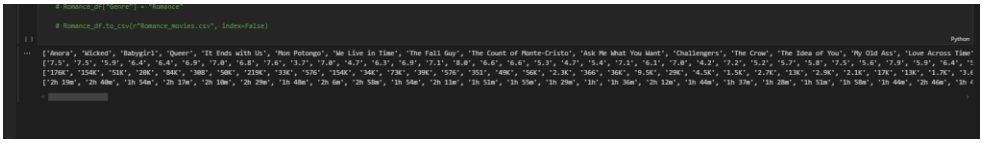
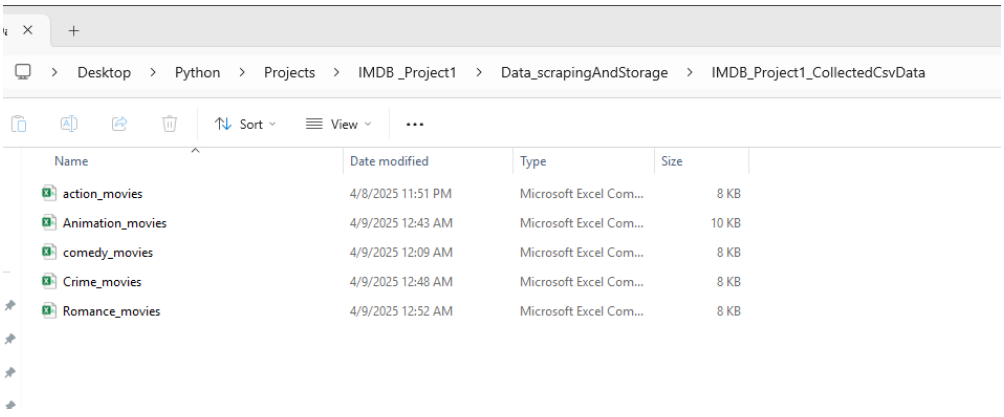
Results:

1. Data Scraping and Storage






```python
# Connect to the new database created //imdb_movies
conn = mysql.connector.connect(
    host="localhost",
    user="dhiviya",
    password="MySQL@25",
    database="imdb_movies"
)
cursor = conn.cursor()
print("Successfully connected to the 'imdb_movies' database!")
query = "SELECT * FROM imdb_movies;"
moviesTable_df = pd.read_sql(query, conn)
print(moviesTable_df)
# print(moviesTable_df.head()) # Display first few rows

# cursor.execute("TRUNCATE TABLE imdb_movies;")
# conn.commit()

cursor.close()
conn.close()
```

[6]

```
Successfully connected to the 'imdb_movies' database!
        id                    title rating votes duration    genre
0        1        Kraven the Hunter    5.5   52K    2h 7m   Action
1        2             Gladiator II    6.5  225K   2h 28m   Action
2        3                 Twisters    6.5  165K    2h 2m   Action
3        4     Sonic the Hedgehog 3    6.9   57K   1h 50m   Action
4        5    Venom: The Last Dance    6.0  114K   1h 50m   Action
..     ...                      ...    ...   ...      ...      ...
995    996       The Everything Pot    7.3    32   1h 30m  Romance
996    997          My Ex's Wedding    8.6    46   1h 35m  Romance
997    998                     Else    6.1   230   1h 40m  Romance
998    999  A Merry Royal Christmas    5.2   144   1h 28m  Romance
999   1000   Chainsaws Were Singing    7.2   355   1h 57m  Romance

[1000 rows x 6 columns]
C:\Users\v-dhramaraj\AppData\Local\Temp\ipykernel_36740\2968407491.py:11: UserWarning: pandas only supports SQLAlc
  moviesTable_df = pd.read_sql(query, conn)
```

DATA Cleaning

```
# print(movies_df)

## Create Data frame from exisiting movies_df and clean data

## 1. Remove rows with any null values
## 2. Remove rows where any column valu has 0
## 3. Change values ok to 1000
## 4. Convert duration to HH:MM format

movies_clean_df = movies_df.dropna()
movies_clean_df = movies_clean_df[~movies_clean_df.eq('0').any(axis=1)]
movies_clean_df["votes"] = movies_clean_df["votes"].apply(
    lambda x: str(int(float(x.replace("K", "")) * 1000)) if "K" in str(x) else str(int(x))
)
# movies_clean_df.loc[24] # To Check: Select row with index 24 where vote value is 2.3k, votes should be 2300 with the above K value

movies_clean_df["Duration in HH:MM"] = movies_clean_df["duration"].str.extract(r'(\d+)h', expand=False).fillna(0).astype(int).astype(str).str.zfill(2) + ":" + \
                                       movies_clean_df["duration"].str.extract(r'(\d+)m', expand=False).fillna(0).astype(int).astype(str).str.zfill(2)
# movies_clean_df.loc[90] # To Check: Select row with index 90 where duration value is 44mm, Duration in HH:MM should be 00:44 with the above HH:MM conversion
movies_clean_df = movies_clean_df[movies_clean_df["Duration in HH:MM"] != "00:00"] # Delete rows where the duration is "00:00"

# Verify the cleaned dataset
movies_clean_df = movies_clean_df.reset_index(drop=True) #Reset index value in order after data cleaning
print(movies_clean_df.info()) # Show dataset summary
movies_clean_df
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 967 entries, 0 to 966
Data columns (total 7 columns):
 #   Column             Non-Null Count  Dtype
---  ------             --------------  -----
 0   id                 967 non-null    int64
 1   title              967 non-null    object
 2   rating             967 non-null    object
 3   votes              967 non-null    object
 4   duration           967 non-null    object
 5   genre              967 non-null    object
 6   Duration in HH:MM  967 non-null    object
dtypes: int64(1), object(6)
memory usage: 53.0+ KB
None
```

	id	title	rating	votes	duration	genre	Duration in HH:MM
0	1	Kraven the Hunter	5.5	52000	2h 7m	Action	02:07
1	2	Gladiator II	6.5	225000	2h 28m	Action	02:28
2	3	Twisters	6.5	165000	2h 2m	Action	02:02
3	4	Sonic the Hedgehog 3	6.9	57000	1h 50m	Action	01:50
4	5	Venom: The Last Dance	6.0	114000	1h 50m	Action	01:50
...	...	...	...	...	...	...	...
962	996	The Everything Pot	7.3	32	1h 30m	Romance	01:30
963	997	My Ex's Wedding	8.6	46	1h 35m	Romance	01:35
964	998	Else	6.1	230	1h 40m	Romance	01:40
965	999	A Merry Royal Christmas	5.2	144	1h 28m	Romance	01:28
966	1000	Chainsaws Were Singing	7.2	355	1h 57m	Romance	01:57

967 rows × 7 columns

2. Data Analysis, Visualization, and Filtration

```
# Task 2: Data Analysis, Visualization, and Filtration # Interactive Visualizations
# Using Python and Streamlit, create dynamic visualizations for:

# Top 10 Movies by Rating and Voting Counts: Identify movies with the highest ratings and significant voting engagement.
# Genre Distribution: Plot the count of movies for each genre in a bar chart.
# Average Duration by Genre: Show the average movie duration per genre in a horizontal bar chart.
# Voting Trends by Genre: Visualize average voting counts across different genres.
# Rating Distribution: Display a histogram or boxplot of movie ratings.
# Genre-Based Rating Leaders: Highlight the top-rated movie for each genre in a table.
# Most Popular Genres by Voting: Identify genres with the highest total voting counts in a pie chart.
# Duration Extremes: Use a table or card display to show the shortest and longest movies.
# Ratings by Genre: Use a heatmap to compare average ratings across genres.
# Correlation Analysis: Analyze the relationship between ratings and voting counts using a scatter plot.
```

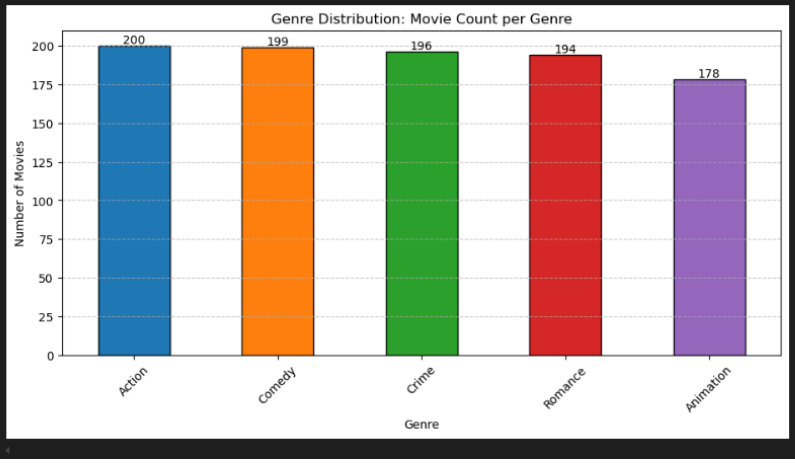
```python
# Sort movies by rating (highest first) & votes (highest first)

movies_clean_df["votes"] = movies_clean_df["votes"].astype(int) # convert datatype for acurate values
movies_clean_df["rating"] = movies_clean_df["rating"].astype(float)

top10Rating_movies_df = pd.DataFrame()
top10Rating_movies_df = movies_clean_df.sort_values(by=["rating"], ascending=False).head(10)
top10Rating_movies_df = top10Rating_movies_df.sort_values(by=["votes"], ascending=False, ignore_index=True)

top10Rating_movies_df
```

✓ 0.0s

	id	title	rating	votes	duration	genre	Duration in HH:MM
0	215	Attack on Titan the Movie: The Last Attack	9.2	15000	2h 25m	Animation	02:25
1	50	Attack on Titan the Movie: The Last Attack	9.2	15000	2h 25m	Action	02:25
2	206	Solo Leveling: ReAwakening	8.9	11000	2h 1m	Animation	02:01
3	16	Solo Leveling: ReAwakening	8.9	11000	2h 1m	Action	02:01
4	770	The Birds Who Fear Death	9.2	73	1h 42m	Crime	01:42
5	307	(S)KiDS	9.8	72	1h 25m	Animation	01:25
6	256	Mars	8.9	21	1h 24m	Animation	01:24
7	366	Nothing Unusual	9.7	12	1h 32m	Animation	01:32
8	399	Rocky and Bullwinkle	9.1	12	1h 40m	Animation	01:40
9	663	Reputation	9.3	8	1h 23m	Crime	01:23

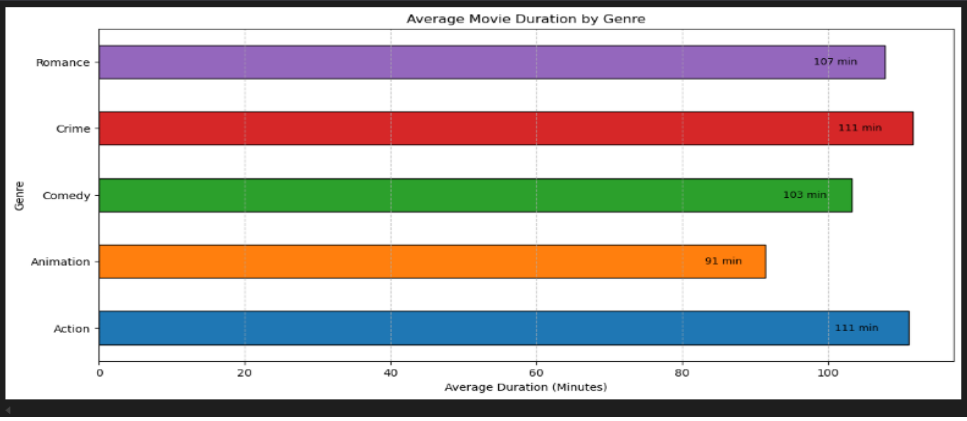
```python
# 2. Genre Distribution: Plot the count of movies for each genre in a bar chart.
import matplotlib.pyplot as plt
# Count movies per genre
count_movies_genre = movies_clean_df["genre"].value_counts()
colors = plt.cm.tab10.colors[:len(count_movies_genre)]

# Plot the bar chart
plt.figure(figsize=(11, 5))
bars=count_movies_genre.plot(kind="bar", color=colors, edgecolor="black")

# Add count values on top of bars
for bar in bars.patches:
    plt.text(
        bar.get_x() + bar.get_width() / 2,
        bar.get_height(),
        int(bar.get_height()),
        ha="center", va="bottom", fontsize=10, color="black"
    )

plt.title("Genre Distribution: Movie Count per Genre")
plt.xlabel("Genre")
plt.ylabel("Number of Movies")
plt.xticks(rotation=45)
plt.grid(axis="y", linestyle="--", alpha=0.7)

plt.show()
```

✓ 0.4s



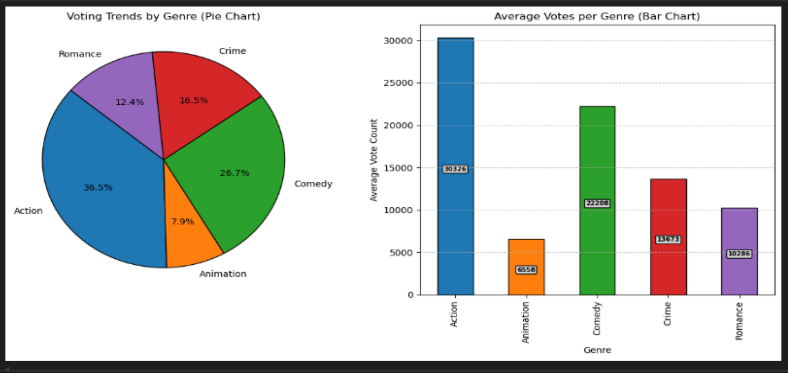
```python
# 3. Average Duration by Genre: Show the average movie duration per genre in a horizontal bar chart.
# Calculate average duration per genre
movies_clean_df["total_minutes"] = movies_clean_df["Duration in HH:MM"].apply(
    lambda x: int(x.split(":")[0]) * 60 + int(x.split(":")[1]) if isinstance(x, str) and ":" in x else None
)

movies_clean_df.dropna(subset=["total_minutes"], inplace=True) # Drop null values before averaging
avg_duration_per_genre = movies_clean_df.groupby("genre")["total_minutes"].mean() # Calculate the average duration per genre

# Plot horizontal bar chart
plt.figure(figsize=(13, 6))
barsh = avg_duration_per_genre.plot(kind="barh", color=colors, edgecolor="black")

# Add values
for bar in barsh.containers[0]:
    plt.text(
        bar.get_width()/ 1.1,
        bar.get_y() + bar.get_height() / 2,
        f"{int(bar.get_width())} min",
        ha="left", va="center", fontsize=9, color="black"
    )

plt.title("Average Movie Duration by Genre")
plt.xlabel("Average Duration (Minutes)")
plt.ylabel("Genre")
plt.grid(axis="x", linestyle="--", alpha=0.7)

plt.show()
```

0.1s



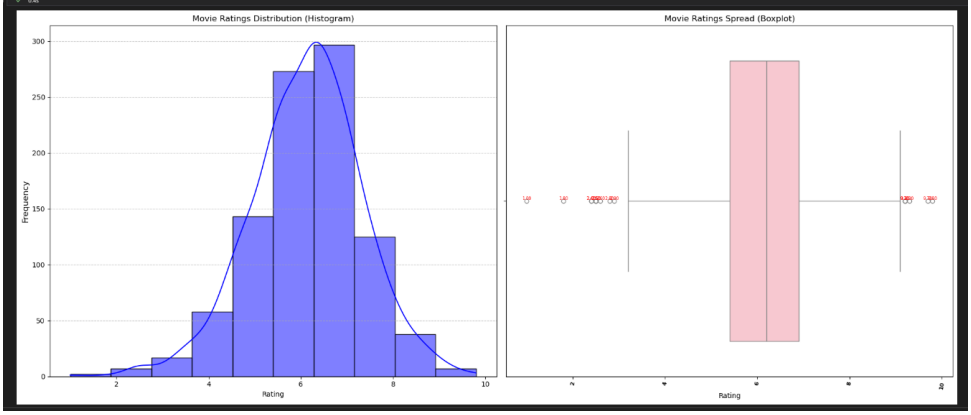

```python
# Voting Trends by Genre: Visualize average voting counts across different genres.

avg_votes_genre = movies_clean_df.groupby("genre")["votes"].mean() # Calculate average votes per genre

# Creating figure with two subplots: one for the pie chart, one for the bar chart
fig, axes = plt.subplots(1, 2, figsize=(12, 6))

# Pie Chart
axes[0].pie(
    avg_votes_genre,
    labels=avg_votes_genre.index,
    autopct="%1.1f%%",
    colors=plt.cm.tab10.colors[:len(avg_votes_genre)],
    startangle=140,
    wedgeprops={"edgecolor": "black"}
)
axes[0].set_title("Voting Trends by Genre (Pie Chart)")

# Bar Chart
bar_chart=avg_votes_genre.plot(kind="bar", ax=axes[1], color=colors, edgecolor="black")
for bar in bar_chart.patches:
    plt.text(
        bar.get_x() + bar.get_width() / 2,
        bar.get_height() / 2,
        int(bar.get_height()),
        ha="center", va="top", fontsize=7, fontweight="bold", color="black",
        bbox=dict(facecolor="lightgrey", edgecolor="black", boxstyle="round,pad=0.2")
    )
axes[1].set_title("Average Votes per Genre (Bar Chart)")
axes[1].set_xlabel("Genre")
axes[1].set_ylabel("Average Vote Count")
axes[1].grid(axis="y", linestyle="--", alpha=0.7)

# Show both chart
plt.tight_layout()
plt.show()
```

0.3s



```python
# Creating figure with two subplots: Histogram & Boxplot
fig, axes = plt.subplots(1, 2, figsize=(10, 8))

plt.xticks(rotation=80, fontsize=8, fontweight="bold")  # Rotates x-axis labels & makes them readable

# Histogram
sns.histplot(movies_clean_df["rating"], bins=10, kde=True, color="blue", ax=axes[0])
axes[0].set_title("Movie Ratings Distribution (Histogram)")
axes[0].set_xlabel("Rating")
axes[0].set_ylabel("Frequency", fontsize=12)
axes[0].grid(axis="y", linestyle="--", alpha=0.7)

# Boxplot: Highlights median & outliers
sns.boxplot(x=movies_clean_df["rating"], color="pink", ax=axes[1])
axes[1].set_title("Movie Ratings Spread (Boxplot)")
axes[1].set_xlabel("Rating")

# Annotate outliers
outliers = movies_clean_df["rating"][
    (movies_clean_df["rating"] < movies_clean_df["rating"].quantile(0.25) - 1.5 * (movies_clean_df["rating"].quantile(0.75) - movies_clean_df["rating"].quantile(0.25))) |
    (movies_clean_df["rating"] > movies_clean_df["rating"].quantile(0.75) + 1.5 * (movies_clean_df["rating"].quantile(0.75) - movies_clean_df["rating"].quantile(0.25)))
]
for outlier in outliers:
    axes[1].text(outlier, 0, f"{outlier:.2f}", ha="center", va="bottom", fontsize=6, color="Red")

# # Show both plots
plt.tight_layout()
plt.show()
```

✓ 0.4s




```python
# # Genre-Based Rating Leaders: Highlight the top-rated movie for each genre in a table.
# Highlighted_movies=top_movies = movies_clean_df.loc[movies_clean_df.groupby("genre")["rating"].idxmax()]
# Display the top 5 rated movies in each genre
toprated_movies = (
    movies_clean_df.groupby("genre", group_keys=False).apply(lambda x: x.nlargest(5, "rating"))  # Select the top 5 movies in each genre
)
# toprated_movies= toprated_movies[["id","title","rating","genre"]]
top_movies = toprated_movies.loc[toprated_movies.groupby("genre")["rating"].idxmax()].index # Identify the index value of the top-rated movies in each genre

# Optional: Creating a class to highlight only the top-rated rows in each genre
def highlight_top_movie(row):
    return ['color: green; font-weight: bold' if row.name in top_movies else '' for _ in row]
# Output
print("\n 🎬 **Top 5 Rated Movies in Each Genre** 🎬 ")
toprated_movies =toprated_movies.style.apply(highlight_top_movie, axis=1)
toprated_movies
```

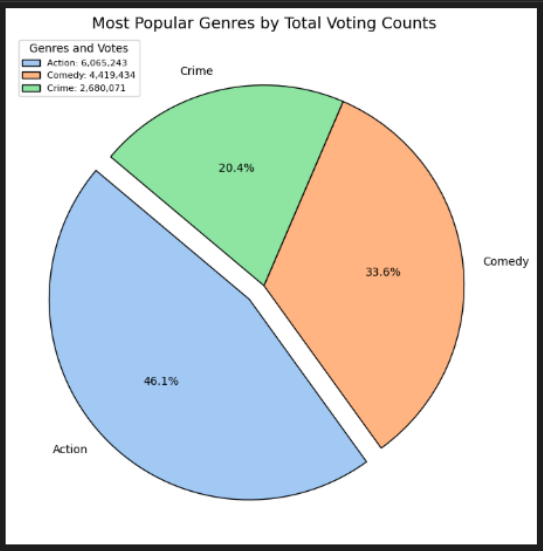
✓ 0.3s

```
C:\Users\v-dhramaraj\AppData\Local\Temp\ipykernel_16008\417532917.py:5: DeprecationWarning: DataFrameGroupBy.apply operated on the grouping columns. This behavior is
  movies_clean_df.groupby("genre", group_keys=False).apply(lambda x: x.nlargest(5, "rating"))  # Select the top 5 movies in each genre

 🎬 **Top 5 Rated Movies in Each Genre** 🎬
```

	id	title	rating	votes	duration	genre	Duration in HH:MM	total_minutes
49	50	Attack on Titan the Movie: The Last Attack	9.200000	15000	2h 25m	Action	02:25	145
15	16	Solo Leveling: ReAwakening	8.900000	11000	2h 1m	Action	02:01	121
103	104	Black Heat	8.600000	117	1h 33m	Action	01:33	93
172	173	Black Creek	8.600000	7	1h 56m	Action	01:56	116
7	8	Dune: Part Two	8.500000	620000	2h 46m	Action	02:46	166
302	307	(S)KIDS	9.800000	72	1h 25m	Animation	01:25	85
352	366	Nothing Unusual	9.700000	12	1h 32m	Animation	01:32	92
214	215	Attack on Titan the Movie: The Last Attack	9.200000	15000	2h 25m	Animation	02:25	145
377	399	Rocky and Bullwinkle	9.100000	12	1h 40m	Animation	01:40	100
205	206	Solo Leveling: ReAwakening	8.900000	11000	2h 1m	Animation	02:01	121
451	474	Psycho Therapy: The Shallow Tale of a Writer Who Decided to Write about a Serial Killer	8.600000	93	1h 42m	Comedy	01:42	102
474	497	Sketch	8.400000	47	1h 32m	Comedy	01:32	92
575	599	Desert Fiends	8.300000	394	1h 46m	Comedy	01:46	106
538	562	We're All Gonna Die	8.200000	91	1h 50m	Comedy	01:50	110
569	593	Dan Da Dan: First Encounter	8.200000	2700	1h 23m	Comedy	01:23	83
639	663	Reputation	9.200000	8	1h 23m	Crime	01:23	83
745	770	The Birds Who Fear Death	9.200000	73	1h 42m	Crime	01:42	102
605	629	Maharaja	8.400000	66000	2h 21m	Crime	02:21	141
668	692	Barron's Cove	8.200000	28	1h 56m	Crime	01:56	116
691	715	Guns & Moses	8.100000	44	1h 34m	Crime	01:34	94
886	915	Given 3: To the Sea	8.800000	35	1h 20m	Romance	01:20	80
908	938	The Southern Chronicles	8.800000	2500	2h	Romance	02:00	120
904	934	Ajosepo	8.700000	54	2h 14m	Romance	02:14	134
946	980	Switch Up	8.600000	27	1h 45m	Romance	01:45	105
963	997	My Ex's Wedding	8.600000	46	1h 35m	Romance	01:35	95

```python
# Most Popular Genres by Voting: Identify genres with the highest total voting counts in a pie chart.

top_votes = movies_clean_df.groupby("genre")["votes"].sum().sort_values(ascending=False) #Sort movies by votes (descending) and then by genre

# Limit the number of genres to top 3 for clarity
top_votes = top_votes.nlargest(3)

# Plot pie chart
plt.figure(figsize=(8, 8))
plt.pie(
    top_votes,
    labels=top_votes.index,  #Use the index (genres) as labels
    autopct="%1.1f%%",
    colors=sns.color_palette("pastel")[:len(top_votes)],
    startangle=140,
    wedgeprops={"edgecolor": "black"},
    explode=[0.1 if i == 0 else 0 for i in range(len(top_votes))]  # Emphasize highest voted genre
)
# Add a custom legend with genre names and voting counts
plt.legend(
    loc="upper left",
    labels=[f"{genre}: {vote:,}" for genre, vote in top_votes.items()],
    title="Genres and Votes",
    fontsize=8
)

plt.title("Most Popular Genres by Total Voting Counts", fontsize=14)
plt.show()
```

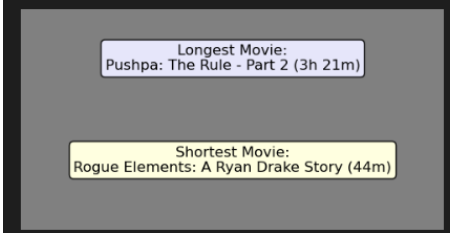
[18] ✓ 0.2s




```python
# Duration Extremes: Use a table or card display to show the shortest and longest movies.

shortest_movie = movies_clean_df.loc[movies_clean_df["Duration in HH:MM"].idxmin()]
longest_movie = movies_clean_df.loc[movies_clean_df["Duration in HH:MM"].idxmax()]

# Create a table with results
table_duration = pd.DataFrame([shortest_movie, longest_movie])
print(table_duration[["title", "Duration in HH:MM"]])

# Card-style display
fig, ax = plt.subplots(facecolor="grey",figsize=(6, 3))
ax.text(0.5, 0.3, f"Shortest Movie:\n{shortest_movie['title']} ({shortest_movie['duration']})",
        fontsize=12, ha="center", va="center", bbox=dict(facecolor="lightyellow", edgecolor="black", boxstyle="round,pad=0.3"))
ax.text(0.5, 0.8, f"Longest Movie:\n{longest_movie['title']} ({longest_movie['duration']})",
        fontsize=12, ha="center", va="center", bbox=dict(facecolor="lavender", edgecolor="black", boxstyle="round,pad=0.3"))
ax.set_axis_off()  # Hide axes
```

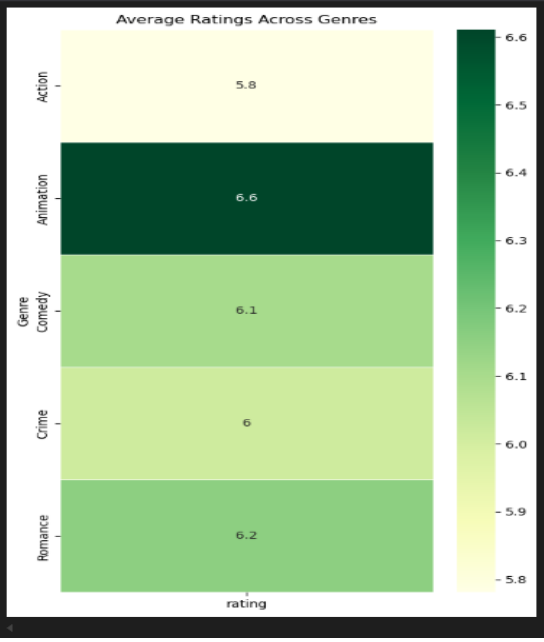
✓ 0.0s

```
                              title Duration in HH:MM
90  Rogue Elements: A Ryan Drake Story             00:44
6            Pushpa: The Rule - Part 2             03:21
```



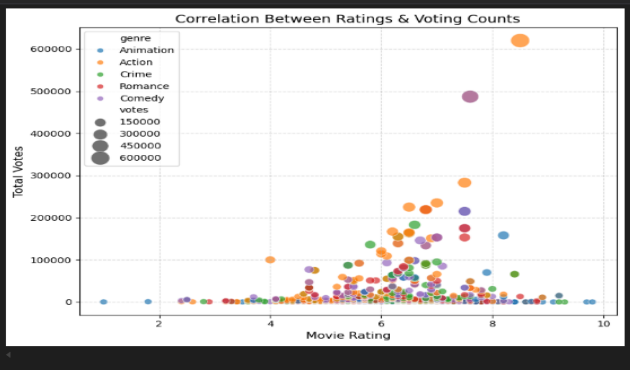
```python
# Ratings by Genre: Use a heatmap to compare average ratings across genres.

# Calculate average ratings for each genre
average_ratings = movies_clean_df.groupby("genre")["rating"].mean().reset_index()

# Pivot data for heatmap
pivot_data = average_ratings.pivot_table(index="genre", values="rating")
plt.figure(figsize=(6, 10))
sns.heatmap(
    pivot_data,
    annot=True,
    cmap="YlGn",
    linewidths=0.5,
    # vmin=1,  # Set minimum value of the scale to 1
    # vmax=10  # Set maximum value of the scale to 10
)
plt.title("Average Ratings Across Genres", fontsize=12)
plt.ylabel("Genre")
plt.show()
```

0.2s




```python
# Correlation Analysis: Analyze the relationship between ratings and voting counts using a scatter plot.
movies_clean_df_sorted = movies_clean_df.sort_values(by="votes", ascending=True)

# # Display original and converted votes
# print(movies_clean_df_sorted[["title", "votes"]])

# Create the scatter plot
plt.figure(figsize=(8, 6))
sns.scatterplot(
    data=movies_clean_df_sorted,
    x="rating",
    y="votes",
    hue="genre",
    size="votes",
    sizes=(50, 300),
    alpha=0.7
)
# # Set the y-axis range to start from certain range
# plt.ylim(1000, movies_clean_df["votes"].max() + 10000)

plt.title("Correlation Between Ratings & Voting Counts", fontsize=14)
plt.xlabel("Movie Rating", fontsize=12)
plt.ylabel("Total Votes", fontsize=12)
plt.grid(True, linestyle="--", alpha=0.5)

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

0.3s



Interactive Visualizations Using Python and Streamlit, create dynamic visualizations