True Romance (1993)',
'War Room, The (1993)',
'Pagemaster, The (1994)',
'Beans of Egypt, Maine, The (1994)',
'Welcome to the Dollhouse (1995)',
'Germinal (1993)',
'Cronos (1993)',
'Naked in New York (1994)',
'Kika (1993)',
'Bhaji on the Beach (1993)',
'Little Big League (1994)',
'Slingshot, The (Kådisbellan) (1993)',
'Wedding Gift, The (1994)',
'Ciao, Professore! (Io speriamo che me la cavo) (1992)',
'Spanking the Monkey (1994)',
'Little Rascals, The (1994)',
'Andre (1994)',
'Princess Caraboo (1994)',
'Celluloid Closet, The (1995)',
'Dear Diary (Caro Diario) (1994)',
'Brady Bunch Movie, The (1995)',
'Home Alone (1990)',

'Ghost (1990)',
'Aladdin (1992)',
'Terminator 2: Judgment Day (1991)',
'Dances with Wolves (1990)',
'Batman (1989)',
'Silence of the Lambs, The (1991)',
'Snow White and the Seven Dwarfs (1937)',
'Beauty and the Beast (1991)',
'Pinocchio (1940)',
'Pretty Woman (1990)',
'Wild Bunch, The (1969)',
'Love and a .45 (1994)',
"Wooden Man's Bride, The (Yan shen) (1994)",
'Great Day in Harlem, A (1994)',
'Bye Bye, Love (1995)',
'One Fine Day (1996)',
'Candyman: Farewell to the Flesh (1995)',
'Fargo (1996)',
'Homeward Bound II: Lost in San Francisco (1996)',
'Heavy Metal (1981)',
'Hellraiser: Bloodline (1996)',
'Pallbearer, The (1996)',
'Jane Eyre (1996)',
'Loaded (1994)',
'Bread and Chocolate (Pane e cioccolata) (1973)',
'Aristocats, The (1970)',
'Flower of My Secret, The (La flor de mi secreto) (1995)',
'Two Much (1995)',
'Ed (1996)',
'My Favorite Season (1993)',
'Thin Line Between Love and Hate, A (1996)',
'Last Supper, The (1995)',
'Primal Fear (1996)',
'Carried Away (1996)',
'All Dogs Go to Heaven 2 (1996)',
'Land and Freedom (Tierra y libertad) (1995)',
'Denise Calls Up (1995)',
'Theodore Rex (1995)',
'Family Thing, A (1996)',
'Sgt. Bilko (1996)',
'Jack and Sarah (1995)',
'Girl 6 (1996)',
'Diabolique (1996)',
'Courage Under Fire (1996)',
'Mission: Impossible (1996)',
'Cold Fever (Á köldum klaka) (1995)',
'Moll Flanders (1996)',

'Dragonheart (1996)',
'Eddie (1996)',
'Purple Noon (Plein soleil) (1960)',
'August (1996)',
'James and the Giant Peach (1996)',
'Fear (1996)',
'Kids in the Hall: Brain Candy (1996)',
'Faithful (1996)',
'Underground (1995)',
'Bloodsport 2 (a.k.a. Bloodsport II: The Next Kumite) (1996)',
'Song of the Little Road (Pather Panchali) (1955)',
'World of Apu, The (Apur Sansar) (1959)',
'Mystery Science Theater 3000: The Movie (1996)',
'Space Jam (1996)',
'Barbarella (1968)',
'Some Folks Call It a Sling Blade (1993)',
'Run of the Country, The (1995)',
'Alphaville (Alphaville, une étrange aventure de Lemmy Caution) (1965)',
'Coup de torchon (Clean Slate) (1981)',
"It's My Party (1996)",
'Operation Dumbo Drop (1995)',
'Promise, The (Versprechen, Das) (1995)',
'Mrs. Winterbourne (1996)',
'Solo (1996)',
'Substitute, The (1996)',
'True Crime (1996)',
'Feeling Minnesota (1996)',
'Angus (1995)',
'Faces (1968)',
'Boys (1996)',
'Quest, The (1996)',
'Cosi (1996)',
'Sunset Park (1996)',
'Mulholland Falls (1996)',
'Truth About Cats & Dogs, The (1996)',
'Oliver & Company (1988)',
'Celtic Pride (1996)',
'Flipper (1996)',
'Captives (1994)',
'Dead Man (1995)',
'Horseman on the Roof, The (Hussard sur le toit, Le) (1995)',
'Switchblade Sisters (1975)',
'Visitors, The (Visiteurs, Les) (1993)',
'Multiplicity (1996)',
'Wallace & Gromit: The Best of Aardman Animation (1996)',
'Haunted World of Edward D. Wood Jr., The (1996)',
'Craft, The (1996)',

'Great White Hype, The (1996)',
'Last Dance (1996)',
'Cold Comfort Farm (1995)',
"Heaven's Prisoners (1996)",
'Original Gangstas (1996)',
'Rock, The (1996)',
'Cemetery Man (Dellamorte Dellamore) (1994)',
'Twister (1996)',
'Barb Wire (1996)',
'Ghost in the Shell (Kôkaku kidôtai) (1995)',
'Thinner (1996)',
'Spy Hard (1996)',
'Wallace & Gromit: A Close Shave (1995)',
'Force of Evil (1948)',
'Stupids, The (1996)',
'Arrival, The (1996)',
'Dr. Strangelove or: How I Learned to Stop Worrying and Love the Bomb (1964)',
'Month by the Lake, A (1995)',
'Gold Diggers: The Secret of Bear Mountain (1995)',
'Kim (1950)',
'Ashes of Time (Dung che sai duk) (1994)',
'Maya Lin: A Strong Clear Vision (1994)',
'Stalingrad (1993)',
'Phantom, The (1996)',
'Striptease (1996)',
'Heavy (1995)',
'Jack (1996)',
'I Shot Andy Warhol (1996)',
'Grass Harp, The (1995)',
'Marlene Dietrich: Shadow and Light (1996)',
'Trainspotting (1996)',
"'Til There Was You (1997)",
'Independence Day (a.k.a. ID4) (1996)',
'Stealing Beauty (1996)',
'Fan, The (1996)',
'Hunchback of Notre Dame, The (1996)',
'Cable Guy, The (1996)',
'Kingpin (1996)',
'Eraser (1996)',
'Nutty Professor, The (1996)',
'Daylight (1996)',
'Frighteners, The (1996)',
'Lone Star (1996)',
'Harriet the Spy (1996)',
'Phenomenon (1996)',
'Walking and Talking (1996)',
"She's the One (1996)",

'Time to Kill, A (1996)',
'American Buffalo (1996)',
'Rendezvous in Paris (Rendez-vous de Paris, Les) (1995)',
'Alaska (1996)',
'Fled (1996)',
'Kazaam (1996)',
'Larger Than Life (1996)',
'Very Brady Sequel, A (1996)',
'Collector, The (La collectionneuse) (1967)',
'Kaspar Hauser (1993)',
'Convent, The (O Convento) (1995)',
'Adventures of Pinocchio, The (1996)',
"Joe's Apartment (1996)",
'First Wives Club, The (1996)',
'Stonewall (1995)',
'Ransom (1996)',
'High School High (1996)',
'Phat Beach (1996)',
'Foxfire (1996)',
'Chain Reaction (1996)',
'Matilda (1996)',
'Emma (1996)',
'Crow: City of Angels, The (1996)',
'House Arrest (1996)',
'Eyes Without a Face (Yeux sans visage, Les) (1959)',
'Tales from the Crypt Presents: Bordello of Blood (1996)',
'Story of Xinghua, The (Xinghua san yue tian) (1994)',
'Flirt (1995)',
'Spitfire Grill, The (1996)',
'Escape from L.A. (1996)',
'Cyclo (Xich lo) (1995)',
'Basquiat (1996)',
'Tin Cup (1996)',
'Ballad of Narayama, The (Narayama Bushiko) (1958)',
'Godfather, The (1972)',
'Supercop (Police Story 3: Supercop) (Jing cha gu shi III: Chao ji jing cha) (1992)',
'Manny & Lo (1996)',
'Small Faces (1996)',
'Bound (1996)',
'Carpool (1996)',
'Death in Brunswick (1991)',
'Kansas City (1996)',
"Gone Fishin' (1997)",
'Nothing to Lose (1994)',
'Supercop 2 (Project S) (Chao ji ji hua) (1993)',
'Relic, The (1997)',

'Island of Dr. Moreau, The (1996)',
'First Kid (1996)',
'Trigger Effect, The (1996)',
'Bogus (1996)',
'Bulletproof (1996)',
'Land Before Time III: The Time of the Great Giving (1995)',
'Baton Rouge (Bâton rouge) (1988)',
'Halloween: The Curse of Michael Myers (Halloween 6: The Curse of Michael
Myers) (1995)',
'Twelfth Night (1996)',
'Mother Night (1996)',
'Wild Reeds (Les roseaux sauvages) (1994)',
'For Whom the Bell Tolls (1943)',
'Philadelphia Story, The (1940)',
"Singin' in the Rain (1952)",
'American in Paris, An (1951)',
'Funny Face (1957)',
"Breakfast at Tiffany's (1961)",
'Vertigo (1958)',
'Rear Window (1954)',
'It Happened One Night (1934)',
'Gaslight (1944)',
'Gay Divorcee, The (1934)',
'North by Northwest (1959)',
'Apartment, The (1960)',
'Some Like It Hot (1959)',
'Charade (1963)',
'Casablanca (1942)',
'Maltese Falcon, The (1941)',
'My Fair Lady (1964)',
'Sabrina (1954)',
'Roman Holiday (1953)',
'Little Princess, The (1939)',
'Meet Me in St. Louis (1944)',
'Wizard of Oz, The (1939)',
'Gone with the Wind (1939)',
'My Favorite Year (1982)',
'Sunset Blvd. (a.k.a. Sunset Boulevard) (1950)',
'Citizen Kane (1941)',
'2001: A Space Odyssey (1968)',
'All About Eve (1950)',
'Women, The (1939)',
'Rebecca (1940)',
'Foreign Correspondent (1940)',
'Notorious (1946)',
'Spellbound (1945)',
'Affair to Remember, An (1957)',

'To Catch a Thief (1955)',
'Father of the Bride (1950)',
'Band Wagon, The (1953)',
'Ninotchka (1939)',
'Love in the Afternoon (1957)',
'Gigi (1958)',
'Reluctant Debutante, The (1958)',
'Adventures of Robin Hood, The (1938)',
'Mark of Zorro, The (1940)',
'Laura (1944)',
'Ghost and Mrs. Muir, The (1947)',
'Lost Horizon (1937)',
'Top Hat (1935)',
'To Be or Not to Be (1942)',
'My Man Godfrey (1936)',
'Giant (1956)',
'East of Eden (1955)',
'Thin Man, The (1934)',
'His Girl Friday (1940)',
'Around the World in 80 Days (1956)',
"It's a Wonderful Life (1946)",
'Mr. Smith Goes to Washington (1939)',
'Bringing Up Baby (1938)',
'Penny Serenade (1941)',
'Scarlet Letter, The (1926)',
'Lady of Burlesque (1943)',
'Of Human Bondage (1934)',
'Angel on My Shoulder (1946)',
'Little Lord Fauntleroy (1936)',
'Inspector General, The (1949)',
'Angel and the Badman (1947)',
'39 Steps, The (1935)',
'Walk in the Sun, A (1945)',
'Outlaw, The (1943)',
'Night of the Living Dead (1968)',
'African Queen, The (1951)',
'Beat the Devil (1953)',
'Cat on a Hot Tin Roof (1958)',
'Last Time I Saw Paris, The (1954)',
'Meet John Doe (1941)',
'Algiers (1938)',
'Farewell to Arms, A (1932)',
'Nothing Personal (1995)',
'Yes, Madam (a.k.a. Police Assassins) (a.k.a. In the Line of Duty 2) (Huang gu shi jie) (1985)',
'Dangerous Ground (1997)',
'Picnic (1955)',

'Fly Away Home (1996)',
'Bliss (1997)',
'Grace of My Heart (1996)',
'Maximum Risk (1996)',
'Michael Collins (1996)',
'Infinity (1996)',
'Big Night (1996)',
'Last Man Standing (1996)',
'Caught (1996)',
'Set It Off (1996)',
'2 Days in the Valley (1996)',
'Curdled (1996)',
'Extreme Measures (1996)',
'Glimmer Man, The (1996)',
'D3: The Mighty Ducks (1996)',
'Chamber, The (1996)',
'Apple Dumpling Gang, The (1975)',
'Davy Crockett, King of the Wild Frontier (1955)',
'Escape to Witch Mountain (1975)',
'Love Bug, The (1969)',
'Herbie Rides Again (1974)',
'Old Yeller (1957)',
'Parent Trap, The (1961)',
'Pollyanna (1960)',
'Homeward Bound: The Incredible Journey (1993)',
'Shaggy Dog, The (1959)',
'Swiss Family Robinson (1960)',
'That Darn Cat! (1965)',
'20,000 Leagues Under the Sea (1954)',
'Cool Runnings (1993)',
'Angels in the Outfield (1994)',
'Cinderella (1950)',
'Winnie the Pooh and the Blustery Day (1968)',
'Three Caballeros, The (1945)',
'Sword in the Stone, The (1963)',
'Robin Hood: Prince of Thieves (1991)',
'Mary Poppins (1964)',
'Dumbo (1941)',
"Pete's Dragon (1977)",
'Bedknobs and Broomsticks (1971)',
'Alice in Wonderland (1951)',
'Fox and the Hound, The (1981)',
'Freeway (1996)',
'Sound of Music, The (1965)',
'Die Hard (1988)',
'Lawnmower Man, The (1992)',
'Unhook the Stars (1996)',

'Secret Agent, The (1996)',
'Secrets & Lies (1996)',
'That Thing You Do! (1996)',
'To Gillian on Her 37th Birthday (1996)',
'Surviving Picasso (1996)',
'Beautiful Thing (1996)',
'Long Kiss Goodnight, The (1996)',
'Ghost and the Darkness, The (1996)',
'Looking for Richard (1996)',
'Trees Lounge (1996)',
'Normal Life (1996)',
'Get on the Bus (1996)',
'Jude (1996)',
'Everyone Says I Love You (1996)',
'Bitter Sugar (Azúcar amarga) (1996)',
"William Shakespeare's Romeo + Juliet (1996)",
'Swingers (1996)',
'Sleepers (1996)',
'Johns (1996)',
'Aladdin and the King of Thieves (1996)',
'Shall We Dance (1937)',
'Damsel in Distress, A (1937)',
'Crossfire (1947)',
'Murder, My Sweet (1944)',
'Macao (1952)',
'For the Moment (1994)',
'Willy Wonka & the Chocolate Factory (1971)',
'Innocents, The (1961)',
'Sleeper (1973)',
'Bananas (1971)',
'Fish Called Wanda, A (1988)',
"Monty Python's Life of Brian (1979)",
'Victor/Victoria (1982)',
'Candidate, The (1972)',
'Great Race, The (1965)',
'Bonnie and Clyde (1967)',
'Old Man and the Sea, The (1958)',
'Dial M for Murder (1954)',
'Madame Butterfly (1995)',
'Dirty Dancing (1987)',
'Reservoir Dogs (1992)',
'Platoon (1986)',
"Weekend at Bernie's (1989)",
'Basic Instinct (1992)',
'Doors, The (1991)',
'Crying Game, The (1992)',
'Glengarry Glen Ross (1992)',

"Sophie's Choice (1982)",
'E.T. the Extra-Terrestrial (1982)',
'Christmas Carol, A (1938)',
'Days of Thunder (1990)',
'Top Gun (1986)',
'Rebel Without a Cause (1955)',
'Streetcar Named Desire, A (1951)',
'Children of the Corn IV: The Gathering (1996)',
"Microcosmos (Microcosmos: Le peuple de l'herbe) (1996)",
'Palookaville (1996)',
'Associate, The (1996)',
'Funeral, The (1996)',
'Single Girl, A (Fille seule, La) (1995)',
'Eighth Day, The (Huitième jour, Le) (1996)',
'Drunks (1995)',
'People vs. Larry Flynt, The (1996)',
'Glory Daze (1995)',
'Perfect Candidate, A (1996)',
'On Golden Pond (1981)',
'Return of the Pink Panther, The (1975)',
'Drop Dead Fred (1991)',
'Abyss, The (1989)',
'Fog, The (1980)',
'Escape from New York (1981)',
'Howling, The (1980)',
'Jean de Florette (1986)',
'Manon of the Spring (Manon des sources) (1986)',
'Talking About Sex (1994)',
'Private Benjamin (1980)',
'Monty Python and the Holy Grail (1975)',
'Snowriders (1996)',
'When We Were Kings (1996)',
'Wallace & Gromit: The Wrong Trousers (1993)',
'Return of Martin Guerre, The (Retour de Martin Guerre, Le) (1982)',
'He Walked by Night (1948)',
'Raw Deal (1948)',
'T-Men (1947)',
'Children Are Watching Us, The (Bambini ci guardano, I) (1944)',
'Tin Drum, The (Blechtrommel, Die) (1979)',
'Ruling Class, The (1972)',
'Dear God (1996)',
'Bad Moon (1996)',
'American Dream (1990)',
'Best of the Best 3: No Turning Back (1995)',
'Bob Roberts (1992)',
'Cinema Paradiso (Nuovo cinema Paradiso) (1989)',
'Cook the Thief His Wife & Her Lover, The (1989)',

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'Delicatessen (1991)',
'Double Life of Veronique, The (Double Vie de Véronique, La) (1991)',
'Enchanted April (1992)',
'Paths of Glory (1957)',
'Grifters, The (1990)',
'Hear My Song (1991)',
'English Patient, The (1996)',
'Mediterraneo (1991)',
'My Left Foot (1989)',
'Sex, Lies, and Videotape (1989)',
'Passion Fish (1992)',
'Strictly Ballroom (1992)',
'Thin Blue Line, The (1988)',
'Tie Me Up! Tie Me Down! (¡Átame!) (1990)',
'Madonna: Truth or Dare (1991)',
'Paris Is Burning (1990)',
"One Flew Over the Cuckoo's Nest (1975)",
"Cheech and Chong's Up in Smoke (1978)",
'Star Wars: Episode V - The Empire Strikes Back (1980)',
'Princess Bride, The (1987)',
'Raiders of the Lost Ark (Indiana Jones and the Raiders of the Lost Ark)
(1981)',
'Brazil (1985)',
'Aliens (1986)',
'Good, the Bad and the Ugly, The (Buono, il brutto, il cattivo, Il) (1966)',
'Withnail & I (1987)',
'12 Angry Men (1957)',
'Lawrence of Arabia (1962)',
'Clockwork Orange, A (1971)',
'To Kill a Mockingbird (1962)',
'Apocalypse Now (1979)',
"Once Upon a Time in the West (C'era una volta il West) (1968)",
'Star Wars: Episode VI - Return of the Jedi (1983)',
'Wings of Desire (Himmel über Berlin, Der) (1987)',
'Third Man, The (1949)',
'Goodfellas (1990)',
'Alien (1979)',
'Army of Darkness (1993)',
'Big Blue, The (Grand bleu, Le) (1988)',
'Ran (1985)',
'Killer, The (Die xue shuang xiong) (1989)',
'Psycho (1960)',
'Blues Brothers, The (1980)',
'Godfather: Part II, The (1974)',
'Full Metal Jacket (1987)',
'Grand Day Out with Wallace and Gromit, A (1989)',
'Henry V (1989)',
```

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 'Amadeus (1984)',
 'Quiet Man, The (1952)',
 'Once Upon a Time in America (1984)',
 'Raging Bull (1980)',
 'Annie Hall (1977)',
 'Right Stuff, The (1983)',
 'Stalker (1979)',
 'Boot, Das (Boat, The) (1981)',
 'Sting, The (1973)',
 'Harold and Maude (1971)',
 'Trust (1990)',
 'Seventh Seal, The (Sjunde inseglet, Det) (1957)',
 'Local Hero (1983)',
 'Terminator, The (1984)',
 …]
```

[16]:
```python
highest_number_of_rating = (dataset.groupby('title')[['rating']].count()).
↪nlargest(10, 'rating')
```

[53]:
```python
highest_number_of_rating
```

[53]:
```
                                             rating
title
Pulp Fiction (1994)                             325
Forrest Gump (1994)                             311
Shawshank Redemption, The (1994)                308
Jurassic Park (1993)                            294
Silence of the Lambs, The (1991)                290
Star Wars: Episode IV - A New Hope (1977)       273
Matrix, The (1999)                              261
Terminator 2: Judgment Day (1991)               253
Braveheart (1995)                               248
Schindler's List (1993)                         248
```

[17]:
```python
highest_number_of_rating.head()
```

[17]:
```
                                    rating
title
Pulp Fiction (1994)                    325
Forrest Gump (1994)                    311
Shawshank Redemption, The (1994)       308
Jurassic Park (1993)                   294
Silence of the Lambs, The (1991)       290
```

[18]:
```python
table = dataset.pivot_table(index='title', columns='userId', values='rating')
```

[19]:
```python
table.tail()
```

```
[19]: userId                                            1    2    3    4    5    6    \
      title
      loudQUIETloud: A Film About the Pixies (2006)   NaN  NaN  NaN  NaN  NaN  NaN
      xXx (2002)                                      NaN  NaN  NaN  NaN  NaN  NaN
      xXx: State of the Union (2005)                  NaN  NaN  NaN  NaN  NaN  NaN
      ¡Three Amigos! (1986)                           NaN  NaN  NaN  NaN  NaN  NaN
      À nous la liberté (Freedom for Us) (1931)       NaN  NaN  NaN  NaN  NaN  NaN

      userId                                            7    8    9    10   …  659  \
      title                                                                 …
      loudQUIETloud: A Film About the Pixies (2006)   NaN  NaN  NaN  NaN  …  NaN
      xXx (2002)                                      NaN  NaN  NaN  NaN  …  NaN
      xXx: State of the Union (2005)                  NaN  NaN  NaN  NaN  …  NaN
      ¡Three Amigos! (1986)                           NaN  NaN  NaN  NaN  …  NaN
      À nous la liberté (Freedom for Us) (1931)       NaN  NaN  NaN  NaN  …  NaN

      userId                                          660  661  662  663  664  665  \
      title
      loudQUIETloud: A Film About the Pixies (2006)   NaN  NaN  NaN  NaN  NaN  NaN
      xXx (2002)                                      NaN  NaN  NaN  NaN  NaN  NaN
      xXx: State of the Union (2005)                  NaN  NaN  NaN  NaN  NaN  NaN
      ¡Three Amigos! (1986)                           NaN  NaN  NaN  NaN  NaN  NaN
      À nous la liberté (Freedom for Us) (1931)       NaN  NaN  NaN  NaN  NaN  NaN

      userId                                          666  667  668
      title
      loudQUIETloud: A Film About the Pixies (2006)   NaN  NaN  NaN
      xXx (2002)                                      NaN  NaN  3.5
      xXx: State of the Union (2005)                  NaN  NaN  NaN
      ¡Three Amigos! (1986)                           NaN  NaN  2.0
      À nous la liberté (Freedom for Us) (1931)       NaN  NaN  3.0

      [5 rows x 668 columns]

[20]: table.head(10)

[20]: userId                                       1    2    3    4    5    6    7    \
      title
      '71 (2014)                                 NaN  NaN  NaN  NaN  NaN  NaN  NaN
      'Hellboy': The Seeds of Creation (2004)    NaN  NaN  NaN  NaN  NaN  NaN  NaN
      'Round Midnight (1986)                     NaN  NaN  NaN  NaN  NaN  NaN  NaN
      'Til There Was You (1997)                  NaN  NaN  NaN  NaN  NaN  NaN  NaN
      'burbs, The (1989)                         NaN  NaN  NaN  NaN  NaN  NaN  NaN
      'night Mother (1986)                       NaN  NaN  NaN  NaN  NaN  NaN  NaN
      (500) Days of Summer (2009)                NaN  NaN  NaN  NaN  NaN  NaN  NaN
      *batteries not included (1987)             NaN  NaN  NaN  NaN  NaN  NaN  NaN
      …And Justice for All (1979)                NaN  NaN  NaN  NaN  NaN  NaN  NaN
```

```
10 (1979)                                NaN  NaN  NaN  NaN  NaN  NaN  NaN

userId                                   8    9    10   …    659  660  661  \
title                                                   …
'71 (2014)                               NaN  NaN  NaN  …    NaN  NaN  NaN
'Hellboy': The Seeds of Creation (2004)  NaN  NaN  NaN  …    NaN  NaN  NaN
'Round Midnight (1986)                   NaN  NaN  NaN  …    NaN  NaN  NaN
'Til There Was You (1997)                NaN  NaN  NaN  …    NaN  NaN  NaN
'burbs, The (1989)                       NaN  NaN  NaN  …    NaN  NaN  NaN
'night Mother (1986)                     NaN  NaN  NaN  …    NaN  NaN  NaN
(500) Days of Summer (2009)              NaN  NaN  NaN  …    NaN  NaN  NaN
*batteries not included (1987)           NaN  NaN  NaN  …    NaN  NaN  NaN
…And Justice for All (1979)              NaN  NaN  NaN  …    NaN  NaN  NaN
10 (1979)                                NaN  NaN  NaN  …    NaN  NaN  NaN

userId                                   662  663  664  665  666  667  668
title
'71 (2014)                               NaN  NaN  NaN  NaN  NaN  NaN  NaN
'Hellboy': The Seeds of Creation (2004)  NaN  NaN  NaN  NaN  NaN  NaN  NaN
'Round Midnight (1986)                   NaN  NaN  NaN  NaN  NaN  NaN  2.5
'Til There Was You (1997)                NaN  NaN  NaN  NaN  NaN  NaN  NaN
'burbs, The (1989)                       NaN  NaN  NaN  NaN  NaN  NaN  NaN
'night Mother (1986)                     NaN  NaN  NaN  NaN  NaN  NaN  NaN
(500) Days of Summer (2009)              NaN  NaN  NaN  NaN  NaN  NaN  2.0
*batteries not included (1987)           NaN  NaN  NaN  NaN  NaN  NaN  NaN
…And Justice for All (1979)              NaN  NaN  NaN  NaN  NaN  NaN  3.0
10 (1979)                                NaN  NaN  NaN  NaN  NaN  NaN  2.5

[10 rows x 668 columns]
```

[22]: `table`

```
[22]: userId                                            1    2    3    4    5    6    \
      title
      '71 (2014)                                        NaN  NaN  NaN  NaN  NaN  NaN
      'Hellboy': The Seeds of Creation (2004)           NaN  NaN  NaN  NaN  NaN  NaN
      'Round Midnight (1986)                            NaN  NaN  NaN  NaN  NaN  NaN
      'Til There Was You (1997)                         NaN  NaN  NaN  NaN  NaN  NaN
      'burbs, The (1989)                                NaN  NaN  NaN  NaN  NaN  NaN
      …                                                 …    …    …    …    …    …
      loudQUIETloud: A Film About the Pixies (2006)     NaN  NaN  NaN  NaN  NaN  NaN
      xXx (2002)                                        NaN  NaN  NaN  NaN  NaN  NaN
      xXx: State of the Union (2005)                    NaN  NaN  NaN  NaN  NaN  NaN
      ¡Three Amigos! (1986)                             NaN  NaN  NaN  NaN  NaN  NaN
      À nous la liberté (Freedom for Us) (1931)         NaN  NaN  NaN  NaN  NaN  NaN

      userId                                            7    8    9    10   …    659  \
```

```
title                                                            …        …
'71 (2014)                                    NaN   NaN   NaN   NaN   …   NaN
'Hellboy': The Seeds of Creation (2004)       NaN   NaN   NaN   NaN   …   NaN
'Round Midnight (1986)                        NaN   NaN   NaN   NaN   …   NaN
'Til There Was You (1997)                     NaN   NaN   NaN   NaN   …   NaN
'burbs, The (1989)                            NaN   NaN   NaN   NaN   …   NaN
…                                              …     …     …     …    …    …
loudQUIETloud: A Film About the Pixies (2006) NaN   NaN   NaN   NaN   …   NaN
xXx (2002)                                    NaN   NaN   NaN   NaN   …   NaN
xXx: State of the Union (2005)                NaN   NaN   NaN   NaN   …   NaN
¡Three Amigos! (1986)                         NaN   NaN   NaN   NaN   …   NaN
À nous la liberté (Freedom for Us) (1931)     NaN   NaN   NaN   NaN   …   NaN

userId                                        660   661   662   663   664   665  \
title
'71 (2014)                                    NaN   NaN   NaN   NaN   NaN   NaN
'Hellboy': The Seeds of Creation (2004)       NaN   NaN   NaN   NaN   NaN   NaN
'Round Midnight (1986)                        NaN   NaN   NaN   NaN   NaN   NaN
'Til There Was You (1997)                     NaN   NaN   NaN   NaN   NaN   NaN
'burbs, The (1989)                            NaN   NaN   NaN   NaN   NaN   NaN
…                                              …     …     …     …     …     …
loudQUIETloud: A Film About the Pixies (2006) NaN   NaN   NaN   NaN   NaN   NaN
xXx (2002)                                    NaN   NaN   NaN   NaN   NaN   NaN
xXx: State of the Union (2005)                NaN   NaN   NaN   NaN   NaN   NaN
¡Three Amigos! (1986)                         NaN   NaN   NaN   NaN   NaN   NaN
À nous la liberté (Freedom for Us) (1931)     NaN   NaN   NaN   NaN   NaN   NaN

userId                                        666   667   668
title
'71 (2014)                                    NaN   NaN   NaN
'Hellboy': The Seeds of Creation (2004)       NaN   NaN   NaN
'Round Midnight (1986)                        NaN   NaN   2.5
'Til There Was You (1997)                     NaN   NaN   NaN
'burbs, The (1989)                            NaN   NaN   NaN
…                                              …     …     …
loudQUIETloud: A Film About the Pixies (2006) NaN   NaN   NaN
xXx (2002)                                    NaN   NaN   3.5
xXx: State of the Union (2005)                NaN   NaN   NaN
¡Three Amigos! (1986)                         NaN   NaN   2.0
À nous la liberté (Freedom for Us) (1931)     NaN   NaN   3.0

[10323 rows x 668 columns]
```

[23]: `table = table.fillna(0)`

[24]: `table`

```
[24]: userId                                          1     2     3     4     5     6     \
      title
      '71 (2014)                                      0.0   0.0   0.0   0.0   0.0   0.0
      'Hellboy': The Seeds of Creation (2004)        0.0   0.0   0.0   0.0   0.0   0.0
      'Round Midnight (1986)                          0.0   0.0   0.0   0.0   0.0   0.0
      'Til There Was You (1997)                       0.0   0.0   0.0   0.0   0.0   0.0
      'burbs, The (1989)                              0.0   0.0   0.0   0.0   0.0   0.0
      ...                                             ...   ...   ...   ...   ...   ...
      loudQUIETloud: A Film About the Pixies (2006)   0.0   0.0   0.0   0.0   0.0   0.0
      xXx (2002)                                      0.0   0.0   0.0   0.0   0.0   0.0
      xXx: State of the Union (2005)                  0.0   0.0   0.0   0.0   0.0   0.0
      ¡Three Amigos! (1986)                           0.0   0.0   0.0   0.0   0.0   0.0
      À nous la liberté (Freedom for Us) (1931)       0.0   0.0   0.0   0.0   0.0   0.0

      userId                                          7     8     9     10    ...   659   \
      title                                                                   ...
      '71 (2014)                                      0.0   0.0   0.0   0.0   ...   0.0
      'Hellboy': The Seeds of Creation (2004)        0.0   0.0   0.0   0.0   ...   0.0
      'Round Midnight (1986)                          0.0   0.0   0.0   0.0   ...   0.0
      'Til There Was You (1997)                       0.0   0.0   0.0   0.0   ...   0.0
      'burbs, The (1989)                              0.0   0.0   0.0   0.0   ...   0.0
      ...                                             ...   ...   ...   ...   ...   ...
      loudQUIETloud: A Film About the Pixies (2006)   0.0   0.0   0.0   0.0   ...   0.0
      xXx (2002)                                      0.0   0.0   0.0   0.0   ...   0.0
      xXx: State of the Union (2005)                  0.0   0.0   0.0   0.0   ...   0.0
      ¡Three Amigos! (1986)                           0.0   0.0   0.0   0.0   ...   0.0
      À nous la liberté (Freedom for Us) (1931)       0.0   0.0   0.0   0.0   ...   0.0

      userId                                          660   661   662   663   664   665   \
      title
      '71 (2014)                                      0.0   0.0   0.0   0.0   0.0   0.0
      'Hellboy': The Seeds of Creation (2004)        0.0   0.0   0.0   0.0   0.0   0.0
      'Round Midnight (1986)                          0.0   0.0   0.0   0.0   0.0   0.0
      'Til There Was You (1997)                       0.0   0.0   0.0   0.0   0.0   0.0
      'burbs, The (1989)                              0.0   0.0   0.0   0.0   0.0   0.0
      ...                                             ...   ...   ...   ...   ...   ...
      loudQUIETloud: A Film About the Pixies (2006)   0.0   0.0   0.0   0.0   0.0   0.0
      xXx (2002)                                      0.0   0.0   0.0   0.0   0.0   0.0
      xXx: State of the Union (2005)                  0.0   0.0   0.0   0.0   0.0   0.0
      ¡Three Amigos! (1986)                           0.0   0.0   0.0   0.0   0.0   0.0
      À nous la liberté (Freedom for Us) (1931)       0.0   0.0   0.0   0.0   0.0   0.0

      userId                                          666   667   668
      title
      '71 (2014)                                      0.0   0.0   0.0
      'Hellboy': The Seeds of Creation (2004)        0.0   0.0   0.0
      'Round Midnight (1986)                          0.0   0.0   2.5
```

```
'Til There Was You (1997)                       0.0  0.0  0.0
'burbs, The (1989)                              0.0  0.0  0.0
…                                                …    …    …
loudQUIETloud: A Film About the Pixies (2006)   0.0  0.0  0.0
xXx (2002)                                      0.0  0.0  3.5
xXx: State of the Union (2005)                  0.0  0.0  0.0
¡Three Amigos! (1986)                           0.0  0.0  2.0
À nous la liberté (Freedom for Us) (1931)       0.0  0.0  3.0

[10323 rows x 668 columns]
```

[55]: `table.values`

[55]:
```
array([[0. , 0. , 0. , …, 0. , 0. , 0. ],
       [0. , 0. , 0. , …, 0. , 0. , 0. ],
       [0. , 0. , 0. , …, 0. , 0. , 2.5],
       …,
       [0. , 0. , 0. , …, 0. , 0. , 0. ],
       [0. , 0. , 0. , …, 0. , 0. , 2. ],
       [0. , 0. , 0. , …, 0. , 0. , 3. ]])
```

[26]: `matrix = csr_matrix(table.values)`

[27]:
```
model_knn = NearestNeighbors(metric= 'cosine', algorithm= 'brute')
model_knn.fit(matrix)
```

[27]: `NearestNeighbors(algorithm='brute', metric='cosine')`

[28]:
```
user_query_index = np.random.choice(table.shape[1])
user_query_index
```

[28]: 622

[29]: `table.index[user_query_index]`

[29]: `'Asphalt Jungle, The (1950)'`

[30]: `table.iloc[user_query_index, :]`

[30]:
```
userId
1      0.0
2      0.0
3      0.0
4      0.0
5      0.0
        …
664    0.0
665    0.0
```

```
666     0.0
667     0.0
668     4.0
Name: Asphalt Jungle, The (1950), Length: 668, dtype: float64
```

[31]:
```python
distances, indices = model_knn.kneighbors(table.iloc[user_query_index, :].
↪values.reshape(1, -1), n_neighbors = 6)
```

[65]:
```python
distances
```

[65]:
```
array([[2.22044605e-16, 2.86305904e-01, 2.94706802e-01, 3.18477660e-01,
        3.25936242e-01, 3.60921802e-01]])
```

[32]:
```python
for i in range(0, len(distances.flatten())):
    if i == 0:
        print('Recommendation for {0}:\n'.format(table.index[user_query_index]))
    else:
        print('{0}: {1}, with distance of {2}:'.format(i, table.index[indices.
↪flatten()[i]], distances.flatten()[i]))
```

Recommendation for Asphalt Jungle, The (1950):

1: Hud (1963), with distance of 0.2863059044454557:
2: Coogan's Bluff (1968), with distance of 0.29470680157143736:
3: Nashville (1975), with distance of 0.3184776598857567:
4: Children of Paradise (Les enfants du paradis) (1945), with distance of
0.3259362415768974:
5: McCabe & Mrs. Miller (1971), with distance of 0.3609218019615983:

[66]:
```python
cosine = linear_kernel(matrix, matrix)
cosine
```

[66]:
```
array([[ 12.25,   0.  ,   0.  , …,   0.  ,   7.  ,   0.  ],
       [  0.  ,   9.  ,   0.  , …,   0.  ,   9.  ,   0.  ],
       [  0.  ,   0.  ,   6.25, …,   0.  ,   5.  ,   7.5 ],
       …,
       [  0.  ,   0.  ,   0.  , …,  36.25,   6.  ,   0.  ],
       [  7.  ,   9.  ,   5.  , …,   6.  , 413.75,   6.  ],
       [  0.  ,   0.  ,   7.5 , …,   0.  ,   6.  ,   9.  ]])
```

[67]:
```python
def recommendations(title):
    idx = user_query_index
    print(idx)
    scores = list(enumerate(cosine[idx]))
    scores = sorted(scores, key=lambda x: x[1], reverse=True)
    scores = scores[1:5]
    print(scores)
    movie_indices = [i[0] for i in scores]
```

```
        print(movie_indices)
        return table.iloc[movie_indices]
```

[35]:
```
recommendations(table.index[user_query_index])
```

```
622
[(3683, 159.25), (3755, 156.5), (4806, 156.5), (3721, 155.25)]
[3683, 3755, 4806, 3721]
```

[35]:

userId	1	2	3	4	5	6	7	8	9	\
title										
Godfather: Part II, The (1974)	5.0	0.0	0.0	0.0	0.0	0.0	3.5	0.0	0.0	
Goodfellas (1990)	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Jaws (1975)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Gone with the Wind (1939)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

userId	10	…	659	660	661	662	663	664	665	\
title		…								
Godfather: Part II, The (1974)	0.0	…	3.0	0.0	0.0	0.0	0.0	0.0	0.0	
Goodfellas (1990)	0.0	…	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Jaws (1975)	0.0	…	0.0	0.0	0.0	5.0	0.0	0.0	0.0	
Gone with the Wind (1939)	0.0	…	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

userId	666	667	668
title			
Godfather: Part II, The (1974)	2.0	0.0	4.5
Goodfellas (1990)	5.0	0.0	4.5
Jaws (1975)	0.0	0.0	4.5
Gone with the Wind (1939)	0.0	0.0	3.5

```
[4 rows x 668 columns]
```

[ ]: