IMDB Dataset

In [1]:
```
%%html
<style>
@import url('https://fonts.googleapis.com/css?family=Ewert|Roboto&effect=3d|ice|');
body {background-color: gainsboro;}
a {color: #37c9e1; font-family: 'Roboto';}
h1 {color: #37c9e1; font-family: 'Orbitron'; text-shadow: 4px 4px 4px #aaa;}
h2, h3 {color: slategray; font-family: 'Orbitron'; text-shadow: 4px 4px 4px #aaa;}
h4 {color: #818286; font-family: 'Roboto';}
span {font-family:'Roboto'; color:black; text-shadow: 5px 5px 5px #aaa;}
div.output_area pre{font-family:'Roboto'; font-size:110%; color:lightblue;}
</style>
```

In [2]:
```
import pandas as pd
```

In [3]:
```
movies = pd.read_csv(r"C:\Users\Shiva\Downloads\archive\movie.csv", sep=',')
print(type(movies))
movies.head(20)
```

```
<class 'pandas.core.frame.DataFrame'>
```

Out[3]:

	movieId	title	genres
0	1	Toy Story (1995)	Adventure|Animation|Children|Comedy|Fantasy
1	2	Jumanji (1995)	Adventure|Children|Fantasy
2	3	Grumpier Old Men (1995)	Comedy|Romance
3	4	Waiting to Exhale (1995)	Comedy|Drama|Romance
4	5	Father of the Bride Part II (1995)	Comedy
5	6	Heat (1995)	Action|Crime|Thriller
6	7	Sabrina (1995)	Comedy|Romance
7	8	Tom and Huck (1995)	Adventure|Children
8	9	Sudden Death (1995)	Action
9	10	GoldenEye (1995)	Action|Adventure|Thriller
10	11	American President, The (1995)	Comedy|Drama|Romance
11	12	Dracula: Dead and Loving It (1995)	Comedy|Horror
12	13	Balto (1995)	Adventure|Animation|Children
13	14	Nixon (1995)	Drama
14	15	Cutthroat Island (1995)	Action|Adventure|Romance
15	16	Casino (1995)	Crime|Drama
16	17	Sense and Sensibility (1995)	Drama|Romance
17	18	Four Rooms (1995)	Comedy
18	19	Ace Ventura: When Nature Calls (1995)	Comedy
19	20	Money Train (1995)	Action|Comedy|Crime|Drama|Thriller

In [4]:
```
tags = pd.read_csv(r"C:\Users\Shiva\Downloads\archive\tag.csv", sep=',')
tags.head()
```

Out[4]:

	userId	movieId	tag	timestamp
0	18	4141	Mark Waters	2009-04-24 18:19:40
1	65	208	dark hero	2013-05-10 01:41:18
2	65	353	dark hero	2013-05-10 01:41:19
3	65	521	noir thriller	2013-05-10 01:39:43
4	65	592	dark hero	2013-05-10 01:41:18

In [5]:
```
ratings = pd.read_csv(r"C:\Users\Shiva\Downloads\archive\rating.csv", sep=',', parse_dates=['tim
ratings.head()
```

Out[5]:

	userId	movieId	rating	timestamp
0	1	2	3.5	2005-04-02 23:53:47
1	1	29	3.5	2005-04-02 23:31:16
2	1	32	3.5	2005-04-02 23:33:39
3	1	47	3.5	2005-04-02 23:32:07
4	1	50	3.5	2005-04-02 23:29:40

In [ ]:

In [6]:
```
del ratings['timestamp']
del tags['timestamp']
```

In [7]:
```
# Data structures
```

In [8]:
```
row_0 = tags.iloc[0]
type(row_0)
```

Out[8]:
```
pandas.core.series.Series
```

In [9]:
```
print(row_0)
```

```
userId              18
movieId           4141
tag        Mark Waters
Name: 0, dtype: object
```

In [10]:
```
row_0.index
```

Out[10]:
```
Index(['userId', 'movieId', 'tag'], dtype='object')
```

In [11]:
```
row_0['userId']
```

Out[11]:
```
18
```

In [12]:
```
'rating' in row_0
```

Out[12]:
```
False
```

In [13]:
```
row_0.name
```

Out[13]:
```
0
```

In [14]:
```
row_0 = row_0.rename('firstRow')
row_0.name
```

Out[14]:
```
'firstRow'
```

DataFrames

In [15]:
```
tags.head()
```

Out[15]:

	userId	movieId	tag
0	18	4141	Mark Waters
1	65	208	dark hero
2	65	353	dark hero
3	65	521	noir thriller
4	65	592	dark hero

In [16]:
```
tags.index
```

Out[16]:
```
RangeIndex(start=0, stop=465564, step=1)
```

In [17]:
```
tags.columns
```

Out[17]:
```
Index(['userId', 'movieId', 'tag'], dtype='object')
```

In [18]:
```
tags.iloc[ [0,11,500] ]
```

Out[18]:

	userId	movieId	tag
0	18	4141	Mark Waters
11	65	1783	noir thriller
500	342	55908	entirely dialogue

In [ ]:
```

```

Descriptive Statistics

In [19]:
```
ratings['rating'].describe()
```

Out[19]:
```
count    2.000026e+07
mean     3.525529e+00
std      1.051989e+00
min      5.000000e-01
25%      3.000000e+00
50%      3.500000e+00
75%      4.000000e+00
max      5.000000e+00
Name: rating, dtype: float64
```

In [20]:
```
ratings.describe()
```

Out[20]:

	userId	movieId	rating
count	2.000026e+07	2.000026e+07	2.000026e+07
mean	6.904587e+04	9.041567e+03	3.525529e+00
std	4.003863e+04	1.978948e+04	1.051989e+00
min	1.000000e+00	1.000000e+00	5.000000e-01
25%	3.439500e+04	9.020000e+02	3.000000e+00
50%	6.914100e+04	2.167000e+03	3.500000e+00
75%	1.036370e+05	4.770000e+03	4.000000e+00
max	1.384930e+05	1.312620e+05	5.000000e+00

In [21]:
```
ratings['rating'].mean(0)
```

Out[21]:
```
3.5255285642993797
```

In [22]:
```
ratings.mean()
```

Out[22]:
```
userId     69045.872583
movieId     9041.567330
rating         3.525529
dtype: float64
```

In [23]:
```
ratings['rating'].max()
```

Out[23]:
```
5.0
```

In [24]:
```
ratings['rating'].std()
```

Out[24]:
```
1.051988919275684
```

In [25]:
```
ratings['rating'].mode()
```

Out[25]:
```
0    4.0
Name: rating, dtype: float64
```

In [26]:
```
ratings.corr()
```

Out[26]:

	userId	movieId	rating
userId	1.000000	-0.000850	0.001175
movieId	-0.000850	1.000000	0.002606
rating	0.001175	0.002606	1.000000

In [27]:
```
filter1 = ratings['rating'] > 10
print(filter1)
filter1.any()
```

```
0           False
1           False
2           False
3           False
4           False
            ...
20000258    False
20000259    False
20000260    False
20000261    False
20000262    False
Name: rating, Length: 20000263, dtype: bool
```

Out[27]: False

In [28]:
```
filter2 = ratings['rating'] > 0
filter2.all()
```

Out[28]: True

Data Cleaning: Handling Missing Data

In [29]:
```
movies.shape
```

Out[29]: (27278, 3)

In [30]:
```
movies.isnull().any().any()
```

Out[30]: False

In [31]:
```
ratings.shape
```

Out[31]: (20000263, 3)

In [32]:
```
ratings.isnull().any().any()
```

Out[32]: False

In [33]:
```
tags.shape
```

Out[33]: (465564, 3)

In [34]:
```
tags.isnull().any().any()
```

Out[34]: True

In [35]:
```
# some tags are null => missing tags' data
```

In [36]:
```
tags = tags.dropna()
```

In [37]:
```
tags.isnull().any().any()
```

Out[37]: False

In [38]:
```
tags.shape
```

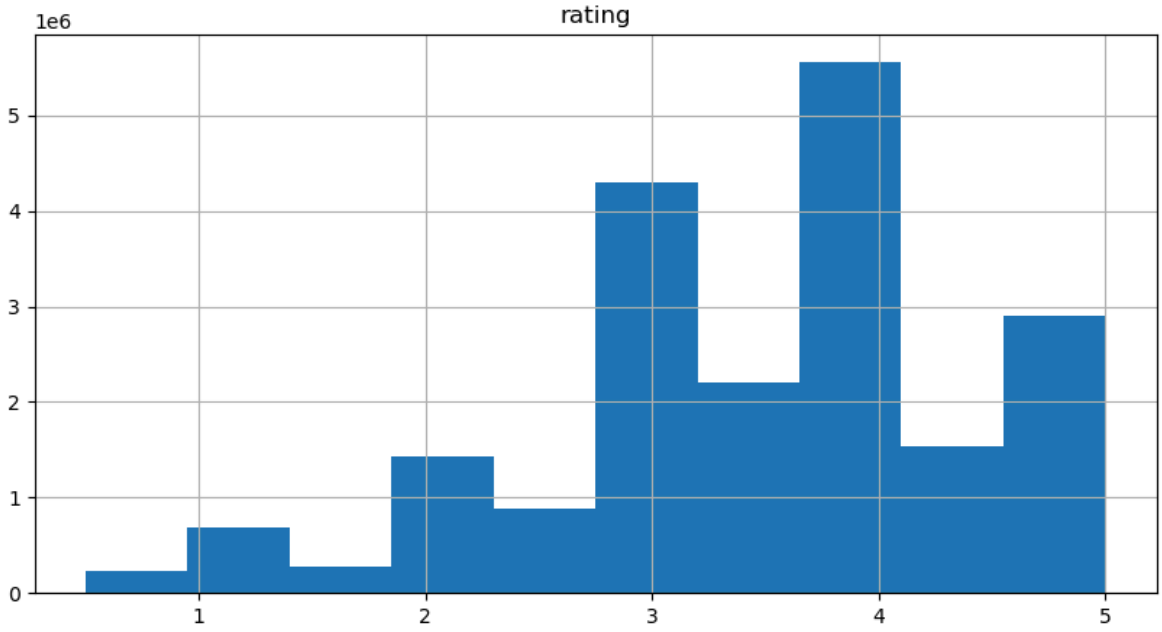
Out[38]: (465548, 3)

In [39]:
```
# no null values in tags.
# before 465564 after removing 465548 => 16 tags dropped
```

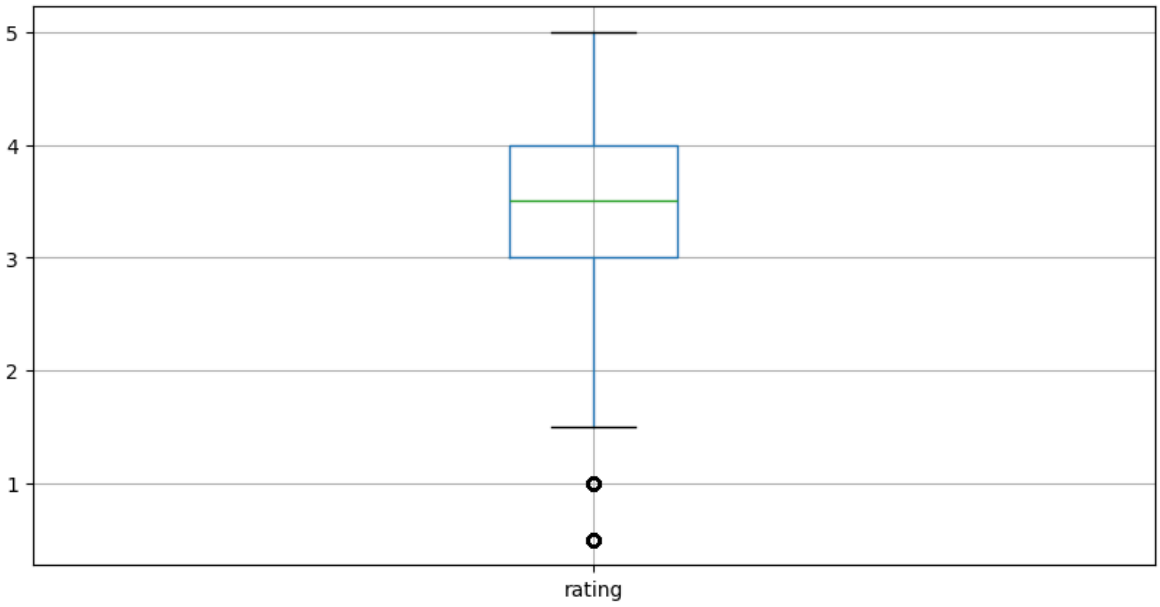
In [ ]:

Data Visualization

In [40]:
```
import matplotlib.pyplot as plt

%matplotlib inline

ratings.hist(column = 'rating', figsize = (10,5) )

plt.show()
```



In [41]:
```
ratings.boxplot(column = 'rating', figsize = (10,5))
plt.show()
```



In [ ]:

Slicing Out Columns

In [42]:
```
tags['tag'].head()
```

Out[42]:
```
0      Mark Waters
1        dark hero
2        dark hero
3    noir thriller
4        dark hero
Name: tag, dtype: object
```

In [43]:
```
movies[ ['title', 'genres'] ].head()
```

Out[43]:

	title	genres
0	Toy Story (1995)	Adventure|Animation|Children|Comedy|Fantasy
1	Jumanji (1995)	Adventure|Children|Fantasy
2	Grumpier Old Men (1995)	Comedy|Romance
3	Waiting to Exhale (1995)	Comedy|Drama|Romance
4	Father of the Bride Part II (1995)	Comedy

In [44]:
```
ratings[-10:]
```

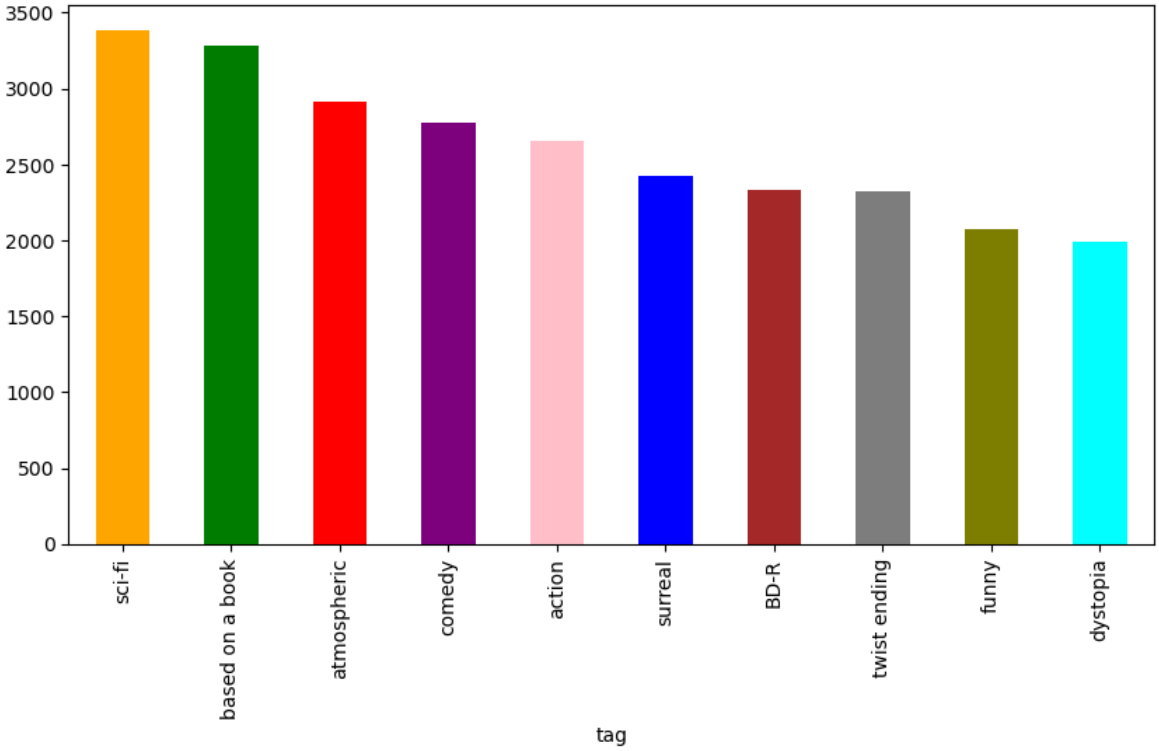
Out[44]:

	userId	movieId	rating
20000253	138493	60816	4.5
20000254	138493	61160	4.0
20000255	138493	65682	4.5
20000256	138493	66762	4.5
20000257	138493	68319	4.5
20000258	138493	68954	4.5
20000259	138493	69526	4.5
20000260	138493	69644	3.0
20000261	138493	70286	5.0
20000262	138493	71619	2.5

In [45]:
```
tag_counts = tags['tag'].value_counts()
tag_counts[-10:]
```

Out[45]:
```
tag
missing child                  1
Ron Moore                      1
Citizen Kane                   1
mullet                         1
biker gang                     1
Paul Adelstein                 1
the wig                        1
killer fish                    1
genetically modified monsters  1
topless scene                  1
Name: count, dtype: int64
```

In [84]:
```
colours = ['orange', 'green' ,'red', 'purple', 'pink', 'blue', 'brown' ,'gray', 'olive', 'cyan']
tag_counts[:10].plot(kind='bar', figsize=(10,5), color = colours )
plt.show()
```



In [ ]:

Filters for Selcting Rows

In [47]:
```
is_highly_rated = ratings['rating'] >= 5.0
ratings[is_highly_rated][30:50]
```

Out[47]:

	userId	movieId	rating
239	3	50	5.0
242	3	175	5.0
244	3	223	5.0
245	3	260	5.0
246	3	316	5.0
247	3	318	5.0
248	3	329	5.0
252	3	457	5.0
253	3	480	5.0
254	3	490	5.0
256	3	541	5.0
258	3	593	5.0
263	3	858	5.0
264	3	904	5.0
267	3	924	5.0
268	3	953	5.0
271	3	1060	5.0
272	3	1073	5.0
275	3	1084	5.0
276	3	1089	5.0

In [48]:
```
is_action = movies['genres'].str.contains('Action')
movies[is_action][5:15]
```

Out[48]:

	movieId	title	genres
22	23	Assassins (1995)	Action|Crime|Thriller
41	42	Dead Presidents (1995)	Action|Crime|Drama
43	44	Mortal Kombat (1995)	Action|Adventure|Fantasy
50	51	Guardian Angel (1994)	Action|Drama|Thriller
65	66	Lawnmower Man 2: Beyond Cyberspace (1996)	Action|Sci-Fi|Thriller
69	70	From Dusk Till Dawn (1996)	Action|Comedy|Horror|Thriller
70	71	Fair Game (1995)	Action
75	76	Screamers (1995)	Action|Sci-Fi|Thriller
77	78	Crossing Guard, The (1995)	Action|Crime|Drama|Thriller
85	86	White Squall (1996)	Action|Adventure|Drama

In [49]:
```
movies[is_action].head(15)
```

Out[49]:

	movieId	title	genres
5	6	Heat (1995)	Action|Crime|Thriller
8	9	Sudden Death (1995)	Action
9	10	GoldenEye (1995)	Action|Adventure|Thriller
14	15	Cutthroat Island (1995)	Action|Adventure|Romance
19	20	Money Train (1995)	Action|Comedy|Crime|Drama|Thriller
22	23	Assassins (1995)	Action|Crime|Thriller
41	42	Dead Presidents (1995)	Action|Crime|Drama
43	44	Mortal Kombat (1995)	Action|Adventure|Fantasy
50	51	Guardian Angel (1994)	Action|Drama|Thriller
65	66	Lawnmower Man 2: Beyond Cyberspace (1996)	Action|Sci-Fi|Thriller
69	70	From Dusk Till Dawn (1996)	Action|Comedy|Horror|Thriller
70	71	Fair Game (1995)	Action
75	76	Screamers (1995)	Action|Sci-Fi|Thriller
77	78	Crossing Guard, The (1995)	Action|Crime|Drama|Thriller
85	86	White Squall (1996)	Action|Adventure|Drama

Group by Aggregate

In [50]:
```
ratings_count = ratings[['movieId','rating']].groupby('rating').count()
ratings_count
```

Out[50]:

rating	movieId
0.5	239125
1.0	680732
1.5	279252
2.0	1430997
2.5	883398
3.0	4291193
3.5	2200156
4.0	5561926
4.5	1534824
5.0	2898660

In [51]:
```
average_ratings = ratings[['movieId','rating']].groupby('movieId').mean()
average_ratings.head()
```

Out[51]:

movieId	rating
1	3.921240
2	3.211977
3	3.151040
4	2.861393
5	3.064592

In [52]:
```
movie_count = ratings[['movieId','rating']].groupby('movieId').count()
movie_count.head()
```

Out[52]:

movieId	rating
1	49695
2	22243
3	12735
4	2756
5	12161

In [53]:
```
movie_count = ratings[['movieId','rating']].groupby('movieId').count()
movie_count.tail()
```

Out[53]:

movieId	rating
131254	1
131256	1
131258	1
131260	1
131262	1

In [ ]:

Merge Dataframes

In [54]:
```
tags.head()
```

Out[54]:

	userId	movieId	tag
0	18	4141	Mark Waters
1	65	208	dark hero
2	65	353	dark hero
3	65	521	noir thriller
4	65	592	dark hero

In [55]:
```
movies.head()
```

Out[55]:

	movieId	title	genres
0	1	Toy Story (1995)	Adventure|Animation|Children|Comedy|Fantasy
1	2	Jumanji (1995)	Adventure|Children|Fantasy
2	3	Grumpier Old Men (1995)	Comedy|Romance
3	4	Waiting to Exhale (1995)	Comedy|Drama|Romance
4	5	Father of the Bride Part II (1995)	Comedy

In [56]:
```
t = movies.merge(tags, on = 'movieId', how = 'inner')
t.head()
```

Out[56]:

	movieId	title	genres	userId	tag
0	1	Toy Story (1995)	Adventure|Animation|Children|Comedy|Fantasy	1644	Watched
1	1	Toy Story (1995)	Adventure|Animation|Children|Comedy|Fantasy	1741	computer animation
2	1	Toy Story (1995)	Adventure|Animation|Children|Comedy|Fantasy	1741	Disney animated feature
3	1	Toy Story (1995)	Adventure|Animation|Children|Comedy|Fantasy	1741	Pixar animation
4	1	Toy Story (1995)	Adventure|Animation|Children|Comedy|Fantasy	1741	TÃ©a Leoni does not star in this movie

combine aggreagation, merging and filters to get useful analytics

In [57]:
```
avg_ratings = ratings.groupby('movieId', as_index = False).mean()
del avg_ratings['userId']
avg_ratings.head()
```

Out[57]:

	movieId	rating
0	1	3.921240
1	2	3.211977
2	3	3.151040
3	4	2.861393
4	5	3.064592

In [58]:
```
box_office = movies.merge(avg_ratings, on = 'movieId', how = 'inner')
box_office.head()
```

Out[58]:

	movieId	title	genres	rating
0	1	Toy Story (1995)	Adventure|Animation|Children|Comedy|Fantasy	3.921240
1	2	Jumanji (1995)	Adventure|Children|Fantasy	3.211977
2	3	Grumpier Old Men (1995)	Comedy|Romance	3.151040
3	4	Waiting to Exhale (1995)	Comedy|Drama|Romance	2.861393
4	5	Father of the Bride Part II (1995)	Comedy	3.064592

In [59]:
```
box_office.tail()
```

Out[59]:

	movieId	title	genres	rating
26739	131254	Kein Bund für's Leben (2007)	Comedy	4.0
26740	131256	Feuer, Eis & Dosenbier (2002)	Comedy	4.0
26741	131258	The Pirates (2014)	Adventure	2.5
26742	131260	Rentun Ruusu (2001)	(no genres listed)	3.0
26743	131262	Innocence (2014)	Adventure|Fantasy|Horror	4.0

In [60]:
```
is_highly_rated = box_office['rating'] >= 4.0
box_office[is_highly_rated][-5:]
```

Out[60]:

	movieId	title	genres	rating
26737	131250	No More School (2000)	Comedy	4.0
26738	131252	Forklift Driver Klaus: The First Day on the Jo...	Comedy|Horror	4.0
26739	131254	Kein Bund für's Leben (2007)	Comedy	4.0
26740	131256	Feuer, Eis & Dosenbier (2002)	Comedy	4.0
26743	131262	Innocence (2014)	Adventure|Fantasy|Horror	4.0

In [61]:
```
is_Adventure = box_office['genres'].str.contains('Adventure')
box_office[is_Adventure][:5]
```

Out[61]:

	movieId	title	genres	rating
0	1	Toy Story (1995)	Adventure|Animation|Children|Comedy|Fantasy	3.921240
1	2	Jumanji (1995)	Adventure|Children|Fantasy	3.211977
7	8	Tom and Huck (1995)	Adventure|Children	3.142049
9	10	GoldenEye (1995)	Action|Adventure|Thriller	3.430029
12	13	Balto (1995)	Adventure|Animation|Children	3.272416

In [62]:
```
box_office[ is_Adventure & is_highly_rated][-5:]
```

Out[62]:

	movieId	title	genres	rating
26611	130586	Itinerary of a Spoiled Child (1988)	Adventure|Drama	4.5
26655	130996	The Beautiful Story (1992)	Adventure|Drama|Fantasy	5.0
26667	131050	Stargate SG-1 Children of the Gods - Final Cut...	Adventure|Sci-Fi|Thriller	5.0
26736	131248	Brother Bear 2 (2006)	Adventure|Animation|Children|Comedy|Fantasy	4.0
26743	131262	Innocence (2014)	Adventure|Fantasy|Horror	4.0

In [63]:
```
box_office[ is_Adventure & is_action & is_highly_rated ][:5]
```

```
C:\Users\Shiva\AppData\Local\Temp\ipykernel_35732\184644979.py:1: UserWarning: Bo
olean Series key will be reindexed to match DataFrame index.
  box_office[ is_Adventure & is_action & is_highly_rated ][:5]
```

Out[63]:

	movieId	title	genres	rating
257	260	Star Wars: Episode IV - A New Hope (1977)	Action|Adventure|Sci-Fi	4.190672
891	908	North by Northwest (1959)	Action|Adventure|Mystery|Romance|Thriller	4.233538
1171	1196	Star Wars: Episode V - The Empire Strikes Back...	Action|Adventure|Sci-Fi	4.188202
1172	1197	Princess Bride, The (1987)	Action|Adventure|Comedy|Fantasy|Romance	4.176732
1173	1198	Raiders of the Lost Ark (Indiana Jones and the...	Action|Adventure	4.219009

In [ ]:

Vectorized String Operations

In [64]:
```
movies.head()
```

Out[64]:

	movieId	title	genres
0	1	Toy Story (1995)	Adventure|Animation|Children|Comedy|Fantasy
1	2	Jumanji (1995)	Adventure|Children|Fantasy
2	3	Grumpier Old Men (1995)	Comedy|Romance
3	4	Waiting to Exhale (1995)	Comedy|Drama|Romance
4	5	Father of the Bride Part II (1995)	Comedy

In [65]:
```
# split 'genres' into multiple columns

movies_genres = movies['genres'].str.split('|', expand = True)
movies_genres[:10]
```

Out[65]:

	0	1	2	3	4	5	6	7	8	9
0	Adventure	Animation	Children	Comedy	Fantasy	None	None	None	None	None
1	Adventure	Children	Fantasy	None	None	None	None	None	None	None
2	Comedy	Romance	None	None	None	None	None	None	None	None
3	Comedy	Drama	Romance	None	None	None	None	None	None	None
4	Comedy	None	None	None	None	None	None	None	None	None
5	Action	Crime	Thriller	None	None	None	None	None	None	None
6	Comedy	Romance	None	None	None	None	None	None	None	None
7	Adventure	Children	None	None	None	None	None	None	None	None
8	Action	None	None	None	None	None	None	None	None	None
9	Action	Adventure	Thriller	None	None	None	None	None	None	None

In [66]:
```
# Add a new column for "Comedy genre" flag

movies_genres['iscomedy'] = movies['genres'].str.contains('Comedy')
```

In [67]:
```
movies_genres[:10]
```

Out[67]:

	0	1	2	3	4	5	6	7	8	9
0	Adventure	Animation	Children	Comedy	Fantasy	None	None	None	None	None
1	Adventure	Children	Fantasy	None	None	None	None	None	None	None
2	Comedy	Romance	None	None	None	None	None	None	None	None
3	Comedy	Drama	Romance	None	None	None	None	None	None	None
4	Comedy	None	None	None	None	None	None	None	None	None
5	Action	Crime	Thriller	None	None	None	None	None	None	None
6	Comedy	Romance	None	None	None	None	None	None	None	None
7	Adventure	Children	None	None	None	None	None	None	None	None
8	Action	None	None	None	None	None	None	None	None	None
9	Action	Adventure	Thriller	None	None	None	None	None	None	None

In [ ]: