Exploratory_for_Moives_Dataset

2024 年 3 月 26 日

1 Exploratory data analysis and data preprocessing for Moives Dataset from Pirated Sites

1.1 一、数据摘要

[16]:
```
# 观察数据集结构
import pandas as pd
movies_df = pd.read_csv('./movies_dataset.csv')
movies_df.head()
```

[16]:

	Unnamed: 0	IMDb-rating	appropriate_for	director	downloads	id	\
0	0	4.8	R	John Swab	304	372092	
1	1	6.4	TV-PG	Paul Ziller	73	372091	
2	2	5.2	R	Ben Wheatley	1,427	343381	
3	3	8.1	NaN	Venky Atluri	1,549	372090	
4	4	4.6	NaN	Shaji Kailas	657	372089	

	industry	language	posted_date	release_date	run_time	\
0	Hollywood / English	English	20 Feb, 2023	Jan 28 2023	105	
1	Hollywood / English	English	20 Feb, 2023	Feb 05 2023	84	
2	Hollywood / English	English,Hindi	20 Apr, 2021	Jun 18 2021	1h 47min	
3	Tollywood	Hindi	20 Feb, 2023	Feb 17 2023	139	
4	Tollywood	Hindi	20 Feb, 2023	Jan 26 2023	122	

	storyline	\
0	Doc\r\n facilitates a fragile truce between th…	
1	Caterer\r\n Goldy Berry reunites with detectiv…	
2	As the world searches for a cure to a disastro…	

```
3  The life of a young man and his struggles agai…
4  A man named Kalidas gets stranded due to the p…
```

	title	views	writer
0	Little Dixie	2,794	John Swab
1	Grilling Season: A Curious Caterer Mystery	1,002	John Christian Plummer
2	In the Earth	14,419	Ben Wheatley
3	Vaathi	4,878	Venky Atluri
4	Alone	2,438	Rajesh Jayaraman

[17]:
```
movies_df.dtypes
```

[17]:
```
Unnamed: 0           int64
IMDb-rating        float64
appropriate_for     object
director            object
downloads           object
id                   int64
industry            object
language            object
posted_date         object
release_date        object
run_time            object
storyline           object
title               object
views               object
writer              object
dtype: object
```

从数据集的前几行看，我们可以看到以下属性：

IMDb-rating (数值属性): IMDB评分
appropriate_for (标称属性): 适宜观看的年龄分级
director (标称属性): 导演
downloads (数值属性): 下载次数（格式需要处理，含有逗号）
id (数值属性): 电影的ID
industry (标称属性): 电影行业/语言
language (标称属性): 语言

posted_date (标称属性): 发布日期
release_date (标称属性): 发布日期
run_time (数值属性): 运行时间（格式需要处理，混合了小时和分钟）
storyline (标称属性): 故事情节
title (标称属性): 标题
views (数值属性): 观看次数（格式需要处理，含有逗号）
writer (标称属性): 编剧

[26]:
```
# 数据清理和转换

# 处理 'run_time': 将格式统一转换为分钟，然后转换为数值类型
def convert_runtime_to_minutes(runtime):
    if isinstance(runtime, str):
        parts = runtime.split(' ')
        minutes = 0
        for part in parts:
            if 'h' in part:
                minutes_part = part.replace('h', '')
                if minutes_part:  # 检查字符串是否非空
                    minutes += int(minutes_part) * 60
            elif 'min' in part:
                minutes_part = part.replace('min', '')
                if minutes_part:  # 检查字符串是否非空
                    minutes += int(minutes_part)
        return minutes
    return runtime
movies_df['run_time'] = movies_df['run_time'].apply(convert_runtime_to_minutes)

# 验证转换后的数据类型
movies_df.dtypes, movies_df.head()
```

[26]:
```
(Unnamed: 0           int64
 IMDb-rating        float64
 appropriate_for     object
 director            object
 downloads          float64
 id                   int64
```

```
industry            object
language            object
posted_date         object
release_date        object
run_time           float64
storyline           object
title               object
views              float64
writer              object
dtype: object,
   Unnamed: 0  IMDb-rating appropriate_for      director  downloads      id  \
0           0          4.8               R     John Swab      304.0  372092
1           1          6.4           TV-PG   Paul Ziller       73.0  372091
2           2          5.2               R  Ben Wheatley     1427.0  343381
3           3          8.1             NaN  Venky Atluri     1549.0  372090
4           4          4.6             NaN  Shaji Kailas      657.0  372089

              industry       language   posted_date release_date  run_time  \
0  Hollywood / English        English  20 Feb, 2023  Jan 28 2023       NaN
1  Hollywood / English        English  20 Feb, 2023  Feb 05 2023       NaN
2  Hollywood / English  English,Hindi  20 Apr, 2021  Jun 18 2021     107.0
3            Tollywood          Hindi  20 Feb, 2023  Feb 17 2023       NaN
4            Tollywood          Hindi  20 Feb, 2023  Jan 26 2023       NaN

                                          storyline  \
0  Doc\r\n facilitates a fragile truce between th…
1  Caterer\r\n Goldy Berry reunites with detectiv…
2  As the world searches for a cure to a disastro…
3  The life of a young man and his struggles agai…
4  A man named Kalidas gets stranded due to the p…

                                    title    views                 writer
0                            Little Dixie   2794.0              John Swab
1  Grilling Season: A Curious Caterer Mystery   1002.0  John Christian Plummer
2                            In the Earth  14419.0           Ben Wheatley
3                                  Vaathi   4878.0           Venky Atluri
```

```
 4                                        Alone    2438.0        Rajesh Jayaraman
)
```

1. 标称属性，给出每个可能取值的频数

[27]:
```
# 标称属性的频数分析
nominal_columns = ['appropriate_for', 'director', 'industry', 'language']
nominal_frequencies = {column: movies_df[column].value_counts() for column in␣
 ↪nominal_columns}


nominal_frequencies
```

[27]:
```
{'appropriate_for': appropriate_for
 R                  4384
 Not Rated          2142
 PG-13              1968
 PG                  886
 TV-14               694
 TV-MA               406
 G                   152
 Unrated             132
 TV-PG               115
 TV-G                 99
 TV-Y7                45
 TV-Y                 25
 Approved              9
 NC-17                 4
 TV-Y7-FV              3
 Passed                3
 MA-17                 1
 TV-13                 1
 Drama                 1
 Drama, Romance        1
 18+                   1
 Name: count, dtype: int64,
 'director': director
 Venky Atluri                                405
```

```
Simone Stock                                    403
Xavier Manrique                                 403
John Swab                                       205
Neil Jordan                                     205
                                                …
Agnieszka Smoczynska                              1
Dylan Thomas Ellis                                1
Sunil Thakur, Sunil Dhawan, Shivani Thakur        1
Suman Mukhopadhyay                                1
Shea Sizemore                                     1
Name: count, Length: 9672, dtype: int64,
'industry': industry
Hollywood / English    14649
Bollywood / Indian      2645
Tollywood               1172
Anime / Kids            1049
Wrestling                433
Punjabi                  332
Stage shows              129
Pakistani                 92
Dub / Dual Audio          45
3D Movies                  1
Name: count, dtype: int64,
'language': language
English                                     12657
Hindi                                        2558
English,Spanish                               391
Punjabi                                       310
English,Hindi                                 304
                                              …
English,Korean,Spanish                          1
Norwegian,Swedish                               1
Spanish,Chinese,English,Maori,French            1
Urdu,Punjabi,English                            1
Spanish,German,English                          1
Name: count, Length: 1167, dtype: int64}
```

从标称属性的频数分析结果不难看出，在该数据集的标称属性中：1. 适宜观看年龄 (appropriate_for):
R 级最多，共有 4384 次出现。
未评级 (Not Rated) 次之，有 2142 次出现。
其余按出现频次依次是 PG-13、PG、TV-14 等。

2. 导演 (director):
   Venky Atluri、Simone Stock 和 Xavier Manrique 是出现频率最高的导演，他们的作品数量都超过了 400 部。
   其他导演的作品数量分布较广，有许多导演只有一部作品出现在数据集中。

3. 产业 (industry):
   大部分电影属于好莱坞/英语片区，共有 14649 部。
   其次是宝莱坞/印度产业，有 2645 部电影。
   托莱坞、动画/儿童、摔跤等其他类型的产业数量明显较少。

4. 语言 (language):
   英语共 12657 次出现。
   其次是印地语，出现了 2558 次。
   还有一些电影提供了多语言版本，如英语 + 西班牙语、英语 + 印地语等，但数量相对较少

1.1.1 2. 数值属性，给出 5 数概括及缺失值的个数

[20]:
```
# 数值属性的五数概括及缺失值个数
numerical_columns = ['IMDb-rating', 'downloads', 'id', 'run_time', 'views']
numerical_summary = pd.DataFrame(index=['min', '25%', '50%', '75%', 'max',␣
 ↪'missing values'])

for column in numerical_columns:
    numerical_summary[column] = [
        movies_df[column].min(),
        movies_df[column].quantile(0.25),
        movies_df[column].median(),
        movies_df[column].quantile(0.75),
        movies_df[column].max(),
        movies_df[column].isnull().sum()
    ]

numerical_summary
```

[20]:

	IMDb-rating	downloads	id	run_time	views
min	1.1	0.0	1.00	10.0	667.0
25%	4.8	855.5	96122.25	88.0	7571.5
50%	5.7	2716.0	264457.50	94.0	15222.0
75%	6.6	10070.0	354561.25	104.0	36571.0
max	9.9	391272.0	372092.00	271.0	1638533.0
missing values	841.0	1.0	0.00	15102.0	1.0

数值属性的五数概括及缺失值个数总览如下

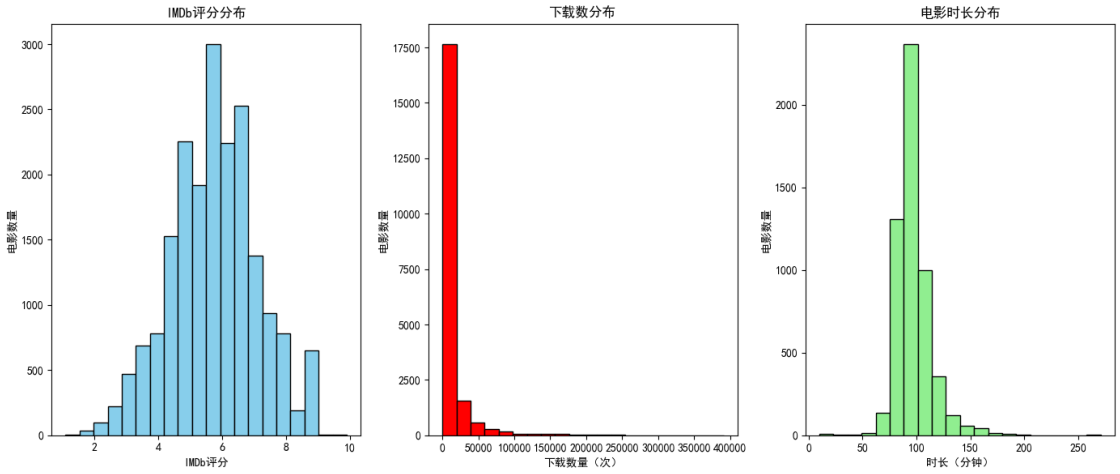
1. IMDb 评分 (IMDb-rating):
   最低 1.1，最高 9.9，中位数 5.7。
   缺失值个数为 841。
2. 下载量 (downloads):
   范围从 0 到 391,272，中位数为 2,716。
   缺失值个数为 1。
3. 电影 ID(id):
   ID 范围从 1 到 372,092，没有缺失值。
4. 时长 (run_time):
   电影时长从 10 分钟到 271 分钟不等，中位数为 94 分钟。
   缺失值个数为 15,102，表明许多电影的时长信息缺失。
5. 观看量 (views):
   观看量范围从 667 到 1,638,533，中位数为 15,222。
   缺失值个数为 1。

1.2 二、数据可视化

1.2.1 1. 使用直方图检查数据分布

[31]:
```
import matplotlib.pyplot as plt
import warnings
warnings.filterwarnings("ignore", category=Warning)
# 设置绘图样式
plt.rcParams['font.sans-serif'] = ['SimHei']

# 绘制直方图
fig, ax = plt.subplots(1, 3, figsize=(14, 6))
```

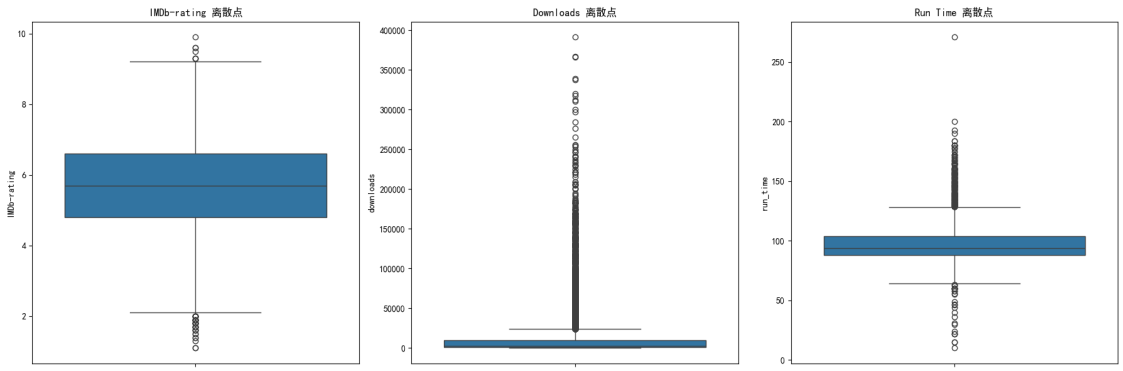
```
# IMDb-rating 直方图
ax[0].hist(movies_df['IMDb-rating'].dropna(), bins=20, color='skyblue',␣
 ↪edgecolor='black')
ax[0].set_title('IMDb 评分分布')
ax[0].set_xlabel('IMDb 评分')
ax[0].set_ylabel('电影数量')

# downloads 直方图
ax[1].hist(movies_df['downloads'].dropna(), bins=20, color='red',␣
 ↪edgecolor='black')
ax[1].set_title('下载数分布')
ax[1].set_xlabel('下载数量（次）')
ax[1].set_ylabel('电影数量')

# run_time 直方图
ax[2].hist(movies_df['run_time'].dropna(), bins=20, color='lightgreen',␣
 ↪edgecolor='black')
ax[2].set_title('电影时长分布')
ax[2].set_xlabel('时长（分钟）')
ax[2].set_ylabel('电影数量')

plt.tight_layout()
plt.show()
```



IMDb-rating分布：呈现出相对均匀的分布，大部分电影的评分集中在4到8分之间，少数电影的评分高于8分
Downloads分布：大部分电影的下载次数较少，但存在少数下载次数非常高的电影，说明一些电影极其受欢迎
Run Time分布：大多数电影的运行时间集中在80到140分钟之间，符合一般电影的标准长度。

1.2.2 2. 使用盒图检查数据离散点

[32]:
```
# 绘制盒图
import seaborn as sns

plt.rcParams['font.sans-serif'] = ['SimHei']
# 2. 使用盒图检查数据离散点
plt.figure(figsize=(18, 6))

plt.subplot(1, 3, 1)
sns.boxplot(data=movies_df, y='IMDb-rating')
plt.title('IMDb-rating 离散点')

plt.subplot(1, 3, 2)
sns.boxplot(data=movies_df, y='downloads')
plt.title('Downloads 离散点')

plt.subplot(1, 3, 3)
sns.boxplot(data=movies_df, y='run_time')
plt.title('Run Time 离散点')

plt.tight_layout()
plt.show()
```



IMDb-rating离散点：盒图显示大多数电影的评分集中在5到7分之间，有一些极端的低评分和高评分电影。
Downloads离散点：下载次数有较大的离散性，存在一些极端的高下载次数电影。
Run Time离散点：大多数电影的运行时间比较集中，也有少数极短或极长的电影。

2 三、缺失数据处理

2.0.1 1. 将缺失部分剔除

[47]:
```
# 重新加载数据集以获取原始的缺失值情况
movies_df_original = pd.read_csv('./movies_dataset.csv')
```

[48]:
```
# 将缺失部分剔除
movies_df_dropped = movies_df_original.dropna()
# 显示处理后的数据集的前几行和原数据集的行数对比
(movies_df_dropped.head(), movies_df_original.shape[0], movies_df_dropped.
 ↪shape[0])
```

[48]:
```
(   Unnamed: 0  IMDb-rating appropriate_for        director downloads      id  \
 0           0          4.8                R       John Swab       304  372092
 1           1          6.4            TV-PG     Paul Ziller        73  372091
 2           2          5.2                R    Ben Wheatley     1,427  343381
 7           7          6.5                R  Benjamin Caron     1,781  371751
 8           8          6.9            PG-13     Ravi Kapoor       458  372042

                industry       language   posted_date release_date  run_time  \
 0  Hollywood / English        English  20 Feb, 2023  Jan 28 2023       105
 1  Hollywood / English        English  20 Feb, 2023  Feb 05 2023        84
 2  Hollywood / English  English,Hindi  20 Apr, 2021  Jun 18 2021  1h 47min
 7  Hollywood / English        English  13 Feb, 2023  Feb 17 2023       116
 8  Hollywood / English        English  18 Feb, 2023  Dec 02 2022        80

                                             storyline  \
 0  Doc\r\n facilitates a fragile truce between th…
 1  Caterer\r\n Goldy Berry reunites with detectiv…
 2  As the world searches for a cure to a disastro…
```

```
7  Motivations are suspect, and expectations are …
8  An\r\n unmotivated South Asian American rapper…

                                        title   views  \
0                               Little Dixie   2,794
1  Grilling Season: A Curious Caterer Mystery   1,002
2                               In the Earth  14,419
7                                    Sharper  18,225
8                               Four Samosas   6,912

                             writer
0                        John Swab
1            John Christian Plummer
2                       Ben Wheatley
7  Brian Gatewood, Alessandro Tanaka
8                        Ravi Kapoor  ,
20548,
9902)
```

剔除包含缺失值的行之前，原始数据集中有 20,548 行，处理后剩下 9902 行

[49]:
```
# 计算重新加载的数据集中每列缺失值的数量
missing_values_per_column_original = movies_df_original.isnull().sum()
missing_values_per_column_original
```

[49]:
```
Unnamed: 0            0
IMDb-rating         841
appropriate_for    9476
director           1938
downloads             1
id                    0
industry              1
language            546
posted_date           1
release_date          1
run_time           1768
storyline          1701
```

```
title                 1
views                 1
writer             2192
dtype: int64
```

可以看见在所有的含有缺失值的数据中”apppriate_for” 属性列的占比高达 89%
因此盲目的直接去除所有含有缺失值的行会使得样本空间大大减少
所以我们要对其进行二次处理

[80]:
```
# 计算 appropriate_for 的值计数
appropriate_count_series = movies_df_original['appropriate_for'].value_counts()
# 将 Series 转换为 DataFrame
appropriate_count_df = appropriate_count_series.reset_index()
# 重命名列
appropriate_count_df.columns = ['appropriate_for', 'appropriate_count']
# 根据计数列排序
appropriate_count_sorted = appropriate_count_df.
 ↪sort_values(by='appropriate_count', ascending=True)
```

[81]:
```
mov_data_cleaned = movies_df_original.dropna()
'18+' in list(mov_data_cleaned['appropriate_for'].value_counts().index)
```

[81]:
```
True
```

[82]:
```
appropriate_count_cleaned = appropriate_count
appropriate_count_cleaned['appropriate_count_cleaned'] = [0] *␣
 ↪len(appropriate_count)

for level in list(appropriate_count.index):
    if level in list(mov_data_cleaned['appropriate_for'].value_counts().index):
        appropriate_count_cleaned.loc[[level], ['appropriate_count_cleaned']] =␣
 ↪mov_data_cleaned['appropriate_for'].value_counts().loc[[level]].values[0]
```

[83]:
```
appropriate_count_cleaned
```

[83]:

	count	count	appropriate_count_cleaned
0	R	4384	0
1	Not Rated	2142	0

2	PG-13	1968	0
3	PG	886	0
4	TV-14	694	0
5	TV-MA	406	0
6	G	152	0
7	Unrated	132	0
8	TV-PG	115	0
9	TV-G	99	0
10	TV-Y7	45	0
11	TV-Y	25	0
12	Approved	9	0
13	NC-17	4	0
14	TV-Y7-FV	3	0
15	Passed	3	0
16	MA-17	1	0
17	TV-13	1	0
18	Drama	1	0
19	Drama, Romance	1	0
20	18+	1	0

[63]:
```
import copy
from numpy import nan as NA
HF = {}
mov_data_HF_replaced = copy.deepcopy(movies_df_original)
for col in mov_data_HF_replaced:
    HF[col] = mov_data_HF_replaced[col].value_counts().index[0]
HF['language'] = 'English'
HF
```

[63]:
```
{'Unnamed: 0': 0,
 'IMDb-rating': 6.6,
 'appropriate_for': 'R',
 'director': 'Venky Atluri',
 'downloads': '75',
 'id': 372090,
 'industry': 'Hollywood / English',
 'language': 'English',
```

```
 'posted_date': '13 Feb, 2023',
 'release_date': 'Jan 01 1970',
 'run_time': '93',
 'storyline': 'The life of a young man and his struggles against the
privatization of education.',
 'title': 'The Girl Who Escaped: The Kara Robinson Story',
 'views': '6,259',
 'writer': 'Nicholas Schutt'}
```

[64]:
```
for col in mov_data_HF_replaced:
    mov_data_HF_replaced[col] = mov_data_HF_replaced[col].replace(NA, HF[col])
mov_data_HF_replaced.isna().sum()
```

[64]:
```
Unnamed: 0         0
IMDb-rating        0
appropriate_for    0
director           0
downloads          0
id                 0
industry           0
language           0
posted_date        0
release_date       0
run_time           0
storyline          0
title              0
views              0
writer             0
dtype: int64
```

[65]:
```
mov_data_HF_replaced.head(10)
```

[65]:

	Unnamed: 0	IMDb-rating	appropriate_for	director	downloads	\
0	0	4.8	R	John Swab	304	
1	1	6.4	TV-PG	Paul Ziller	73	
2	2	5.2	R	Ben Wheatley	1,427	
3	3	8.1	R	Venky Atluri	1,549	

4	4	4.6	R	Shaji Kailas	657
5	5	5.4	R	Srinivas Gavireddy	746
6	6	6.6	TV-PG	Venky Atluri	5,332
7	7	6.5	R	Benjamin Caron	1,781
8	8	6.9	PG-13	Ravi Kapoor	458
9	9	4.2	R	Danny LeGare	1,965

	id	industry	language	posted_date	release_date	\
0	372092	Hollywood / English	English	20 Feb, 2023	Jan 28 2023	
1	372091	Hollywood / English	English	20 Feb, 2023	Feb 05 2023	
2	343381	Hollywood / English	English,Hindi	20 Apr, 2021	Jun 18 2021	
3	372090	Tollywood	Hindi	20 Feb, 2023	Feb 17 2023	
4	372089	Tollywood	Hindi	20 Feb, 2023	Jan 26 2023	
5	372088	Tollywood	Hindi	20 Feb, 2023	Nov 26 2021	
6	372059	Wrestling	English	19 Feb, 2023	Feb 18 2023	
7	371751	Hollywood / English	English	13 Feb, 2023	Feb 17 2023	
8	372042	Hollywood / English	English	18 Feb, 2023	Dec 02 2022	
9	372041	Hollywood / English	English	18 Feb, 2023	Feb 07 2023	

	run_time	storyline	\
0	105	Doc\r\n facilitates a fragile truce between th…	
1	84	Caterer\r\n Goldy Berry reunites with detectiv…	
2	1h 47min	As the world searches for a cure to a disastro…	
3	139	The life of a young man and his struggles agai…	
4	122	A man named Kalidas gets stranded due to the p…	
5	131	Bagaram,\r\n after inheriting his grandfather'…	
6	200	Undisputed\r\n WWE Universal title: Reigns vs …	
7	116	Motivations are suspect, and expectations are …	
8	80	An\r\n unmotivated South Asian American rapper…	
9	80	A\r\n family moves back to a farm in the mothe…	

	title	views	\
0	Little Dixie	2,794	
1	Grilling Season: A Curious Caterer Mystery	1,002	
2	In the Earth	14,419	
3	Vaathi	4,878	

```
4                                    Alone   2,438
5                          Anubhavinchu Raja   2,940
6                      WWE Elimination Chamber  11,978
7                                  Sharper  18,225
8                               Four Samosas   6,912
9                               Blood Harvest   9,710
```

```
                                      writer
0                                   John Swab
1                       John Christian Plummer
2                                  Ben Wheatley
3                                  Venky Atluri
4                               Rajesh Jayaraman
5             Srinivas Gavireddy, Mayukh Adithya
6                               Nicholas Schutt
7              Brian Gatewood, Alessandro Tanaka
8                                   Ravi Kapoor
9  Michael Hultquist, Danny LeGare, Seth Metoyer
```

[66]:
```
mov_data_HF_replaced['appropriate_for'].value_counts()
```

[66]:
```
appropriate_for
R                 13860
Not Rated          2142
PG-13              1968
PG                  886
TV-14               694
TV-MA               406
G                   152
Unrated             132
TV-PG               115
TV-G                 99
TV-Y7                45
TV-Y                 25
Approved              9
NC-17                 4
TV-Y7-FV              3
```

```
Passed                3
MA-17                 1
TV-13                 1
Drama                 1
Drama, Romance        1
18+                   1
Name: count, dtype: int64
```

2.0.2 2. 用最高频率值来填补缺失值除

[38]:
```
# 用最高频率值来填补缺失值
for column in movies_df.columns:
    # 获取最高频率的值（众数）
    most_frequent_value = movies_df[column].mode()[0]
    # 填补缺失值
    movies_df[column].fillna(most_frequent_value, inplace=True)

# 显示处理后的数据集的前几行
movies_df.head()
```

[38]:

	Unnamed: 0	IMDb-rating	appropriate_for	director	downloads	id	industry	language	posted_date	release_date	run_time	storyline
0	0	4.8	R	John Swab	304.0	372092	Hollywood / English	English	20 Feb, 2023	Jan 28 2023	90.0	Doc\r\n facilitates a fragile truce between th…
1	1	6.4	TV-PG	Paul Ziller	73.0	372091	Hollywood / English	English	20 Feb, 2023	Feb 05 2023	90.0	Caterer\r\n Goldy Berry reunites with detectiv…
2	2	5.2	R	Ben Wheatley	1427.0	343381	Hollywood / English	English,Hindi	20 Apr, 2021	Jun 18 2021	107.0	
3	3	8.1	R	Venky Atluri	1549.0	372090	Tollywood	Hindi	20 Feb, 2023	Feb 17 2023	90.0	
4	4	4.6	R	Shaji Kailas	657.0	372089	Tollywood	Hindi	20 Feb, 2023	Jan 26 2023	90.0	

```
2  As the world searches for a cure to a disastro…
3  The life of a young man and his struggles agai…
4  A man named Kalidas gets stranded due to the p…
```

	title	views	writer
0	Little Dixie	2794.0	John Swab
1	Grilling Season: A Curious Caterer Mystery	1002.0	John Christian Plummer
2	In the Earth	14419.0	Ben Wheatley
3	Vaathi	4878.0	Venky Atluri
4	Alone	2438.0	Rajesh Jayaraman

2.0.3 3. 通过属性的相关关系来填补缺失值

[90]:
```
import numpy as np
mov_data_attr_corr = copy.deepcopy(movies_df_original)
```

[91]:
```
df_coded = pd.get_dummies(mov_data_attr_corr, columns=['appropriate_for'],␣
↪dummy_na=True, drop_first=True)
df_coded.head()
```

[91]:

	Unnamed: 0	IMDb-rating	director	downloads	id	\
0	0	4.8	John Swab	304	372092	
1	1	6.4	Paul Ziller	73	372091	
2	2	5.2	Ben Wheatley	1,427	343381	
3	3	8.1	Venky Atluri	1,549	372090	
4	4	4.6	Shaji Kailas	657	372089	

	industry	language	posted_date	release_date	run_time	\
0	Hollywood / English	English	20 Feb, 2023	Jan 28 2023	105	
1	Hollywood / English	English	20 Feb, 2023	Feb 05 2023	84	
2	Hollywood / English	English,Hindi	20 Apr, 2021	Jun 18 2021	1h 47min	
3	Tollywood	Hindi	20 Feb, 2023	Feb 17 2023	139	
4	Tollywood	Hindi	20 Feb, 2023	Jan 26 2023	122	

	…	appropriate_for_TV-13	appropriate_for_TV-14	appropriate_for_TV-G	\
0	…	False	False	False	
1	…	False	False	False	

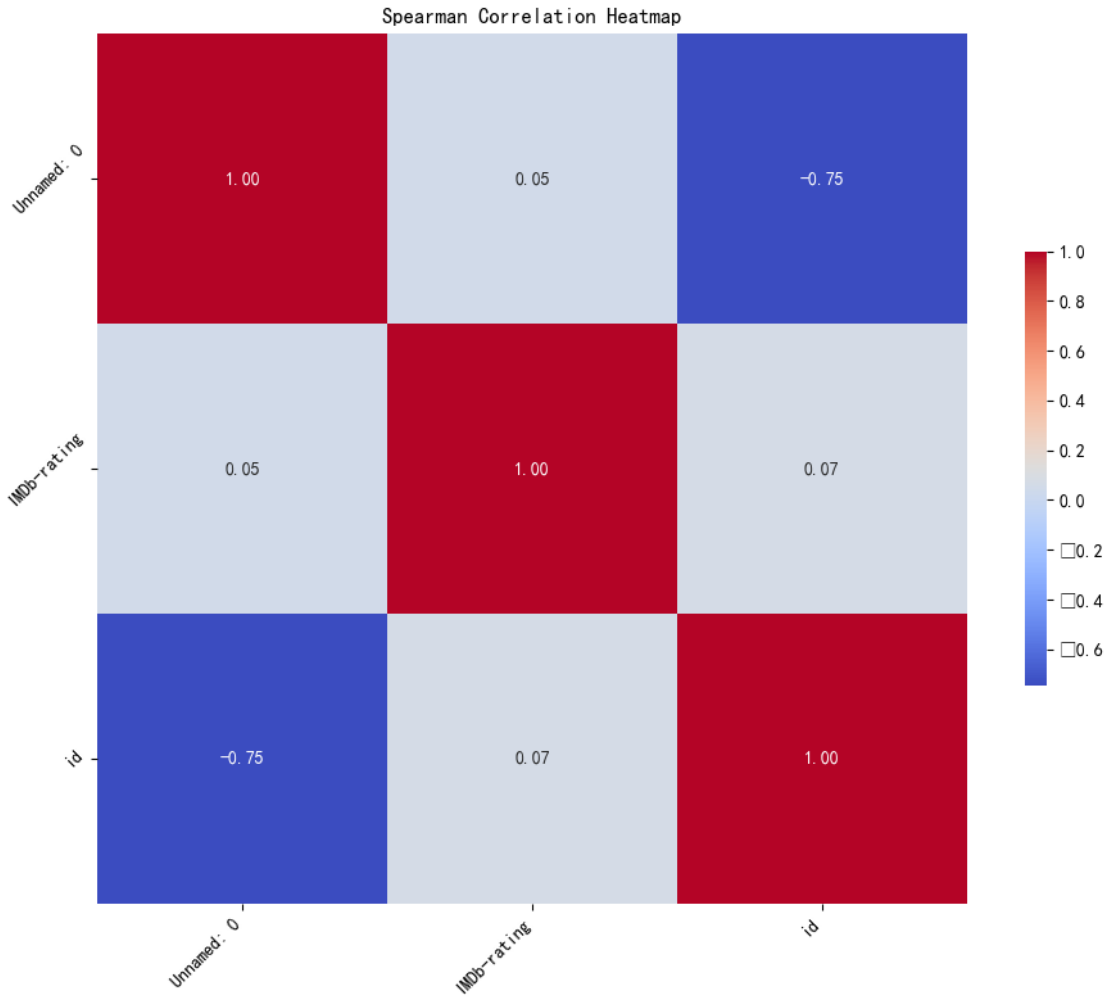
```
2  …                False                False                False
3  …                False                False                False
4  …                False                False                False

  appropriate_for_TV-MA  appropriate_for_TV-PG  appropriate_for_TV-Y  \
0                 False                  False                 False
1                 False                   True                 False
2                 False                  False                 False
3                 False                  False                 False
4                 False                  False                 False

   appropriate_for_TV-Y7  appropriate_for_TV-Y7-FV  appropriate_for_Unrated  \
0                  False                     False                    False
1                  False                     False                    False
2                  False                     False                    False
3                  False                     False                    False
4                  False                     False                    False

   appropriate_for_nan
0                False
1                False
2                False
3                 True
4                 True

[5 rows x 35 columns]
```

[92]:
```
# 从 df_coded 中排除非数值型列
df_coded_numeric = df_coded.select_dtypes(include=[np.number])
# 对数值型数据计算斯皮尔曼相关系数
corr_matrix = df_coded_numeric.corr(method='spearman')
# 显示相关系数矩阵
corr_matrix
```

[92]:
```
              Unnamed: 0  IMDb-rating        id
Unnamed: 0      1.000000     0.048519 -0.747947
IMDb-rating     0.048519     1.000000  0.065239
```

```
id              -0.747947     0.065239  1.000000
```

[94]:
```
# 假设 df_coded_numeric 是之前步骤中筛选出的只包含数值型数据的 DataFrame
df_coded_numeric = df_coded.select_dtypes(include=[np.number])

# 计算相关系数矩阵
corr_matrix = df_coded_numeric.corr(method='spearman')

# 绘制热力图
plt.figure(figsize=(10, 8))
sns.heatmap(corr_matrix, annot=True, fmt=".2f", cmap='coolwarm', square=True,␣
 ↪cbar_kws={'shrink': .5})
plt.title('Spearman Correlation Heatmap')
plt.xticks(rotation=45, ha='right')
plt.yticks(rotation=45)
plt.tight_layout()
plt.show()
```


Spearman Correlation Heatmap
Unnamed: 0
IMDb-rating
id
1.00
0.05
-0.75
0.05
1.00
0.07
-0.75
0.07
1.00
Unnamed: 0
IMDb-rating
id
1.0
0.8
0.6
0.4
0.2
0.0
□0.2
□0.4
□0.6