ACMS 40210 - Spring 2024

TV Shows, Reviews & Streaming Services

In [1]:
```
import pandas as pd

tv_shows = pd.read_csv('tv_shows.csv')
tv_shows.head(8)
```

Out[1]:

	Unnamed: 0	Title	Year	Age	IMDb	Rotten Tomatoes	Netflix	Hulu	Prime Video	Disney+	type
0	0	Breaking Bad	2008	18+	9.5	96%	1	0	0	0	1
1	1	Stranger Things	2016	16+	8.8	93%	1	0	0	0	1
2	2	Money Heist	2017	18+	8.4	91%	1	0	0	0	1
3	3	Sherlock	2010	16+	9.1	78%	1	0	0	0	1
4	4	Better Call Saul	2015	18+	8.7	97%	1	0	0	0	1
5	5	The Office	2005	16+	8.9	81%	1	0	0	0	1
6	6	Black Mirror	2011	18+	8.8	83%	1	0	0	0	1
7	7	Supernatural	2005	16+	8.4	93%	1	0	0	0	1

Analysing the Dataset

In [2]:
```
tv_shows.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 5611 entries, 0 to 5610
Data columns (total 11 columns):
 #   Column           Non-Null Count  Dtype  
---  ------           --------------  -----  
 0   Unnamed: 0       5611 non-null   int64  
 1   Title            5611 non-null   object 
 2   Year             5611 non-null   int64  
 3   Age              3165 non-null   object 
 4   IMDb             4450 non-null   float64
 5   Rotten Tomatoes  1011 non-null   object 
 6   Netflix          5611 non-null   int64  
 7   Hulu             5611 non-null   int64  
 8   Prime Video      5611 non-null   int64  
 9   Disney+          5611 non-null   int64  
 10  type             5611 non-null   int64  
dtypes: float64(1), int64(7), object(3)
memory usage: 482.3+ KB
```

In [3]:
```
# Show Distribution Before
services = ['Netflix', 'Hulu', 'Prime Video', 'Disney+']

service_list = []
for service in services:
    original_service_df = tv_shows[tv_shows[service] == 1] # New dataframe containing
    count = original_service_df.shape[0] # The number of shows in this new dataframe

    service_list.append({'Streaming Service': service,
                        'Number of Shows': count})

pd.DataFrame(service_list).sort_values(by='Number of Shows', ascending=False)
```

Out[3]:

	Streaming Service	Number of Shows
2	Prime Video	2144
0	Netflix	1931
1	Hulu	1754
3	Disney+	180

In [4]:
```
print(tv_shows['Year'].agg(['min', 'max']))
type
```

```
min    1901
max    2020
Name: Year, dtype: int64
```

Out[4]:
```
type
```

In [5]:
```
tv_shows['type'].nunique()
```

Out[5]:
```
1
```

In [6]:
```
tv_shows['Age'].unique()
```

Out[6]:
```
array(['18+', '16+', '7+', nan, 'all', '13+'], dtype=object)
```

In [7]:
```python
tv_shows[tv_shows['Rotten Tomatoes'].isna()].head(18)
```

Out[7]:

	Unnamed: 0	Title	Year	Age	IMDb	Rotten Tomatoes	Netflix	Hulu	Prime Video	Disney+	type
85	85	Death Note	2006	18+	9.0	NaN	1	1	0	0	1
93	93	American Horror Story	2011	18+	8.0	NaN	1	1	1	0	1
96	96	Criminal Minds	2005	16+	8.1	NaN	1	0	0	0	1
119	119	Person of Interest	2011	16+	8.4	NaN	1	0	0	0	1
128	128	Hunter x Hunter	2011	16+	8.9	NaN	1	1	0	0	1
132	132	Naruto	2002	7+	8.3	NaN	1	1	0	0	1
151	151	Law & Order: Special Victims Unit	1999	16+	8.0	NaN	1	1	1	0	1
159	159	Resurrection: Ertugrul	2014	16+	7.7	NaN	1	0	0	0	1
177	177	Allo 'Allo!	1984	7+	8.3	NaN	1	0	0	0	1
183	183	Crash Landing on You	2019	16+	8.8	NaN	1	0	0	0	1
184	184	Bleach	2004	18+	8.1	NaN	1	1	0	0	1
193	193	Haikyu!!	2014	16+	8.7	NaN	1	1	0	0	1
196	196	Babylon Berlin	2017	18+	8.4	NaN	1	0	0	0	1
197	197	That '70s Show	1998	16+	8.1	NaN	1	0	0	0	1
198	198	The Magicians	2015	16+	7.6	NaN	1	0	0	0	1
205	205	Merlin	2008	7+	7.9	NaN	1	1	1	0	1
207	207	Travelers	2016	16+	8.1	NaN	1	0	0	0	1
213	213	Malcolm in the Middle	2000	7+	8.0	NaN	1	1	0	0	1

Performing Clean-up

In [8]:
```python
# Before Cleanup
sorted_tv_shows = tv_shows.sort_values(by='IMDb', ascending=False)
sorted_tv_shows.head(8)
```

Out[8]:

	Unnamed: 0	Title	Year	Age	IMDb	Rotten Tomatoes	Netflix	Hulu	Prime Video	Disney+	type
3023	3023	Destiny	2014	NaN	9.6	NaN	0	1	0	0	1
0	0	Breaking Bad	2008	18+	9.5	96%	1	0	0	0	1
3747	3747	Malgudi Days	1987	all	9.5	NaN	0	0	1	0	1
3177	3177	Hungry Henry	2014	NaN	9.5	NaN	0	1	0	0	1
2365	2365	The Joy of Painting	1983	all	9.4	NaN	0	1	1	0	1
3567	3567	Band of Brothers	2001	18+	9.4	94%	0	0	1	0	1
3566	3566	The Wire	2002	18+	9.3	94%	0	0	1	0	1
91	91	Our Planet	2019	7+	9.3	93%	1	0	0	0	1

In [9]:
```
tv_shows[tv_shows['Netflix']==1]
```

Out[9]:

	Unnamed: 0	Title	Year	Age	IMDb	Rotten Tomatoes	Netflix	Hulu	Prime Video	Disney+	type
0	0	Breaking Bad	2008	18+	9.5	96%	1	0	0	0	1
1	1	Stranger Things	2016	16+	8.8	93%	1	0	0	0	1
2	2	Money Heist	2017	18+	8.4	91%	1	0	0	0	1
3	3	Sherlock	2010	16+	9.1	78%	1	0	0	0	1
4	4	Better Call Saul	2015	18+	8.7	97%	1	0	0	0	1
...	...	...	...	...	...	...	...	...	...	...	...
1926	1926	The Golden Path	2012	NaN	NaN	NaN	1	0	0	0	1
1927	1927	JingleKids	2019	NaN	NaN	NaN	1	0	0	0	1
1928	1928	Sin Ellas No Hay Paraíso	2013	NaN	NaN	NaN	1	0	0	0	1
1929	1929	Slice of Paradise	2017	NaN	NaN	NaN	1	0	0	0	1
1930	1930	Two Fathers	2013	NaN	NaN	NaN	1	0	0	0	1

1931 rows × 11 columns

In [10]:
```
tv_shows[(tv_shows['Hulu']==1)&(tv_shows['Netflix']==0)]
```

Out[10]:

	Unnamed: 0	Title	Year	Age	IMDb	Rotten Tomatoes	Netflix	Hulu	Prime Video	Disney+	type
1931	1931	Rick and Morty	2013	18+	9.2	94%	0	1	0	0	1
1932	1932	Fargo	2014	18+	8.9	96%	0	1	0	0	1
1933	1933	Vikings	2013	18+	8.5	93%	0	1	1	0	1
1934	1934	Brooklyn Nine-Nine	2013	16+	8.4	97%	0	1	0	0	1
1935	1935	The Simpsons	1989	7+	8.7	85%	0	1	0	1	1
...	...	...	...	...	...	...	...	...	...	...	...
3561	3561	Newsy	2016	NaN	NaN	NaN	0	1	0	0	1
3562	3562	Modd Couples	2016	NaN	NaN	NaN	0	1	0	0	1
3563	3563	Fantasy Forecast	2016	NaN	NaN	NaN	0	1	0	0	1
3564	3564	Secret Talent Theatre	2016	NaN	NaN	NaN	0	1	0	0	1
3565	3565	pocket.watch Challenge Squad	2018	NaN	NaN	NaN	0	1	1	0	1

1635 rows × 11 columns

In [11]:
```
tv_shows[(tv_shows['Prime Video'] ==1)&(tv_shows['Hulu']==0)&(tv_shows['Netflix']==0)]
```

Out[11]:

	Unnamed: 0	Title	Year	Age	IMDb	Rotten Tomatoes	Netflix	Hulu	Prime Video	Disney+	type
3566	3566	The Wire	2002	18+	9.3	94%	0	0	1	0	1
3567	3567	Band of Brothers	2001	18+	9.4	94%	0	0	1	0	1
3568	3568	The Sopranos	1999	18+	9.2	92%	0	0	1	0	1
3569	3569	House	2004	16+	8.7	90%	0	0	1	0	1
3570	3570	Mr. Robot	2015	18+	8.5	94%	0	0	1	0	1
...	...	...	...	...	...	...	...	...	...	...	...
5450	5450	Sawyer Sessions	2015	NaN	NaN	NaN	0	0	1	0	1
5451	5451	Pinkfong! Dinosaur Songs	2014	NaN	NaN	NaN	0	0	1	0	1
5452	5452	How To Self-Publish	2017	NaN	NaN	NaN	0	0	1	0	1
5453	5453	BigDo2 - Random Hair	2016	NaN	NaN	NaN	0	0	1	0	1
5454	5454	We`ll Talk When You Get Back	2015	NaN	NaN	NaN	0	0	1	0	1

1889 rows × 11 columns

In [12]:

```
tv_shows[(tv_shows['Disney+']==1)&(tv_shows['Prime Video']==0)&(tv_shows['Netflix']==
```

Out[12]:

	Unnamed: 0	Title	Year	Age	IMDb	Rotten Tomatoes	Netflix	Hulu	Prime Video	Disney+	type
5455	5455	The Mandalorian	2019	7+	8.7	93%	0	0	0	1	1
5456	5456	Star Wars: The Clone Wars	2008	7+	8.2	93%	0	0	0	1	1
5457	5457	Marvel's Agent Carter	2015	7+	7.9	86%	0	0	0	1	1
5458	5458	Star Wars Rebels	2014	7+	8.0	100%	0	0	0	1	1
5459	5459	DuckTales	2017	7+	8.2	100%	0	0	0	1	1
...	...	...	...	...	...	...	...	...	...	...	...
5606	5606	Tut's Treasures: Hidden Secrets	2018	NaN	NaN	NaN	0	0	0	1	1
5607	5607	Paradise Islands	2017	NaN	NaN	NaN	0	0	0	1	1
5608	5608	Wild Russia	2018	NaN	NaN	NaN	0	0	0	1	1
5609	5609	Love & Vets	2017	NaN	NaN	NaN	0	0	0	1	1
5610	5610	United States of Animals	2016	NaN	NaN	NaN	0	0	0	1	1

156 rows × 11 columns

In [13]:
```
def keep_top_60_percent(group):
    keep_count = int(len(group) * 0.60)
    return group.iloc[:keep_count]

relevent_tv_shows = pd.concat([
    keep_top_60_percent(tv_shows[tv_shows['Netflix']==1]),
    keep_top_60_percent(tv_shows[(tv_shows['Hulu']==1)&(tv_shows['Netflix']==0)]),
    keep_top_60_percent(tv_shows[(tv_shows['Prime Video'] ==1)&(tv_shows['Hulu']==0)&(
    keep_top_60_percent(tv_shows[(tv_shows['Disney+']==1)&(tv_shows['Prime Video']==0)
])

relevent_tv_shows
```

Out[13]:

	Unnamed: 0	Title	Year	Age	IMDb	Rotten Tomatoes	Netflix	Hulu	Prime Video	Disney+	type
0	0	Breaking Bad	2008	18+	9.5	96%	1	0	0	0	1
1	1	Stranger Things	2016	16+	8.8	93%	1	0	0	0	1
2	2	Money Heist	2017	18+	8.4	91%	1	0	0	0	1
3	3	Sherlock	2010	16+	9.1	78%	1	0	0	0	1
4	4	Better Call Saul	2015	18+	8.7	97%	1	0	0	0	1
...	...	...	...	...	...	...	...	...	...	...	...
5543	5543	Fantastic Four	1994	7+	6.5	NaN	0	0	0	1	1
5544	5544	Silver Surfer	1998	7+	7.1	NaN	0	0	0	1	1
5545	5545	My Friends Tigger & Pooh	2007	all	5.8	NaN	0	0	0	1	1
5546	5546	Imagination Movers	2008	all	7.0	NaN	0	0	0	1	1
5547	5547	Out of the Box	1998	all	7.5	NaN	0	0	0	1	1

3365 rows × 11 columns

In [14]:

```python
# More Cleaning
clean_tv_shows = relevent_tv_shows.copy()
# Dropping TV shows that are missing BOTH and IMDb and a Rotten Tomatoes Rating
clean_tv_shows = clean_tv_shows.dropna(subset=['IMDb', 'Rotten Tomatoes'], how='all')


# Renaming the Year and Age columns to make it clearer what they mean.
clean_tv_shows.rename(columns={'Year':'Release Year', 'Age':'Age Rating'}, inplace=Tru

# Converting the Rotten Tomatoes review and Age from a string to a float
# We do this so that we can do mathematical calculations

clean_tv_shows['Rotten Tomatoes'] = clean_tv_shows['Rotten Tomatoes'].str.replace('%',
clean_tv_shows['Age Rating'] = clean_tv_shows['Age Rating'].str.replace('+', '').repla

# Because the 'type' column only contains the number 1 for every entry, we dropped thi
clean_tv_shows = clean_tv_shows.drop(columns=['type', 'Unnamed: 0'])

# Step 1: Sort by Rotten Tomatoes, then IMDb
clean_tv_shows = clean_tv_shows.sort_values(['IMDb','Rotten Tomatoes'], ascending=[Fal
clean_tv_shows.head(8)
```

Out[14]:

	Title	Release Year	Age Rating	IMDb	Rotten Tomatoes	Netflix	Hulu	Prime Video	Disney+
0	Breaking Bad	2008	18.0	9.5	96.0	1	0	0	0
3747	Malgudi Days	1987	0.0	9.5	NaN	0	0	1	0
3567	Band of Brothers	2001	18.0	9.4	94.0	0	0	1	0
2365	The Joy of Painting	1983	0.0	9.4	NaN	0	1	1	0
3566	The Wire	2002	18.0	9.3	94.0	0	0	1	0
91	Our Planet	2019	7.0	9.3	93.0	1	0	0	0
325	Ramayan	1987	0.0	9.3	NaN	1	0	0	0
4128	Green Paradise	2011	0.0	9.3	NaN	0	0	1	0

In [15]:

```
services = ['Netflix', 'Hulu', 'Prime Video', 'Disney+']

service_list = []
for service in services:
    updated_service_df = clean_tv_shows[clean_tv_shows[service] == 1] # New dataframe
    count = updated_service_df.shape[0] # The number of shows in this new dataframe

    service_list.append({'Streaming Service': service,
                         'Number of Shows': count})

pd.DataFrame(service_list).sort_values(by='Number of Shows', ascending=False)
```

Out[15]:

	Streaming Service	Number of Shows
2	Prime Video	1243
0	Netflix	1155
1	Hulu	1087
3	Disney+	112

In [16]:

```
service_list_after = []
for service in services:
    service_df_after = clean_tv_shows[clean_tv_shows[service] == 1] # New dataframe cc
    count = service_df_after.shape[0] # The number of shows in this new dataframe

    service_list_after.append({'Streaming Service': service,
                               'Number of Shows': count})

pd.DataFrame(service_list_after).sort_values(by='Number of Shows', ascending=False)
```

Out[16]:

	Streaming Service	Number of Shows
2	Prime Video	1243
0	Netflix	1155
1	Hulu	1087
3	Disney+	112

Which Streaming Service is The Best

In [17]:

```
# Which Streaming Service has the highest IMDb average?
compare_data = clean_tv_shows.copy()
compare_data = compare_data[compare_data['IMDb'] > 3.0]
services = ['Netflix', 'Hulu', 'Prime Video', 'Disney+']
avg_imdb_list = []

for service in services:
    service_df = compare_data[compare_data[service] == 1] # New dataframe containing c
    avg_imdb = service_df['IMDb'].mean()
    count = service_df.shape[0] # The number of shows in this new dataframe

    avg_imdb_list.append({'Streaming Service': service,
                          'Average IMDb': round(avg_imdb, 2),
                          'Number of Shows': count}) # We appended a dictionary to the list

avg_imdb_df = pd.DataFrame(avg_imdb_list)
avg_imdb_df.sort_values(by='Average IMDb', ascending=False)
```

Out[17]:

	Streaming Service	Average IMDb	Number of Shows
0	Netflix	7.52	1154
1	Hulu	7.36	1086
2	Prime Video	7.25	1235
3	Disney+	7.10	112

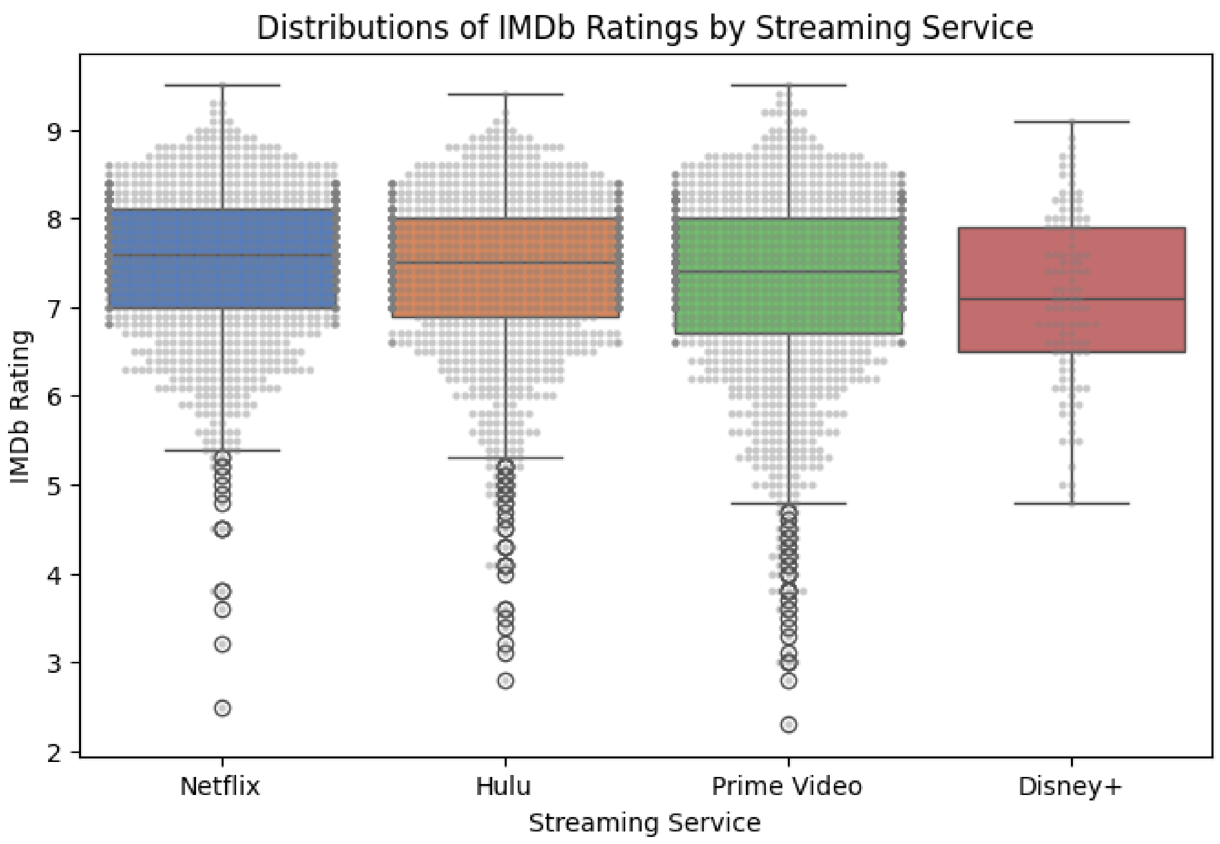
In [18]:

```
# Showing the IMBd Distributions in a Boxplot & Swarmplot for each Streaming Service

import seaborn as sns
import matplotlib.pyplot as plt

services = ['Netflix', 'Hulu', 'Prime Video', 'Disney+']

imdb_data = []

for service in services:
    subset = clean_tv_shows[clean_tv_shows[service] == 1][['Title', 'IMDb']].copy() #
    subset['Streaming Service'] = service
    imdb_data.append(subset)

imdb_df = pd.concat(imdb_data, ignore_index=True)

fig, axes = plt.subplots(figsize=(8,5))
sns.boxplot(data=imdb_df,
               x='Streaming Service',
               y='IMDb',
               palette='muted')
sns.swarmplot(data=imdb_df,
              x = 'Streaming Service',
              y = 'IMDb',
              alpha = 0.4,
              color='grey',
              size=3)

plt.title("Distributions of IMDb Ratings by Streaming Service")
plt.xlabel("Streaming Service")
plt.ylabel("IMDb Rating")
```

```
C:\Users\amann\AppData\Local\Temp\ipykernel_14620\316479031.py:18: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.
0. Assign the `x` variable to `hue` and set `legend=False` for the same effect.

  sns.boxplot(data=imdb_df,
C:\Users\amann\AppData\Local\Packages\PythonSoftwareFoundation.Python.3.11_qbz5n2kfra
8p0\LocalCache\local-packages\Python311\site-packages\seaborn\categorical.py:3399: Us
erWarning: 33.9% of the points cannot be placed; you may want to decrease the size of
the markers or use stripplot.
  warnings.warn(msg, UserWarning)
C:\Users\amann\AppData\Local\Packages\PythonSoftwareFoundation.Python.3.11_qbz5n2kfra
8p0\LocalCache\local-packages\Python311\site-packages\seaborn\categorical.py:3399: Us
erWarning: 30.1% of the points cannot be placed; you may want to decrease the size of
the markers or use stripplot.
  warnings.warn(msg, UserWarning)
C:\Users\amann\AppData\Local\Packages\PythonSoftwareFoundation.Python.3.11_qbz5n2kfra
8p0\LocalCache\local-packages\Python311\site-packages\seaborn\categorical.py:3399: Us
erWarning: 29.0% of the points cannot be placed; you may want to decrease the size of
the markers or use stripplot.
  warnings.warn(msg, UserWarning)
```

```
Out[18]: Text(75.84722222222221, 0.5, 'IMDb Rating')
```

```
C:\Users\amann\AppData\Local\Packages\PythonSoftwareFoundation.Python.3.11_qbz5n2kfra
8p0\LocalCache\local-packages\Python311\site-packages\seaborn\categorical.py:3399: Us
erWarning: 30.6% of the points cannot be placed; you may want to decrease the size of
the markers or use stripplot.
  warnings.warn(msg, UserWarning)
C:\Users\amann\AppData\Local\Packages\PythonSoftwareFoundation.Python.3.11_qbz5n2kfra
8p0\LocalCache\local-packages\Python311\site-packages\seaborn\categorical.py:3399: Us
erWarning: 27.0% of the points cannot be placed; you may want to decrease the size of
the markers or use stripplot.
  warnings.warn(msg, UserWarning)
C:\Users\amann\AppData\Local\Packages\PythonSoftwareFoundation.Python.3.11_qbz5n2kfra
8p0\LocalCache\local-packages\Python311\site-packages\seaborn\categorical.py:3399: Us
erWarning: 26.0% of the points cannot be placed; you may want to decrease the size of
the markers or use stripplot.
  warnings.warn(msg, UserWarning)
```



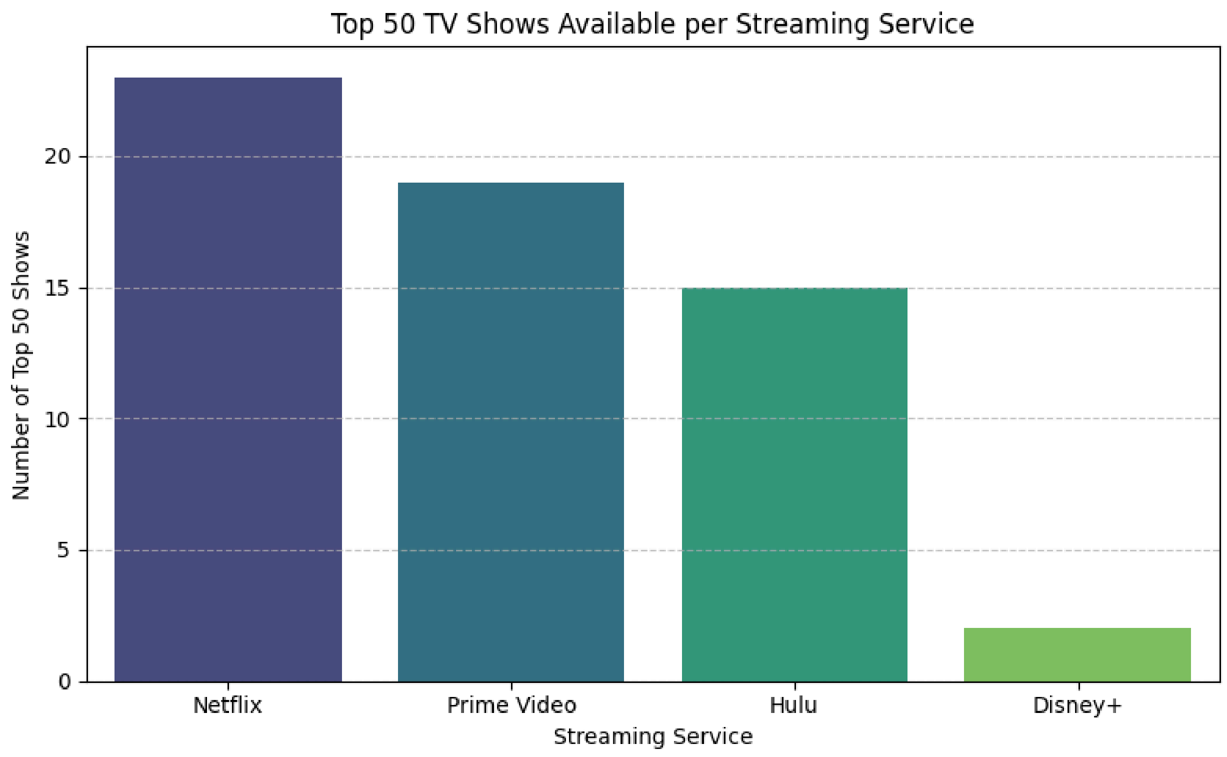
In [20]:
```
# Which Streaming Service has the MOST of the Top 50 TV Shows?
services = ['Netflix', 'Hulu', 'Prime Video', 'Disney+']

top_50_shows_service = clean_tv_shows.head(50)
service_counts = {}
for service in services:
    service_counts[service] = top_50_shows_service[service].sum()

service_counts_df = pd.DataFrame(list(service_counts.items()),
                                 columns=['Streaming Service', 'Top 50 Show Count']
                                 ).sort_values(by='Top 50 Show Count', ascending=False
service_counts_df
```

Out[20]:

	Streaming Service	Top 50 Show Count
0	Netflix	23
2	Prime Video	19
1	Hulu	15
3	Disney+	2

In [21]:
```
plt.figure(figsize=(8, 5))
sns.barplot(data=service_counts_df,
            x='Streaming Service',
            y='Top 50 Show Count',
            palette='viridis')

plt.title('Top 50 TV Shows Available per Streaming Service')
plt.ylabel('Number of Top 50 Shows')
plt.xlabel('Streaming Service')
plt.tight_layout()
plt.grid(axis='y', linestyle='--', alpha=0.7)
plt.show()
```

```
C:\Users\amann\AppData\Local\Temp\ipykernel_14620\48061810.py:2: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.
0. Assign the `x` variable to `hue` and set `legend=False` for the same effect.

  sns.barplot(data=service_counts_df,
```



Extra Analaysis (Not in Presentation)

```
In [22]: # Further Analysis: Which service has the most Kids TV shows?
kids_shows = clean_tv_shows[clean_tv_shows['Age Rating'] == 0]
kids_shows.head()
```

Out[22]:

	Title	Release Year	Age Rating	IMDb	Rotten Tomatoes	Netflix	Hulu	Prime Video	Disney+
3747	Malgudi Days	1987	0.0	9.5	NaN	0	0	1	0
2365	The Joy of Painting	1983	0.0	9.4	NaN	0	1	1	0
325	Ramayan	1987	0.0	9.3	NaN	1	0	0	0
4128	Green Paradise	2011	0.0	9.3	NaN	0	0	1	0
3649	The Planets	2019	0.0	9.1	100.0	0	0	1	0

```
In [23]: top_kids_shows = kids_shows.head(50)

service_counts = {}
```

```
for service in services:
    service_counts[service] = top_kids_shows[service].sum()

service_counts_df = pd.DataFrame(list(service_counts.items()),
                                 columns=['Streaming Service', 'Top 50 Show Count']
                                 ).sort_values(by='Top 50 Show Count', ascending=False
service_counts_df
```

Out[23]:

	Streaming Service	Top 50 Show Count
2	Prime Video	27
0	Netflix	15
1	Hulu	11
3	Disney+	2

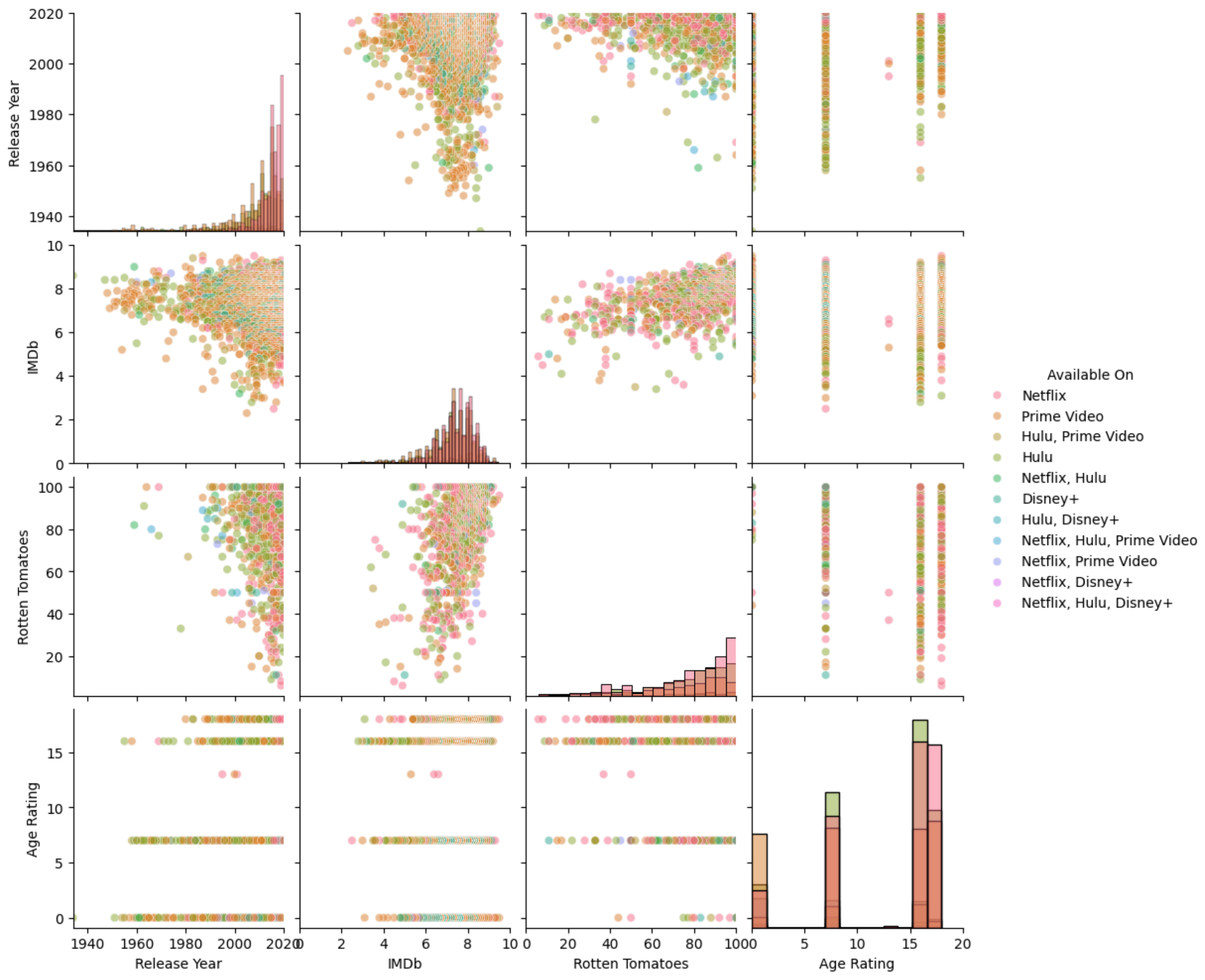
In [24]:

```
# Making 'Available On' Column
available_tv_shows = clean_tv_shows.copy()

# Define a function to list which streamimng services a show is available on
services = ['Netflix', 'Hulu', 'Prime Video', 'Disney+']
def get_services(row): # Input is the title of a TV Show
    where_to_watch = []
    for service in services:
        if row[service] == 1: # If the streaming service column has a 1 for that TV sh
            where_to_watch.append(service)
    return ', '.join(where_to_watch) # Allows for shows that are available on multiple

# Create an 'Available On' column using the function
available_tv_shows['Available On'] = available_tv_shows[services].apply(get_services,
available_tv_shows = available_tv_shows.drop(columns=['Netflix', 'Hulu', 'Prime Video'


available_tv_shows.head(10)
```

Out[24]:

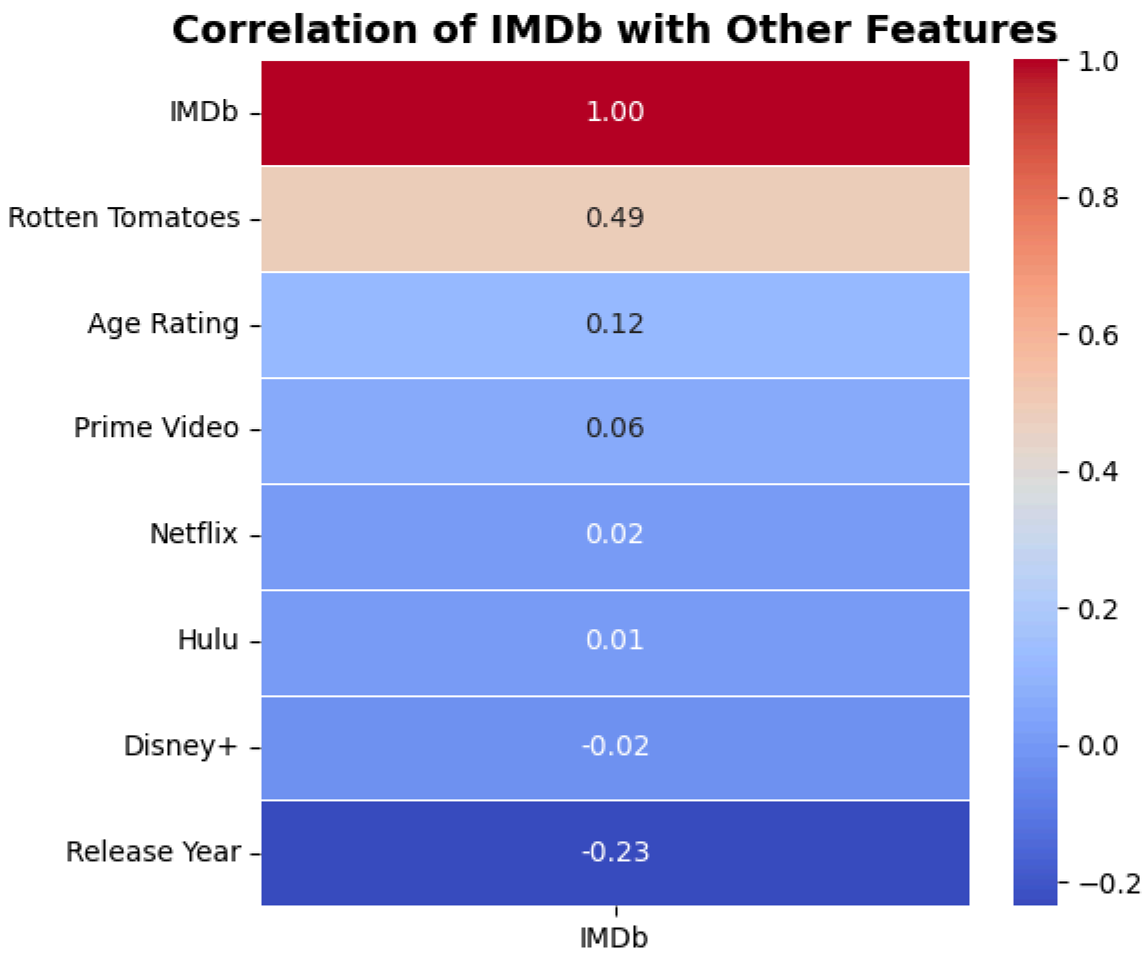
	Title	Release Year	Age Rating	IMDb	Rotten Tomatoes	Available On
0	Breaking Bad	2008	18.0	9.5	96.0	Netflix
3747	Malgudi Days	1987	0.0	9.5	NaN	Prime Video
3567	Band of Brothers	2001	18.0	9.4	94.0	Prime Video
2365	The Joy of Painting	1983	0.0	9.4	NaN	Hulu, Prime Video
3566	The Wire	2002	18.0	9.3	94.0	Prime Video
91	Our Planet	2019	7.0	9.3	93.0	Netflix
325	Ramayan	1987	0.0	9.3	NaN	Netflix
4128	Green Paradise	2011	0.0	9.3	NaN	Prime Video
9	Avatar: The Last Airbender	2005	7.0	9.2	100.0	Netflix
1931	Rick and Morty	2013	18.0	9.2	94.0	Hulu

```
In [25]: # Overall pairplot comparing the variables
import seaborn as sns

pairplot = sns.pairplot(available_tv_shows[['Release Year', 'IMDb', 'Rotten Tomatoes',
             hue = 'Available On',
             diag_kind = 'hist',
             plot_kws={'alpha': 0.5})

for ax in pairplot.axes.flat:
    if ax is not None:
        if ax.get_xlabel() == 'Release Year':
            ax.set_xlim(1934, 2020)
        if ax.get_ylabel() == 'Release Year':
            ax.set_ylim(1934, 2020)

for ax in pairplot.axes.flat:
    if ax is not None:
        if ax.get_xlabel() == 'IMDb':
            ax.set_xlim(0.0, 10.0)
        if ax.get_ylabel() == 'IMDb':
            ax.set_ylim(0.0, 10.0)

for ax in pairplot.axes.flat:
    if ax is not None:
        if ax.get_xlabel() == 'Rotten Tomatoes':
            ax.set_xlim(0, 100)

for ax in pairplot.axes.flat:
    if ax is not None:
        if ax.get_xlabel() == 'Age Rating':
            ax.set_xlim(0, 20)
```



Can we predict IMDb Ratings?

In [26]:
```
import seaborn as sns
import matplotlib.pyplot as plt

# Select numeric columns (adjust as needed)
numeric_columns = ['IMDb', 'Rotten Tomatoes', 'Release Year', 'Age Rating', 'Netflix',

# Drop rows with missing values in these columns
corr_data = clean_tv_shows[numeric_columns].dropna()

# Compute correlation matrix
corr_matrix = corr_data.corr()

# Extract only IMDb correlations
imdb_corr = corr_matrix[['IMDb']].sort_values(by='IMDb', ascending=False)

# Plot the IMDb correlation heatmap
plt.figure(figsize=(6, 5))
sns.heatmap(imdb_corr, annot=True, cmap='coolwarm', fmt=".2f", linewidths=0.5)
plt.title("Correlation of IMDb with Other Features", fontsize=14, fontweight = 'semibo
plt.tight_layout()
plt.show()
```



In [27]:
```
# Predicting IMDb score based on the other columns
clean_tv_shows = clean_tv_shows.sort_index()

from sklearn.model_selection import train_test_split
from sklearn.ensemble import RandomForestRegressor
from sklearn.metrics import mean_absolute_error, r2_score
import numpy as np

clean_tv_shows = clean_tv_shows.dropna(subset=['IMDb', 'Rotten Tomatoes'])
features = ['Rotten Tomatoes', 'Release Year', 'Age Rating','Hulu', 'Prime Video','Net
target = 'IMDb'

x = clean_tv_shows[features]
y = clean_tv_shows[target]

X_train, X_test, y_train, y_test = train_test_split(x, y, test_size=0.2, random_state=

model = RandomForestRegressor(n_estimators=100, max_depth=4, random_state=42)
model.fit(X_train, y_train)

y_pred = model.predict(X_test)

titles = clean_tv_shows.loc[X_test.index, 'Title']

results = pd.DataFrame({'Title':titles, 'Actual IMDb': y_test, 'Predicted IMDb': y_pre
results = results.round({'Predicted IMDb': 2, 'Error': 2})
```

```
print("Sample Predictions")
results.sample(5)
```

```
Sample Predictions
```

Out[27]:

	Title	Actual IMDb	Predicted IMDb	Error
76	Bodyguard	8.1	7.84	0.26
2178	Body of Proof	7.1	7.55	0.45
2310	Into the Dark	6.3	7.23	0.93
2735	Criminal Minds: Suspect Behavior	6.3	6.97	0.67
230	The Order	6.9	7.81	0.91

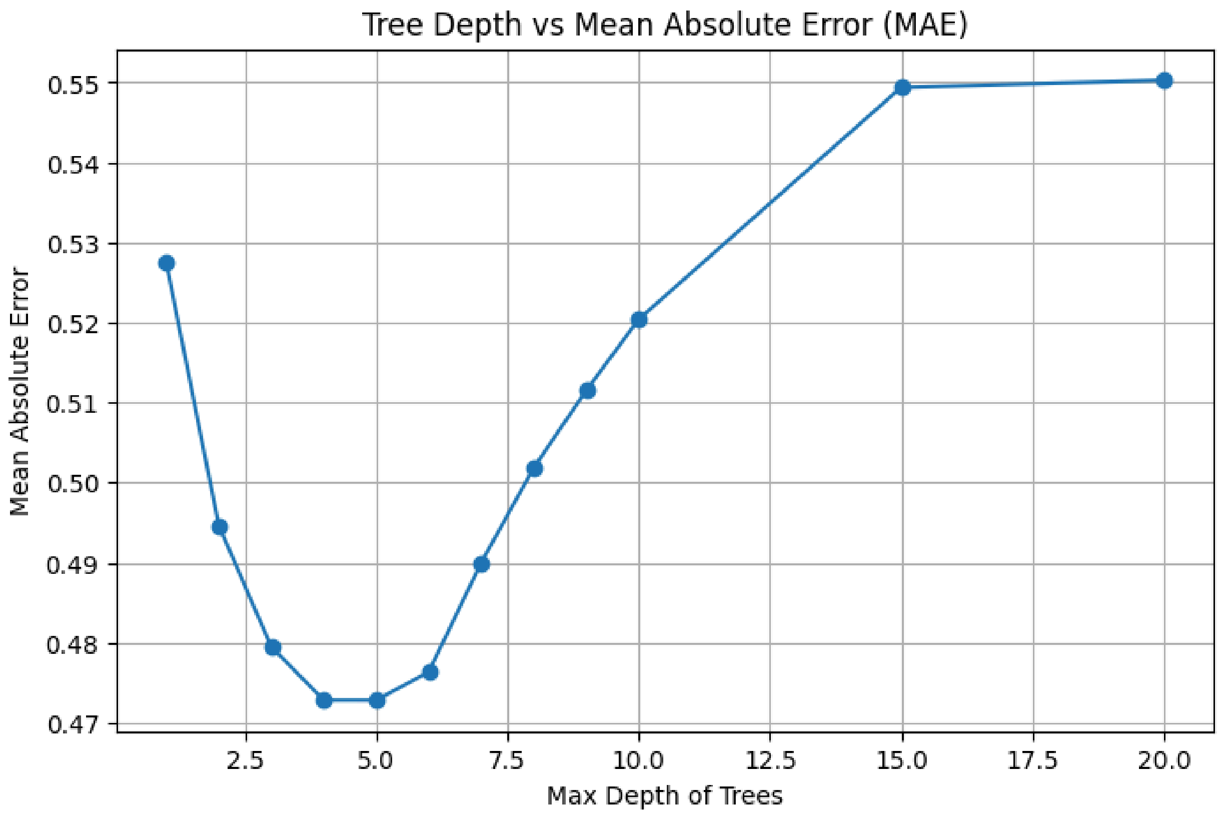
In [28]:

```
mae = mean_absolute_error(y_test, y_pred)
print(f"Mean Absolute Error (MAE): {mae:.2f}")

r2 = r2_score(y_test, y_pred)
print(f"R² Score (Model Accuracy): {r2:.2f}")
```

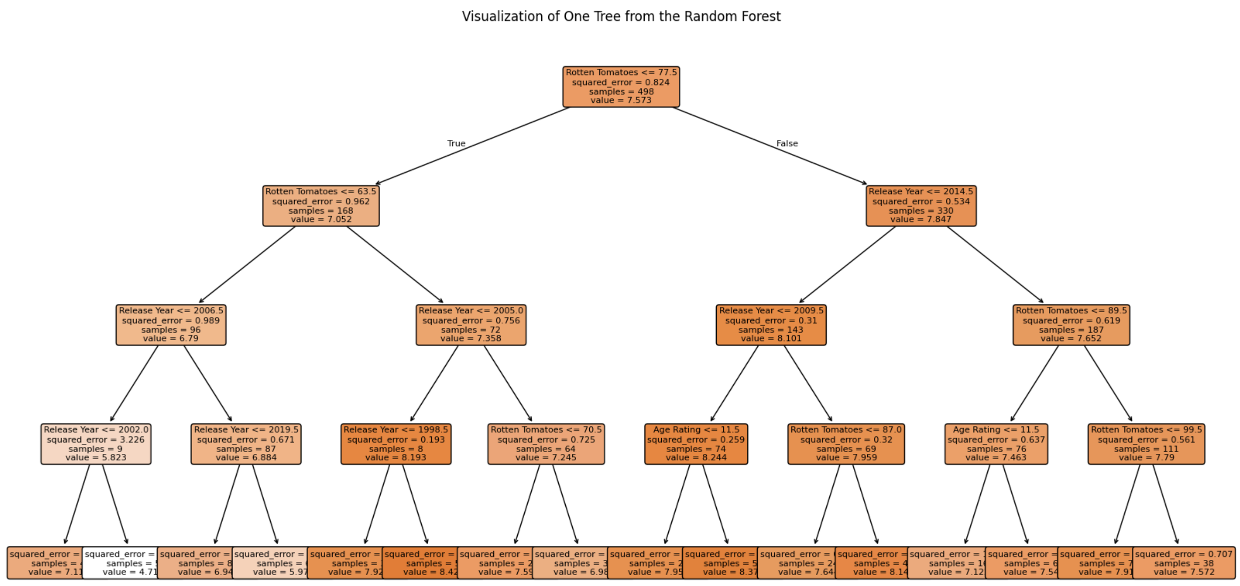
```
Mean Absolute Error (MAE): 0.47
R² Score (Model Accuracy): 0.35
```

In [29]:

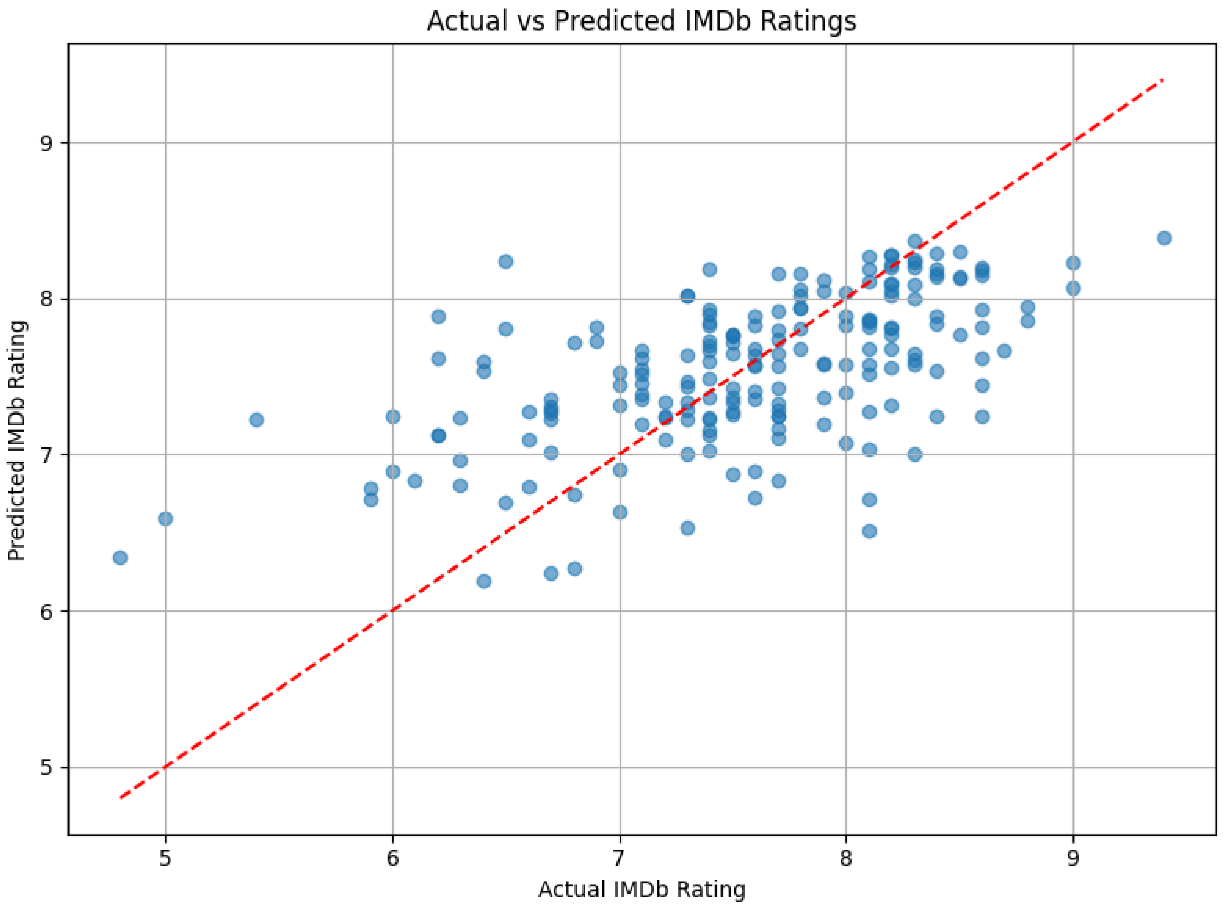
```
def get_mae(depth, train_X, val_X, train_y, val_y):
    model = RandomForestRegressor(n_estimators = 100, max_depth=depth, random_state=1)
    model.fit(train_X, train_y)
    preds_val = model.predict(val_X)
    mae = mean_absolute_error(val_y, preds_val)
    return(mae)

depths = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 15, 20]
mae_values = []

for depth in depths:
    mean_abs_error = get_mae(depth, X_train, X_test, y_train, y_test)
    mae_values.append(mean_abs_error)

plt.figure(figsize=(8,5))
plt.plot(depths, mae_values, marker='o')
plt.title('Tree Depth vs Mean Absolute Error (MAE)')
plt.xlabel('Max Depth of Trees')
plt.ylabel('Mean Absolute Error')
plt.grid(True)
plt.show()
```



In [30]:
```
from sklearn.tree import plot_tree
import matplotlib.pyplot as plt

# Pick one tree from the forest
one_tree = model.estimators_[0]

# Plot that tree
plt.figure(figsize=(20, 10))  # Make it big enough
plot_tree(one_tree,
          feature_names=x.columns,
          filled=True,
          rounded=True,
          fontsize=8)
plt.title('Visualization of One Tree from the Random Forest')
plt.show()
```


Visualization of One Tree from the Random Forest
Rotten Tomatoes <= 77.5 squared_error = 0.824 samples = 498 value = 7.573
True
False
Rotten Tomatoes <= 63.5 squared_error = 0.962 samples = 168 value = 7.052
Release Year <= 2014.5 squared_error = 0.534 samples = 330 value = 7.847
Release Year <= 2006.5 squared_error = 0.989 samples = 96 value = 6.79
Release Year <= 2005.0 squared_error = 0.756 samples = 72 value = 7.358
Release Year <= 2009.5 squared_error = 0.31 samples = 143 value = 8.101
Rotten Tomatoes <= 89.5 squared_error = 0.619 samples = 187 value = 7.652
Release Year <= 2002.0 squared_error = 3.226 samples = 9 value = 5.823
Release Year <= 2019.5 squared_error = 0.671 samples = 87 value = 6.884
Release Year <= 1998.5 squared_error = 0.193 samples = 8 value = 8.193
Rotten Tomatoes <= 70.5 squared_error = 0.725 samples = 64 value = 7.245
Age Rating <= 11.5 squared_error = 0.259 samples = 74 value = 8.244
Rotten Tomatoes <= 87.0 squared_error = 0.32 samples = 69 value = 7.959
Age Rating <= 11.5 squared_error = 0.637 samples = 76 value = 7.463
Rotten Tomatoes <= 99.5 squared_error = 0.561 samples = 111 value = 7.79
squared_error = 0.707 samples = 38 value = 7.572

In [31]:
```
import matplotlib.pyplot as plt

# Scatter plot
plt.figure(figsize=(8, 6))
plt.scatter(y_test, y_pred, alpha=0.6)
plt.plot([y_test.min(), y_test.max()], [y_test.min(), y_test.max()], '--r')  # Perfect
plt.xlabel('Actual IMDb Rating')
plt.ylabel('Predicted IMDb Rating')
plt.title('Actual vs Predicted IMDb Ratings')
plt.grid(True)
plt.tight_layout()
plt.show()
```


Actual vs Predicted IMDb Ratings
Predicted IMDb Rating
Actual IMDb Rating
5
6
7
8
9