OPERATIONS ON Netflix Movies and TV Shows - CLEANED

The "Netflix Movies and TV Shows" dataset is a tabular dataset with listings for all movies and tv shows on Netflix. Fields include director, title, ratings, release year, duration, and more.

```
# QUESTION 1: Content Type Distribution (Pie Chart)
# ============================================
# QUESTION: What is the proportion of Movies vs TV Shows in the Netflix catalog?
#
# VALIDATION/JUSTIFICATION:
# This visualization is essential because:
# 1. It provides a quick overview of Netflix's content strategy (movie-focused vs series-focused)
# 2. Pie charts are ideal for showing parts of a whole when there are few categories (2 in this case)
# 3. Percentages help stakeholders understand resource allocation and content balance
# 4. This metric influences content acquisition decisions and user interface design
# 5. Investors and analysts use this to assess Netflix's content diversification strategy

import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

# Set style for better-looking plots
sns.set_style("darkgrid")
plt.rcParams['figure.figsize'] = (12, 6)

# Step 1: Load the Netflix dataset (robust path handling)
def load_netflix_dataset() -> pd.DataFrame:
    candidate_paths = (
```

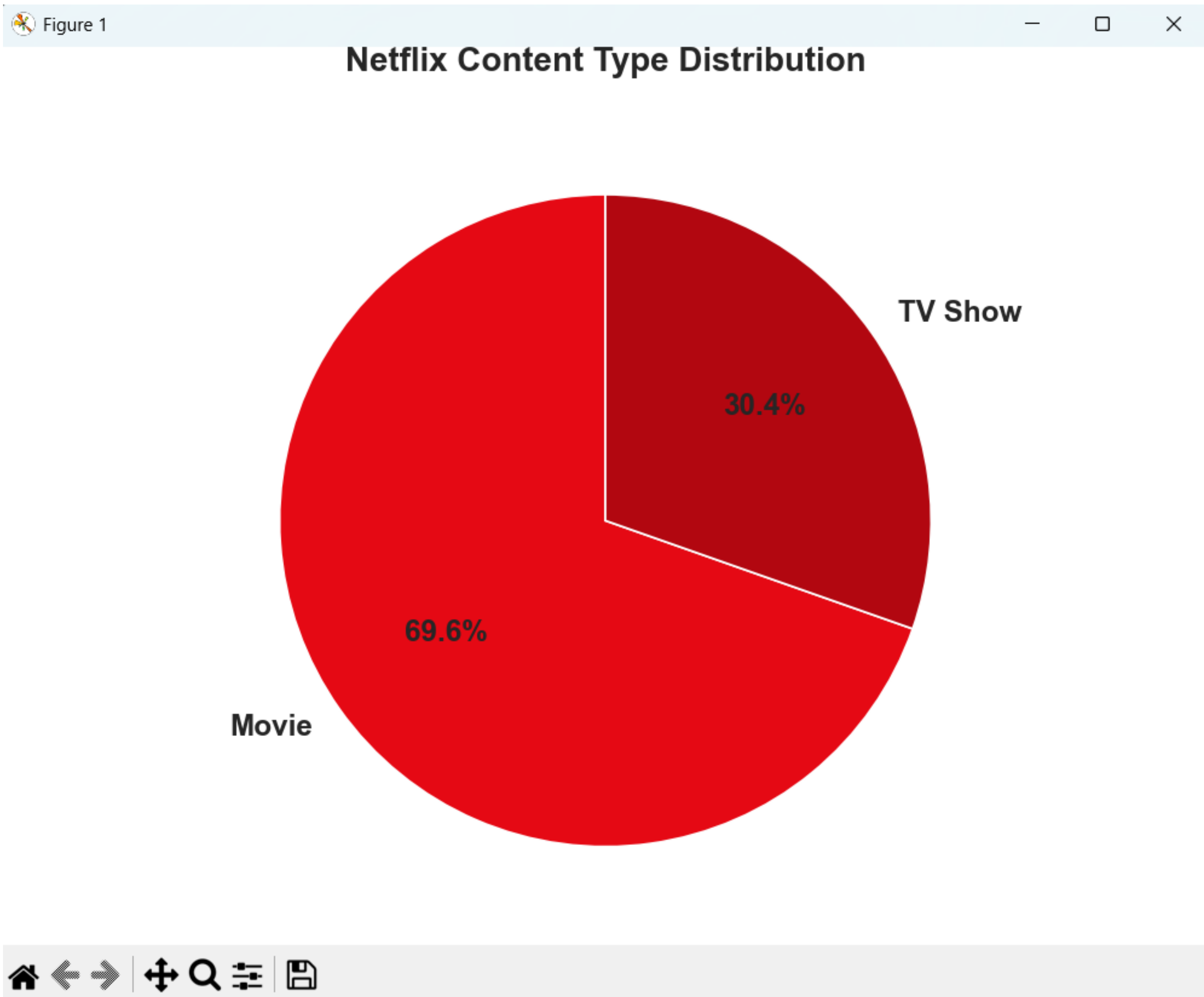
```
        '../netflix_titles_CLEANED.csv',
        '../netflix_titles.CLEANED.csv',
        'netflix_titles_CLEANED.csv',
        'netflix_titles.CLEANED.csv',
    )
    last_err = None
    for p in candidate_paths:
        try:
            return pd.read_csv(p)
        except FileNotFoundError as e:
            last_err = e
            continue
    raise last_err

df = load_netflix_dataset()

print("\n" + "="*50)
print("QUESTION 1: Content Type Distribution")
print("="*50)

type_counts = df['type'].value_counts()
print("\nContent Type Counts:")
print(type_counts)

plt.figure(figsize=(8, 8))
colors = ['#E50914', '#B20710']
plt.pie(type_counts.values, labels=type_counts.index,
autopct='%1.1f%%',
        colors=colors, startangle=90, textprops={'fontsize': 14,
'weight': 'bold'})
plt.title('Netflix Content Type Distribution', fontsize=16,
weight='bold', pad=20)
plt.tight_layout()
plt.show()
```

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# ==========================================
# QUESTION 2: Top 10 Countries by Content (Horizontal Bar Chart)
# ==========================================
# QUESTION: Which countries produce the most content available on
Netflix?
#
# VALIDATION/JUSTIFICATION:
# This analysis is critical because:
# 1. It reveals Netflix's global content sourcing strategy and market
focus
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# 2. Horizontal bar charts are excellent for comparing categories with
long names (country names)
# 3. Top 10 filtering prevents overcrowding while showing the most
significant contributors
# 4. This helps identify which regional markets Netflix is investing in
most heavily
# 5. Content localization teams can use this to prioritize dubbing and
subtitle efforts
# 6. It shows cultural diversity and international expansion patterns
# 7. Regional licensing and production partnerships can be evaluated
based on this data

import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

sns.set_style("darkgrid")
plt.rcParams['figure.figsize'] = (12, 6)

def load_netflix_dataset() -> pd.DataFrame:
    candidate_paths = (
        '../netflix_titles_CLEANED.csv',
        '../netflix_titles.CLEANED.csv',
        'netflix_titles_CLEANED.csv',
        'netflix_titles.CLEANED.csv',
    )
    last_err = None
    for p in candidate_paths:
        try:
            return pd.read_csv(p)
        except FileNotFoundError as e:
            last_err = e
            continue
    raise last_err

df = load_netflix_dataset()

print("\n" + "="*50)
print("QUESTION 2: Top Countries by Content")
print("="*50)

# Extract first country from countries column (some have multiple
countries)
```

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df['primary_country'] =
df['countries'].fillna('Unknown').str.split(',').str[0].str.strip()

country_counts = df['primary_country'].value_counts().head(10)
print("\nTop 10 Countries:")
print(country_counts)

plt.figure(figsize=(12, 6))
country_counts.plot(kind='barh', color='#E50914')
plt.title('Top 10 Countries by Netflix Content', fontsize=16,
weight='bold', pad=20)
plt.xlabel('Number of Titles', fontsize=12, weight='bold')
plt.ylabel('Country', fontsize=12, weight='bold')
plt.gca().invert_yaxis()
plt.tight_layout()
plt.show()
```
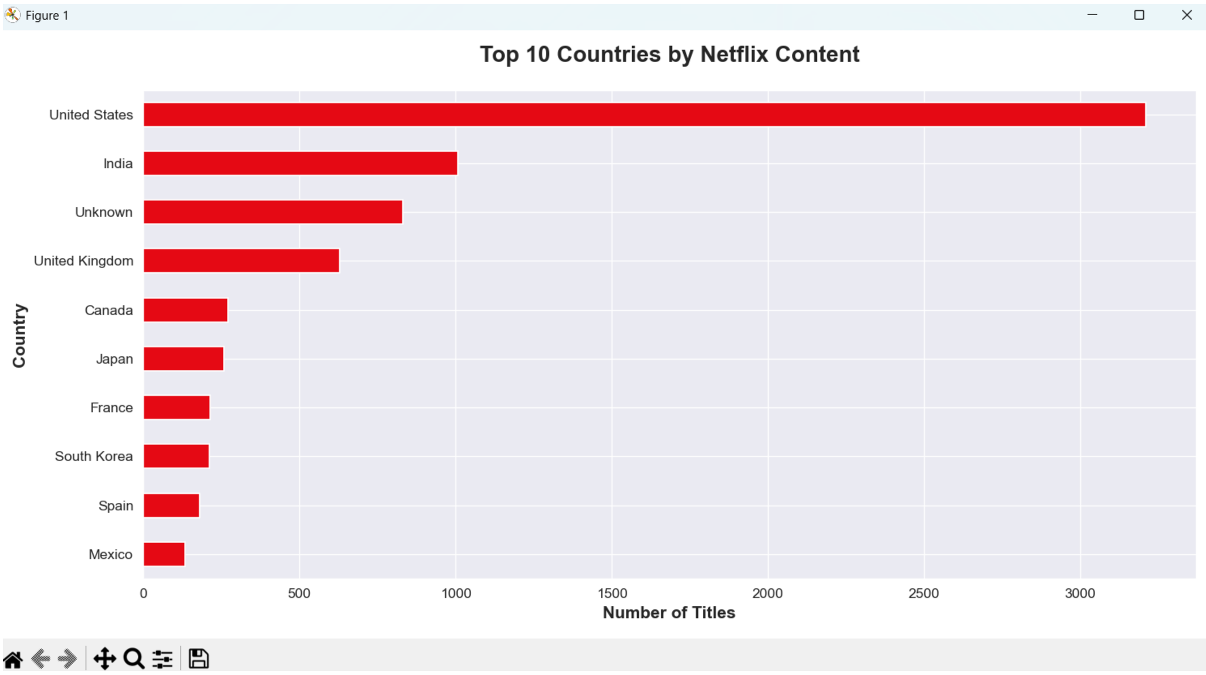
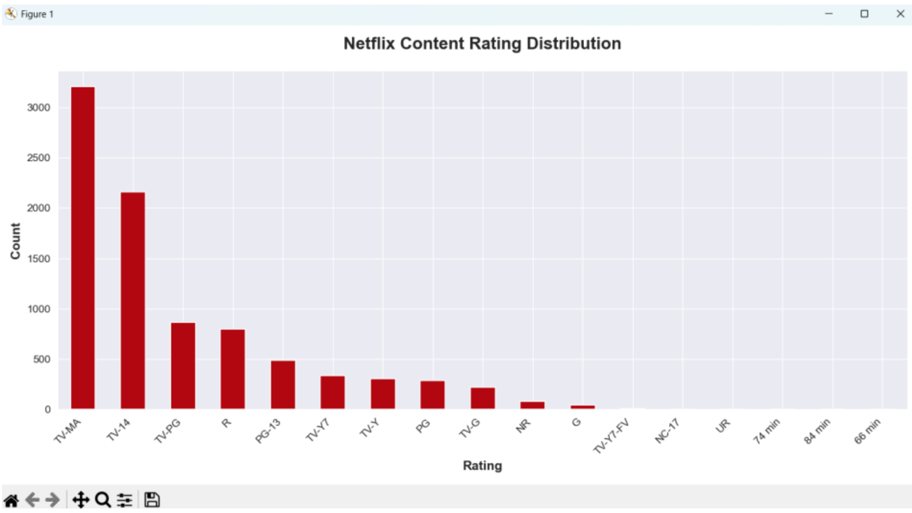



```python
# ============================================
# QUESTION 3: Content Rating Distribution (Bar Chart)
# ============================================
# QUESTION: What is the distribution of content across different
maturity ratings?
#
# VALIDATION/JUSTIFICATION:
# This visualization is important because:
# 1. It shows whether Netflix caters more to adults, families, or
children
# 2. Rating distribution affects parental control features and content
warnings
# 3. Advertisers need this data to determine appropriate ad placements
# 4. Content compliance teams use this to ensure regional rating
requirements are met
# 5. Bar charts effectively show frequency distributions across
discrete categories
# 6. This helps in understanding target audience demographics
# 7. Family-friendly vs mature content balance is a key business metric
# 8. Different markets have different rating preferences, affecting
regional strategies

import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

sns.set_style("darkgrid")
plt.rcParams['figure.figsize'] = (12, 6)

def load_netflix_dataset() -> pd.DataFrame:
    candidate_paths = (
        '../netflix_titles_CLEANED.csv',
        '../netflix_titles.CLEANED.csv',
        'netflix_titles_CLEANED.csv',
        'netflix_titles.CLEANED.csv',
    )
    last_err = None
    for p in candidate_paths:
        try:
            return pd.read_csv(p)
```

```
        except FileNotFoundError as e:
            last_err = e
            continue
    raise last_err

df = load_netflix_dataset()

print("\n" + "="*50)
print("QUESTION 3: Content Rating Distribution")
print("="*50)

rating_counts = df['rating'].value_counts()
print("\nRating Distribution:")
print(rating_counts)

plt.figure(figsize=(12, 6))
rating_counts.plot(kind='bar', color='#B20710')
plt.title('Netflix Content Rating Distribution', fontsize=16,
weight='bold', pad=20)
plt.xlabel('Rating', fontsize=12, weight='bold')
plt.ylabel('Count', fontsize=12, weight='bold')
plt.xticks(rotation=45, ha='right')
plt.tight_layout()
plt.show()
```



```python
# ============================================
# QUESTION 4: Release Year Trend (Line Chart)
# ============================================
# QUESTION: How has the volume of content production changed over the
years?
#
# VALIDATION/JUSTIFICATION:
# This time-series analysis is valuable because:
# 1. Line charts are optimal for showing trends and patterns over
continuous time periods
# 2. It reveals whether Netflix focuses on newer content or maintains a
classic library
# 3. Spikes or drops in certain years can indicate industry events or
strategic shifts
# 4. Content freshness is a key competitive advantage in streaming
services
# 5. Historical content acquisition patterns help predict future
content needs
# 6. This helps identify the "golden age" of content production for the
platform
# 7. Investors use this to assess whether Netflix is acquiring recent
vs archival content
# 8. Marketing teams can highlight "new releases" vs "classic
collection" campaigns

import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

sns.set_style("darkgrid")
plt.rcParams['figure.figsize'] = (14, 6)

def load_netflix_dataset() -> pd.DataFrame:
    candidate_paths = (
        '../netflix_titles_CLEANED.csv',
        '../netflix_titles.CLEANED.csv',
        'netflix_titles_CLEANED.csv',
        'netflix_titles.CLEANED.csv',
    )
    last_err = None
    for p in candidate_paths:
```

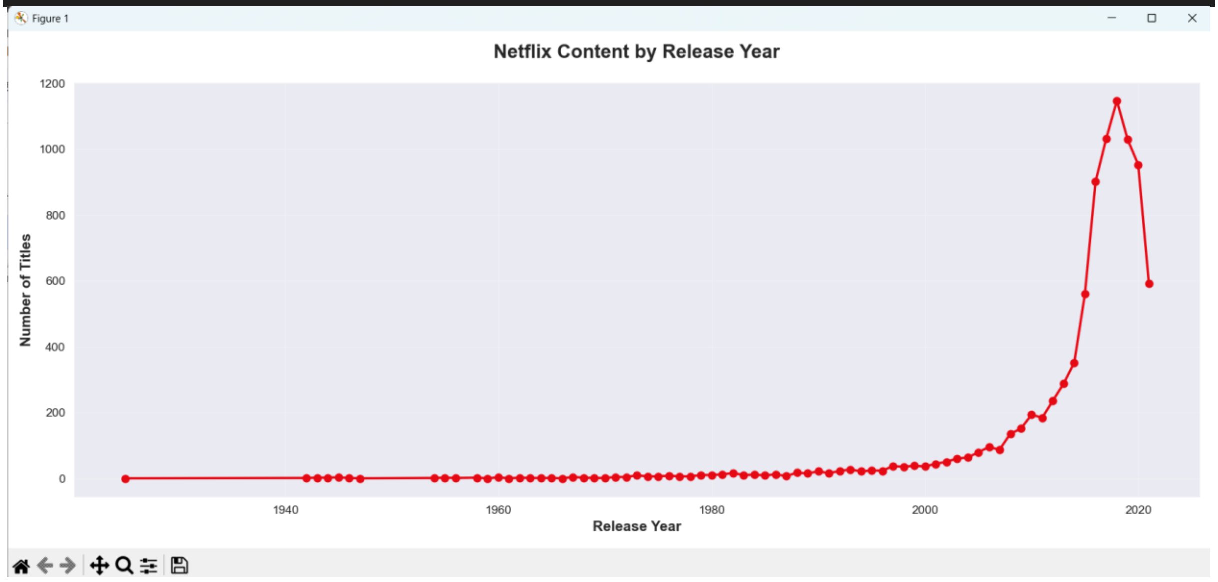
```
        try:
            return pd.read_csv(p)
        except FileNotFoundError as e:
            last_err = e
            continue
    raise last_err

df = load_netflix_dataset()

print("\n" + "="*50)
print("QUESTION 4: Content Release Year Trend")
print("="*50)

year_counts = df['release_year'].value_counts().sort_index()
print("\nContent by Release Year:")
print(year_counts.tail(10))

plt.figure(figsize=(14, 6))
plt.plot(year_counts.index, year_counts.values, marker='o',
         color='#E50914', linewidth=2, markersize=6)
plt.title('Netflix Content by Release Year', fontsize=16,
weight='bold', pad=20)
plt.xlabel('Release Year', fontsize=12, weight='bold')
plt.ylabel('Number of Titles', fontsize=12, weight='bold')
plt.grid(True, alpha=0.3)
plt.tight_layout()
plt.show()
```



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# ==============================================
# QUESTION 5: Heatmap - Content Type by Rating
# ==============================================
# QUESTION: How do content ratings vary between Movies and TV Shows?
#
# VALIDATION/JUSTIFICATION:
# This cross-tabulation analysis is powerful because:
# 1. Heatmaps excel at showing relationships between two categorical
variables
# 2. Color intensity immediately highlights which combinations are
most/least common
# 3. It reveals if movies tend to have different ratings than TV shows
# 4. Content acquisition teams can identify gaps (e.g., lack of PG-
rated TV shows)
# 5. This helps in strategic content planning to balance the catalog
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# 6. Annotation with exact counts provides precise data alongside
visual patterns
# 7. Marketing can tailor campaigns based on rating-type combinations
# 8. This validates whether content guidelines differ between movies
and series

import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

sns.set_style("darkgrid")
plt.rcParams['figure.figsize'] = (12, 6)

def load_netflix_dataset() -> pd.DataFrame:
    candidate_paths = (
        '../netflix_titles_CLEANED.csv',
        '../netflix_titles.CLEANED.csv',
        'netflix_titles_CLEANED.csv',
        'netflix_titles.CLEANED.csv',
    )
    last_err = None
    for p in candidate_paths:
        try:
            return pd.read_csv(p)
        except FileNotFoundError as e:
            last_err = e
            continue
    raise last_err

df = load_netflix_dataset()

print("\n" + "="*50)
print("QUESTION 5: Content Type vs Rating Heatmap")
print("="*50)

pivot_table = pd.crosstab(df['type'], df['rating'])
print("\nPivot Table:")
print(pivot_table)

plt.figure(figsize=(12, 6))
sns.heatmap(pivot_table, annot=True, fmt='d', cmap='Reds',
            cbar_kws={'label': 'Count'}, linewidths=0.5)
```

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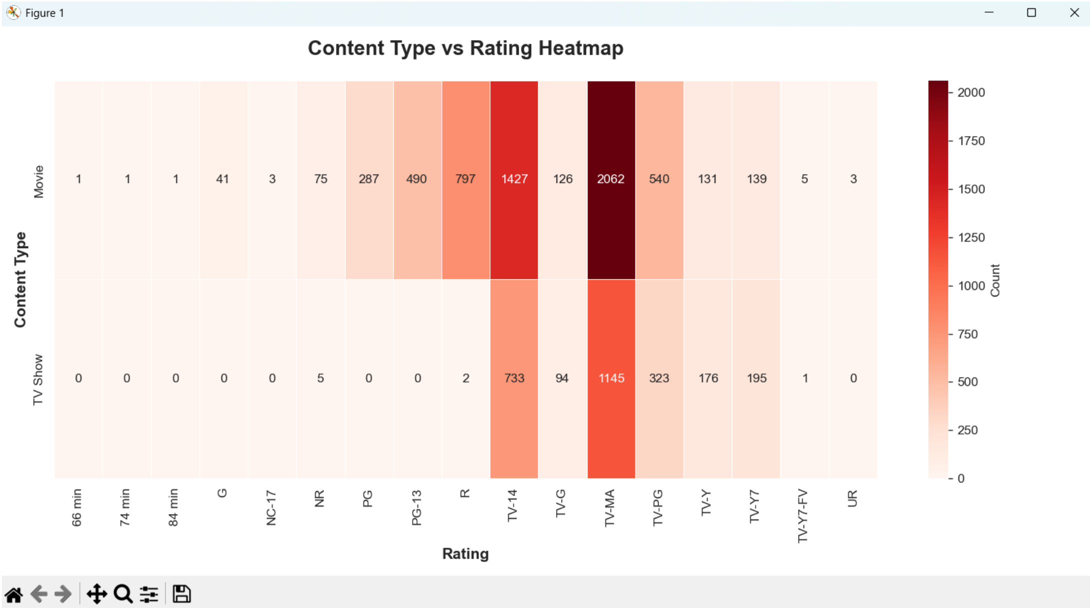
plt.title('Content Type vs Rating Heatmap', fontsize=16, weight='bold',
pad=20)
plt.xlabel('Rating', fontsize=12, weight='bold')
plt.ylabel('Content Type', fontsize=12, weight='bold')
plt.tight_layout()
plt.show()
```

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# ==========================================
# QUESTION 6: Movie Duration Distribution (Histogram)
# ==========================================
# QUESTION: What is the typical length of movies in the Netflix
catalog?
#
# VALIDATION/JUSTIFICATION:
# This distribution analysis is important because:
# 1. Histograms are ideal for showing frequency distributions of
continuous data
# 2. It reveals user preferences - are people watching short, medium,
or long films?
# 3. Content acquisition can target specific duration ranges based on
gaps
# 4. Scheduling and recommendation algorithms use duration as a key
feature
# 5. Understanding duration patterns helps in content categorization
("Quick Watch", "Feature Films")
# 6. Production teams can benchmark their content against industry
standards
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# 7. This identifies outliers (very short or very long movies) that may
need special handling
# 8. User session time and engagement metrics correlate strongly with
content duration

import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

sns.set_style("darkgrid")
plt.rcParams['figure.figsize'] = (12, 6)

def load_netflix_dataset() -> pd.DataFrame:
    candidate_paths = (
        '../netflix_titles_CLEANED.csv',
        '../netflix_titles.CLEANED.csv',
        'netflix_titles_CLEANED.csv',
        'netflix_titles.CLEANED.csv',
    )
    last_err = None
    for p in candidate_paths:
        try:
            return pd.read_csv(p)
        except FileNotFoundError as e:
            last_err = e
            continue
    raise last_err

df = load_netflix_dataset()

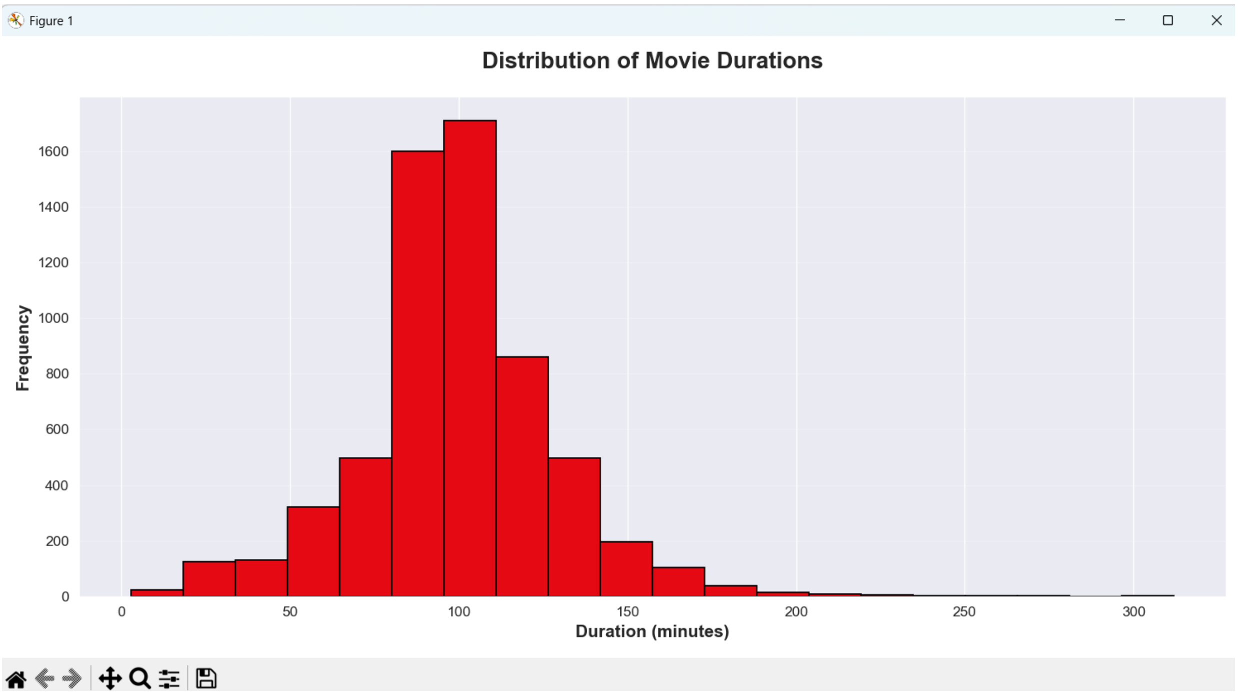
print("\n" + "="*50)
print("QUESTION 6: Movie Duration Distribution")
print("="*50)

movies_df = df[df['type'] == 'Movie'].copy()
movies_df['duration_min'] =
movies_df['duration'].str.extract(r'(\d+)').astype(float)

print("\nMovie Duration Statistics:")
print(movies_df['duration_min'].describe())

plt.figure(figsize=(12, 6))
```

```
plt.hist(movies_df['duration_min'].dropna(), bins=20, color='#E50914',
edgecolor='black')
plt.title('Distribution of Movie Durations', fontsize=16,
weight='bold', pad=20)
plt.xlabel('Duration (minutes)', fontsize=12, weight='bold')
plt.ylabel('Frequency', fontsize=12, weight='bold')
plt.grid(True, alpha=0.3, axis='y')
plt.tight_layout()
plt.show()
```

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# ==========================================
# QUESTION 7: TV Show Seasons Distribution (Bar Chart)
# ==========================================
# QUESTION: How many seasons do most TV shows have on Netflix?
#
# VALIDATION/JUSTIFICATION:
# This analysis is crucial because:
# 1. It shows whether Netflix favors limited series or long-running
shows
# 2. Bar charts clearly show discrete season counts and their
frequencies
# 3. Multi-season shows indicate higher production investment and user
engagement
# 4. Single-season shows might be mini-series, cancelled shows, or
ongoing series
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```
# 5. Content strategy differs for shows with different season counts
(binge vs episodic)
# 6. This helps predict future content pipeline and renewal decisions
# 7. Longer shows provide more "stickiness" - users invest more time in
multi-season series
# 8. Production costs scale with season count, affecting budget
allocation
# 9. Recommendation algorithms treat single vs multi-season shows
differently

import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

sns.set_style("darkgrid")
plt.rcParams['figure.figsize'] = (10, 6)

def load_netflix_dataset() -> pd.DataFrame:
    candidate_paths = (
        '../netflix_titles_CLEANED.csv',
        '../netflix_titles.CLEANED.csv',
        'netflix_titles_CLEANED.csv',
        'netflix_titles.CLEANED.csv',
    )
    last_err = None
    for p in candidate_paths:
        try:
            return pd.read_csv(p)
        except FileNotFoundError as e:
            last_err = e
            continue
    raise last_err

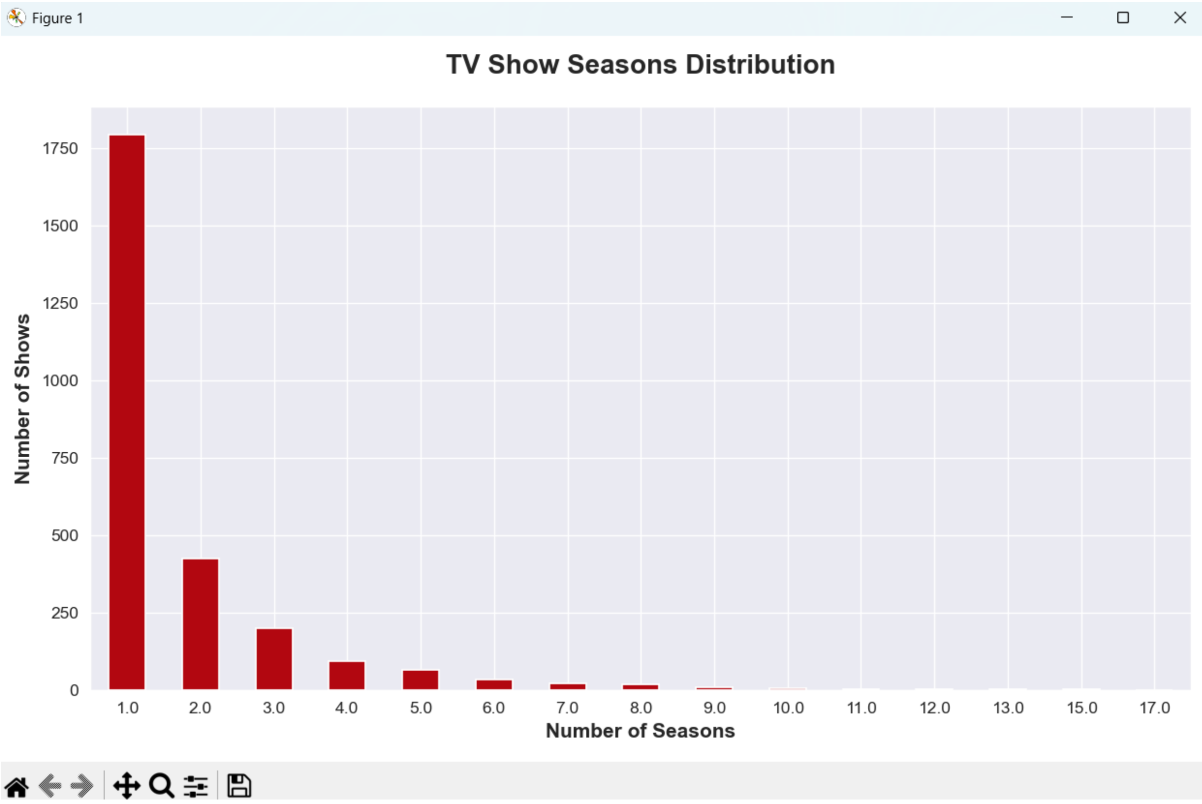
df = load_netflix_dataset()

print("\n" + "="*50)
print("QUESTION 7: TV Show Seasons Distribution")
print("="*50)

tv_shows_df = df[df['type'] == 'TV Show'].copy()
tv_shows_df['num_seasons'] =
tv_shows_df['duration'].str.extract(r'(\d+)').astype(float)
```

```
season_counts = tv_shows_df['num_seasons'].value_counts().sort_index()
print("\nSeasons Distribution:")
print(season_counts)

plt.figure(figsize=(10, 6))
season_counts.plot(kind='bar', color='#B20710')
plt.title('TV Show Seasons Distribution', fontsize=16, weight='bold',
pad=20)
plt.xlabel('Number of Seasons', fontsize=12, weight='bold')
plt.ylabel('Number of Shows', fontsize=12, weight='bold')
plt.xticks(rotation=0)
plt.tight_layout()
plt.show()
```

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# ==========================================
# QUESTION 8: Content Added Over Time (Line Chart)
# ==========================================
# QUESTION: At what rate is Netflix adding new content to its platform
over time?
#
# VALIDATION/JUSTIFICATION:
# This time-series analysis is essential because:
# 1. Line charts excel at showing trends and growth patterns over time
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```python
# 2. It reveals Netflix's content acquisition velocity and strategic timing
# 3. Spikes might correspond to major releases, seasonal trends, or strategic launches
# 4. Investors track content addition rate as a key performance indicator
# 5. Competitive analysis: comparing growth rate with other streaming platforms
# 6. This helps predict infrastructure needs (storage, bandwidth, servers)
# 7. Marketing teams can align campaigns with content drop patterns
# 8. Monthly/yearly patterns reveal content licensing cycles and renewal schedules
# 9. Declining trends might indicate market saturation or strategic pivots
# 10. This validates whether Netflix is maintaining its promised content refresh rate

import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

sns.set_style("darkgrid")
plt.rcParams['figure.figsize'] = (14, 6)

def load_netflix_dataset() -> pd.DataFrame:
    candidate_paths = (
        '../netflix_titles_CLEANED.csv',
        '../netflix_titles.CLEANED.csv',
        'netflix_titles_CLEANED.csv',
        'netflix_titles.CLEANED.csv',
    )
    last_err = None
    for p in candidate_paths:
        try:
            return pd.read_csv(p)
        except FileNotFoundError as e:
            last_err = e
            continue
    raise last_err

df = load_netflix_dataset()
```

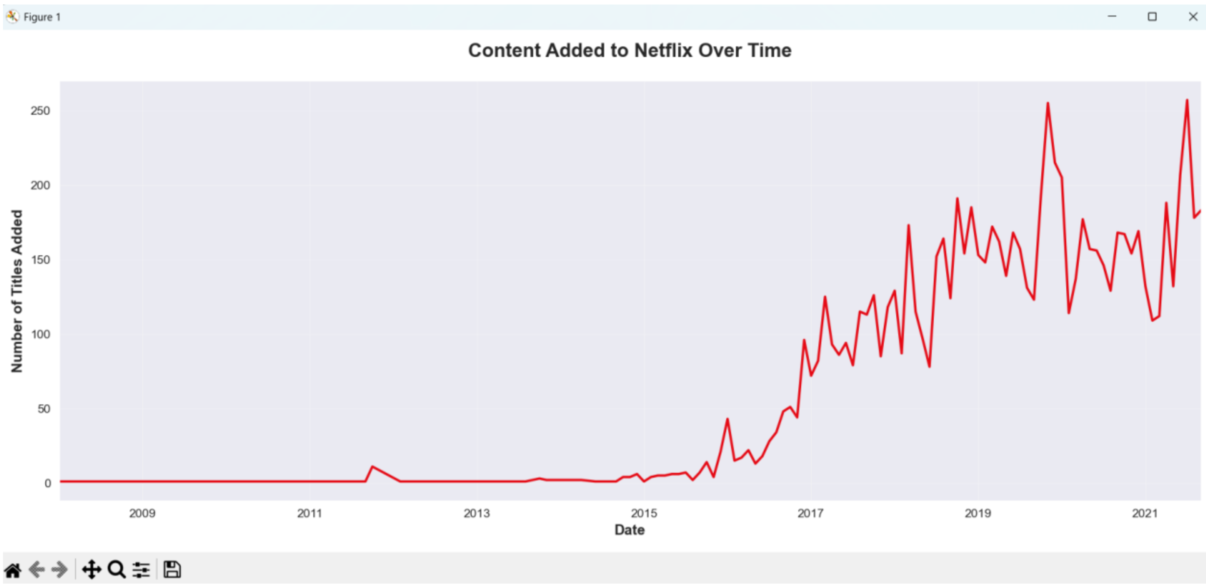
```
print("\n" + "="*50)
print("QUESTION 8: Content Added to Netflix Over Time")
print("="*50)

df['date_added'] = pd.to_datetime(df['date_added'], errors='coerce')
df['month_added'] = df['date_added'].dt.to_period('M')

monthly_additions = df.groupby('month_added').size().sort_index()

print("\nMonthly Content Additions:")
print(monthly_additions.tail(10))

plt.figure(figsize=(14, 6))
monthly_additions.plot(color='#E50914', linewidth=2)
plt.title('Content Added to Netflix Over Time', fontsize=16,
weight='bold', pad=20)
plt.xlabel('Date', fontsize=12, weight='bold')
plt.ylabel('Number of Titles Added', fontsize=12, weight='bold')
plt.grid(True, alpha=0.3)
plt.tight_layout()
plt.show()
```



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# ============================================
# QUESTION 9: Movies vs TV Shows by Year (Stacked Area Chart)
# ============================================
# QUESTION: How has the balance between Movies and TV Shows evolved
over release years?
#
# VALIDATION/JUSTIFICATION:
# This visualization is valuable because:
# 1. Stacked area charts show both total volume and composition changes
over time
# 2. It reveals strategic shifts in content type preferences across
different eras
# 3. This helps understand if Netflix is pivoting toward original
series vs films
# 4. Historical trends inform future content production roadmaps
# 5. Different decades had different production norms (more movies in
90s, more series recently)
# 6. Investment allocation between movie rights and TV show licenses
can be evaluated
# 7. This shows how streaming has influenced content production
patterns

import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

sns.set_style("darkgrid")
plt.rcParams['figure.figsize'] = (14, 6)

def load_netflix_dataset() -> pd.DataFrame:
    candidate_paths = (
        '../netflix_titles_CLEANED.csv',
        '../netflix_titles.CLEANED.csv',
        'netflix_titles_CLEANED.csv',
        'netflix_titles.CLEANED.csv',
    )
    last_err = None
    for p in candidate_paths:
        try:
            return pd.read_csv(p)
```

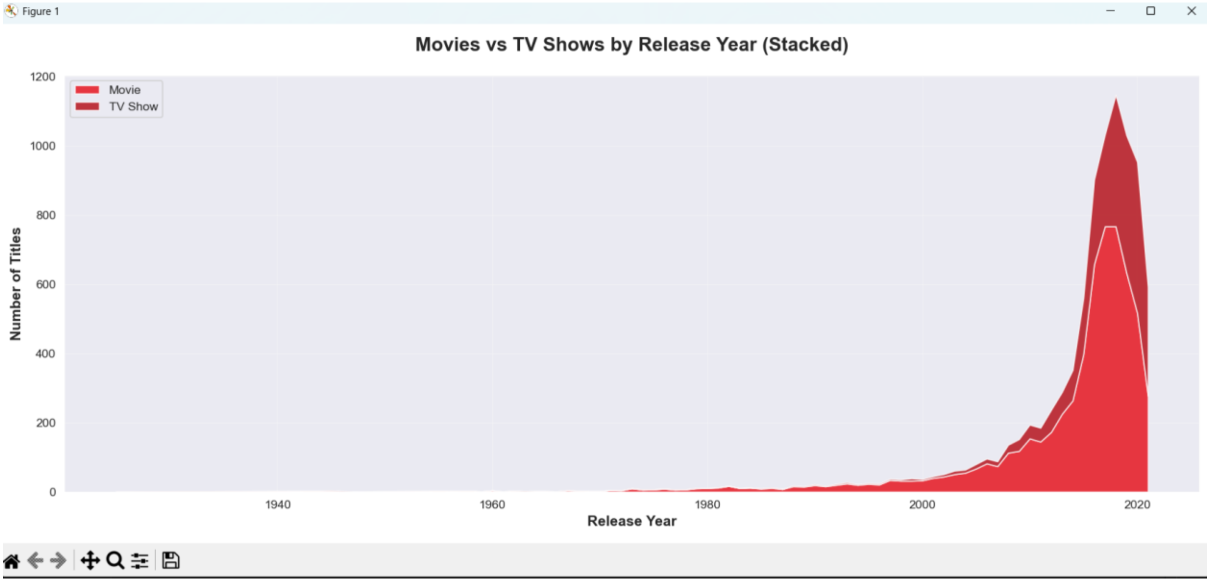
```
        except FileNotFoundError as e:
            last_err = e
            continue
    raise last_err

df = load_netflix_dataset()

print("\n" + "="*50)
print("QUESTION 9: Movies vs TV Shows Over Release Years")
print("="*50)

year_type = df.groupby(['release_year',
'type']).size().unstack(fill_value=0)
# Ensure both columns exist for stackplot
year_type = year_type.reindex(columns=['Movie', 'TV Show'],
fill_value=0)
print("\nContent Type by Year:")
print(year_type.tail(10))

plt.figure(figsize=(14, 6))
plt.stackplot(year_type.index, year_type['Movie'], year_type['TV
Show'],
              labels=['Movie', 'TV Show'], colors=['#E50914',
'#B20710'], alpha=0.8)
plt.title('Movies vs TV Shows by Release Year (Stacked)', fontsize=16,
weight='bold', pad=20)
plt.xlabel('Release Year', fontsize=12, weight='bold')
plt.ylabel('Number of Titles', fontsize=12, weight='bold')
plt.legend(loc='upper left')
plt.grid(True, alpha=0.3)
plt.tight_layout()
plt.show()
```

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# ============================================
# QUESTION 10: Top 10 Directors by Content Count (Bar Chart)
# ============================================
# QUESTION: Which directors have the most content on Netflix?
#
# VALIDATION/JUSTIFICATION:
# This analysis is important because:
# 1. Identifies key content creators and potential partnership
opportunities
# 2. Bar charts effectively rank and compare discrete entities
# 3. High-volume directors might have exclusive deals or strong
relationships with Netflix
# 4. This data supports talent acquisition and retention strategies
# 5. Marketing can leverage popular directors for promotional campaigns
# 6. Understanding director portfolios helps in content curation and
collections
# 7. Fans of specific directors can be targeted with personalized
recommendations
```
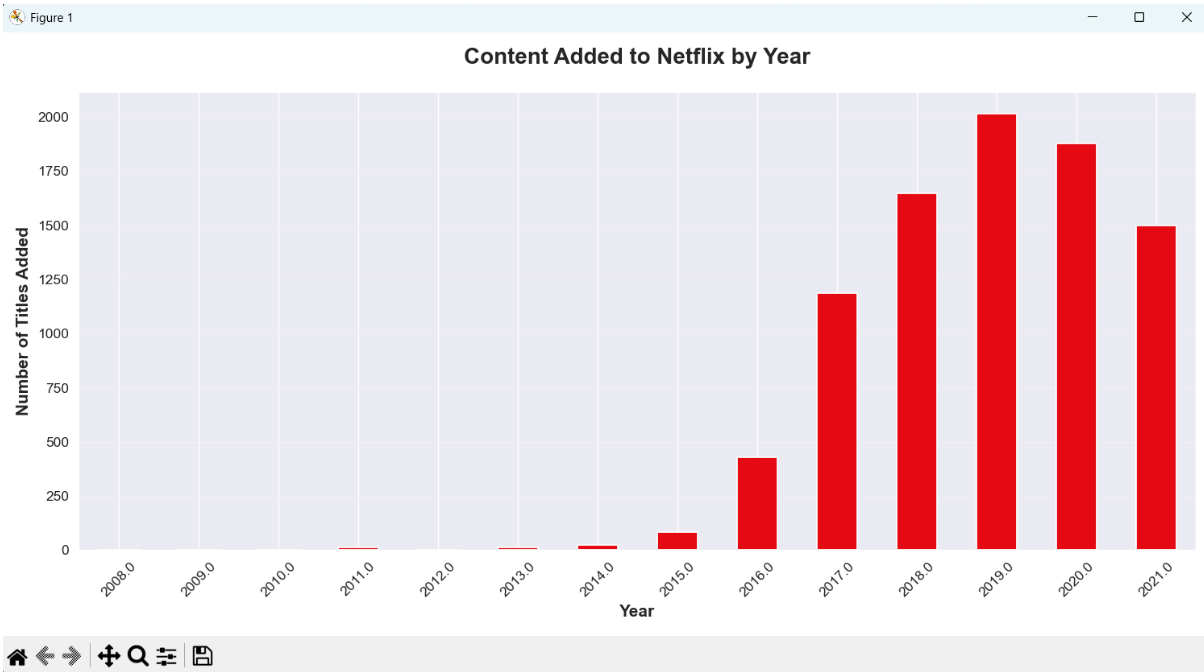

```
# 8. This reveals Netflix's investment in auteur-driven vs commercial
content

import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

sns.set_style("darkgrid")
plt.rcParams['figure.figsize'] = (12, 6)

def load_netflix_dataset() -> pd.DataFrame:
    candidate_paths = (
        '../netflix_titles_CLEANED.csv',
        '../netflix_titles.CLEANED.csv',
        'netflix_titles_CLEANED.csv',
        'netflix_titles.CLEANED.csv',
    )
    last_err = None
    for p in candidate_paths:
        try:
            return pd.read_csv(p)
        except FileNotFoundError as e:
            last_err = e
            continue
    raise last_err

df = load_netflix_dataset()

print("\n" + "="*50)
print("QUESTION 10: Top 10 Directors by Content Count")
print("="*50)

directors_list =
df['directors'].dropna().str.split(',').explode().str.strip()
director_counts = directors_list.value_counts().head(10)

print("\nTop 10 Directors:")
print(director_counts)

plt.figure(figsize=(12, 6))
director_counts.plot(kind='barh', color='#831010')
plt.title('Top 10 Directors with Most Content on Netflix', fontsize=16,
weight='bold', pad=20)
```

```
plt.xlabel('Number of Titles', fontsize=12, weight='bold')
plt.ylabel('Director', fontsize=12, weight='bold')
plt.gca().invert_yaxis()
plt.tight_layout()
plt.show()
```

```
# ============================================
# QUESTION 11: Content Addition by Year (Bar Chart)
# ============================================
# QUESTION: In which years did Netflix add the most content to its
platform?
#
# VALIDATION/JUSTIFICATION:
# This analysis is critical because:
# 1. Bar charts clearly show year-over-year comparisons of content
additions
```

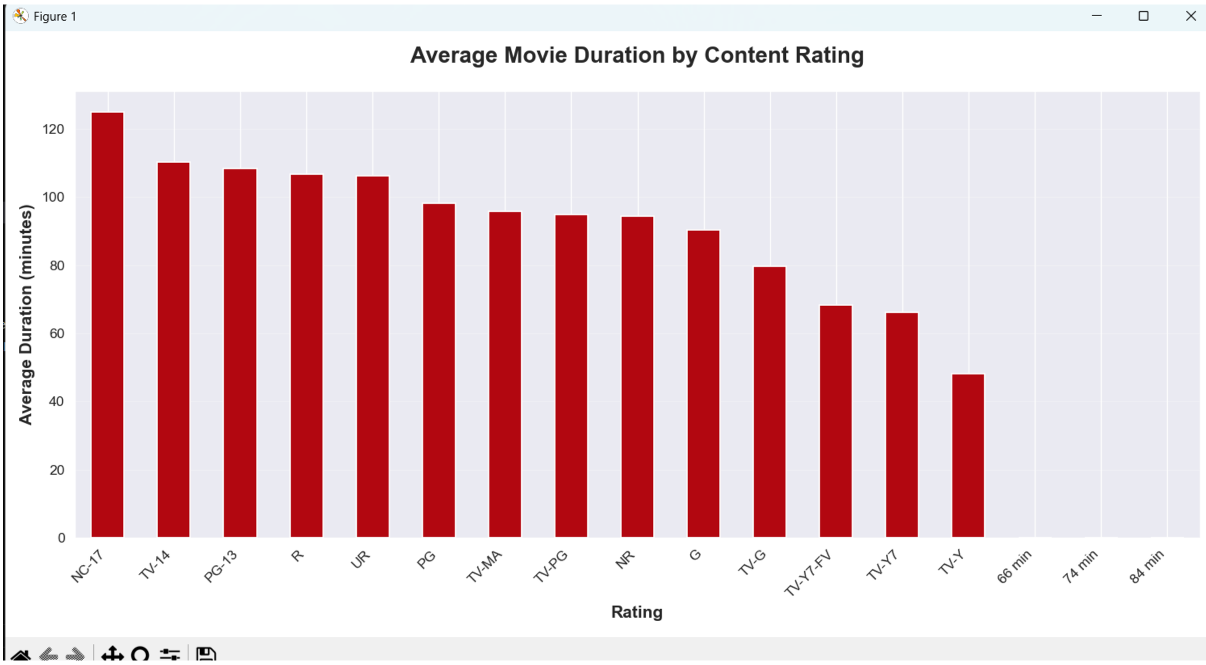
```
# 2. Peak years indicate major content acquisition initiatives or
market expansion
# 3. Declining years might signal market maturity or strategic content
pruning
# 4. This correlates with Netflix's subscriber growth and competitive
landscape
# 5. Content budgets and licensing deals can be inferred from addition
patterns
# 6. Regulatory changes or competitive pressures show up as year-over-
year changes
# 7. This validates Netflix's "content is king" strategy execution over
time

import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

sns.set_style("darkgrid")
plt.rcParams['figure.figsize'] = (12, 6)

def load_netflix_dataset() -> pd.DataFrame:
    candidate_paths = (
        '../netflix_titles_CLEANED.csv',
        '../netflix_titles.CLEANED.csv',
        'netflix_titles_CLEANED.csv',
        'netflix_titles.CLEANED.csv',
    )
    last_err = None
    for p in candidate_paths:
        try:
            return pd.read_csv(p)
        except FileNotFoundError as e:
            last_err = e
            continue
    raise last_err

df = load_netflix_dataset()

print("\n" + "="*50)
print("QUESTION 11: Content Added by Year")
print("="*50)

df['date_added'] = pd.to_datetime(df['date_added'], errors='coerce')
```

```
df['year_added'] = df['date_added'].dt.year

yearly_additions = df['year_added'].value_counts().sort_index()
print("\nContent Added per Year:")
print(yearly_additions)

plt.figure(figsize=(12, 6))
yearly_additions.plot(kind='bar', color='#E50914')
plt.title('Content Added to Netflix by Year', fontsize=16,
weight='bold', pad=20)
plt.xlabel('Year', fontsize=12, weight='bold')
plt.ylabel('Number of Titles Added', fontsize=12, weight='bold')
plt.xticks(rotation=45)
plt.grid(True, alpha=0.3, axis='y')
plt.tight_layout()
plt.show()
```



```python
# ============================================
# QUESTION 12: Average Movie Duration by Rating (Bar Chart)
# ============================================
# QUESTION: Does movie runtime vary by content rating?
#
# VALIDATION/JUSTIFICATION:
# This analysis reveals important patterns:
# 1. Grouped bar charts show average values across categories effectively
# 2. Family content (PG, PG-13) might have different runtime norms than mature content (R, TV-MA)
# 3. This helps content creators understand industry standards for different audiences
# 4. Programming blocks and scheduling decisions depend on content length by rating
# 5. Children's content typically has shorter runtimes than adult content
# 6. This validates whether Netflix's catalog aligns with typical rating-duration relationships
# 7. User session planning differs for short family movies vs long adult dramas

import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

sns.set_style("darkgrid")
plt.rcParams['figure.figsize'] = (12, 6)

def load_netflix_dataset() -> pd.DataFrame:
    candidate_paths = (
        '../netflix_titles_CLEANED.csv',
        '../netflix_titles.CLEANED.csv',
        'netflix_titles_CLEANED.csv',
        'netflix_titles.CLEANED.csv',
    )
    last_err = None
    for p in candidate_paths:
        try:
            return pd.read_csv(p)
        except FileNotFoundError as e:
            last_err = e
            continue
```

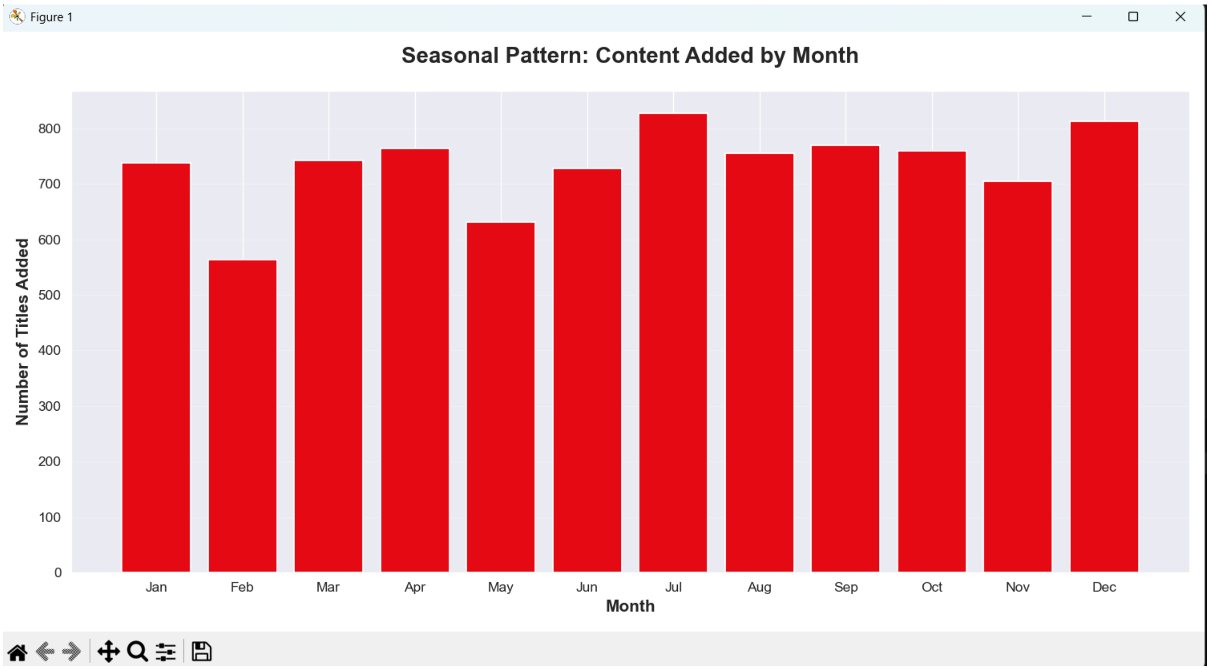
```
    raise last_err

df = load_netflix_dataset()

print("\n" + "="*50)
print("QUESTION 12: Average Movie Duration by Rating")
print("="*50)

movies_df = df[df['type'] == 'Movie'].copy()
movies_df['duration_min'] =
movies_df['duration'].str.extract(r'(\d+)').astype(float)

avg_duration_by_rating =
movies_df.groupby('rating')['duration_min'].mean().sort_values(ascendin
g=False)
print("\nAverage Duration by Rating:")
print(avg_duration_by_rating)

plt.figure(figsize=(12, 6))
avg_duration_by_rating.plot(kind='bar', color='#B20710')
plt.title('Average Movie Duration by Content Rating', fontsize=16,
weight='bold', pad=20)
plt.xlabel('Rating', fontsize=12, weight='bold')
plt.ylabel('Average Duration (minutes)', fontsize=12, weight='bold')
plt.xticks(rotation=45, ha='right')
plt.grid(True, alpha=0.3, axis='y')
plt.tight_layout()
plt.show()
```




```
# ============================================
# QUESTION 13: Content Addition by Month of Year (Bar Chart)
# ============================================
# QUESTION: Are there seasonal patterns in when Netflix adds content?
#
# VALIDATION/JUSTIFICATION:
# This seasonal analysis is valuable because:
# 1. Identifies if Netflix has strategic content drop periods (e.g.,
holiday seasons)
# 2. Bar charts effectively show cyclical patterns across 12 months
# 3. Content marketing campaigns can be planned around high-addition
months
# 4. Competitor analysis: are there industry-wide seasonal patterns?
# 5. Licensing renewals and expirations often follow calendar patterns
# 6. Major entertainment events (awards season, summer blockbusters)
influence timing
# 7. This helps predict future content pipeline and manage subscriber
expectations
# 8. Resource allocation (QA, localization teams) can be planned based
on seasonal peaks

import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

```python
sns.set_style("darkgrid")
plt.rcParams['figure.figsize'] = (12, 6)

def load_netflix_dataset() -> pd.DataFrame:
    candidate_paths = (
        '../netflix_titles_CLEANED.csv',
        '../netflix_titles.CLEANED.csv',
        'netflix_titles_CLEANED.csv',
        'netflix_titles.CLEANED.csv',
    )
    last_err = None
    for p in candidate_paths:
        try:
            return pd.read_csv(p)
        except FileNotFoundError as e:
            last_err = e
            continue
    raise last_err

df = load_netflix_dataset()

print("\n" + "="*50)
print("QUESTION 13: Content Addition by Month")
print("="*50)

df['date_added'] = pd.to_datetime(df['date_added'], errors='coerce')
df['month_number'] = df['date_added'].dt.month
monthly_pattern = df['month_number'].value_counts().sort_index()
month_names = ['Jan', 'Feb', 'Mar', 'Apr', 'May', 'Jun', 'Jul', 'Aug',
'Sep', 'Oct', 'Nov', 'Dec']

print("\nContent Added by Month:")
print(monthly_pattern)

plt.figure(figsize=(12, 6))
plt.bar(range(1, 13), [monthly_pattern.get(i, 0) for i in range(1,
13)], color='#E50914')
plt.title('Seasonal Pattern: Content Added by Month', fontsize=16,
weight='bold', pad=20)
plt.xlabel('Month', fontsize=12, weight='bold')
plt.ylabel('Number of Titles Added', fontsize=12, weight='bold')
plt.xticks(range(1, 13), month_names)
```

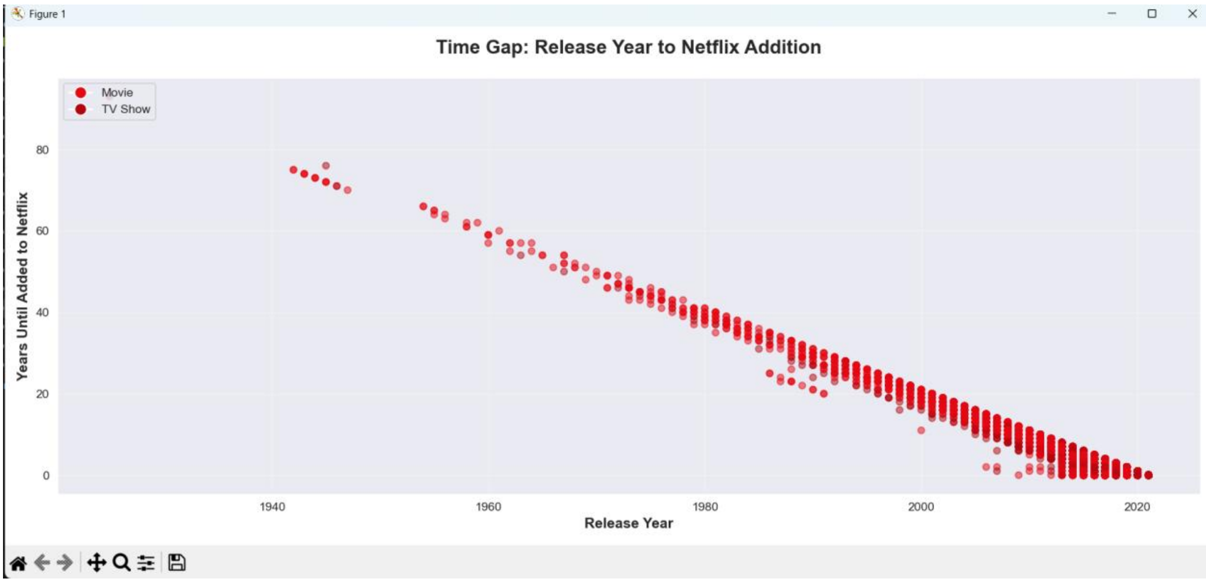
```
plt.grid(True, alpha=0.3, axis='y')
plt.tight_layout()
plt.show()
```




```
# ============================================
# QUESTION 14: Release Year vs Date Added Gap (Scatter Plot)
# ============================================
# QUESTION: How long after release does content typically get added to
Netflix?
#
# VALIDATION/JUSTIFICATION:
# This time-lag analysis is insightful because:
# 1. Scatter plots show relationships between two continuous variables
effectively
# 2. It reveals if Netflix acquires fresh content or relies on
catalog/archive content
# 3. Short gaps indicate aggressive recent content acquisition or
original productions
# 4. Long gaps suggest catalog content or classic movie collections
```

```
# 5. This informs licensing strategy and production vs acquisition
balance
# 6. Windowing strategies (theatrical → streaming → TV) affect
acquisition timing
# 7. Competitive advantage: shorter gaps mean fresher content for
subscribers
# 8. Different gaps for movies vs TV shows indicate different content
strategies

import pandas as pd
import matplotlib.pyplot as plt
from matplotlib.lines import Line2D
import seaborn as sns

sns.set_style("darkgrid")
plt.rcParams['figure.figsize'] = (14, 6)

def load_netflix_dataset() -> pd.DataFrame:
    candidate_paths = (
        '../netflix_titles_CLEANED.csv',
        '../netflix_titles.CLEANED.csv',
        'netflix_titles_CLEANED.csv',
        'netflix_titles.CLEANED.csv',
    )
    last_err = None
    for p in candidate_paths:
        try:
            return pd.read_csv(p)
        except FileNotFoundError as e:
            last_err = e
            continue
    raise last_err

df = load_netflix_dataset()

print("\n" + "="*50)
print("QUESTION 14: Release Year vs Addition Date Gap")
print("="*50)

df['date_added'] = pd.to_datetime(df['date_added'], errors='coerce')
df['year_added'] = df['date_added'].dt.year
df['year_gap'] = df['year_added'] - df['release_year']
df_gap = df[df['year_gap'].notna() & (df['year_gap'] >= 0)].copy()
```

```
print("\nYear Gap Statistics:")
print(df_gap['year_gap'].describe())

plt.figure(figsize=(14, 6))
plt.scatter(df_gap['release_year'], df_gap['year_gap'],
            c=df_gap['type'].map({'Movie': '#E50914', 'TV Show':
'#B20710'}),
            alpha=0.5, s=30)
plt.title('Time Gap: Release Year to Netflix Addition', fontsize=16,
weight='bold', pad=20)
plt.xlabel('Release Year', fontsize=12, weight='bold')
plt.ylabel('Years Until Added to Netflix', fontsize=12, weight='bold')
plt.grid(True, alpha=0.3)
legend_elements = [Line2D([0], [0], marker='o', color='w',
markerfacecolor='#E50914',
                          markersize=10, label='Movie'),
                   Line2D([0], [0], marker='o', color='w',
markerfacecolor='#B20710',
                          markersize=10, label='TV Show')]
plt.legend(handles=legend_elements, loc='upper left')
plt.tight_layout()
plt.show()
```



```
# ============================================
# QUESTION 15: Top 5 Countries - Content Type Breakdown (Grouped Bar
Chart)
# ============================================
# QUESTION: How does the Movie/TV Show split differ across top content-
producing countries?
#
# VALIDATION/JUSTIFICATION:
# This comparative analysis is powerful because:
# 1. Grouped bar charts excel at comparing subcategories across main
categories
# 2. Regional content preferences and production capabilities vary
significantly
# 3. Some countries specialize in films (Bollywood) while others in
series (US TV industry)
# 4. This informs regional partnership strategies and content
acquisition focus
# 5. Cultural differences in storytelling formats (episodic vs feature-
length) are revealed
# 6. Market-specific content strategies can be developed based on
regional strengths
# 7. This validates whether Netflix's regional content mix matches
local production trends
# 8. Investment priorities can be adjusted per region based on content
type strengths

import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

sns.set_style("darkgrid")
plt.rcParams['figure.figsize'] = (12, 6)

def load_netflix_dataset() -> pd.DataFrame:
```

```python
    candidate_paths = (
        '../netflix_titles_CLEANED.csv',
        '../netflix_titles.CLEANED.csv',
        'netflix_titles_CLEANED.csv',
        'netflix_titles.CLEANED.csv',
    )
    last_err = None
    for p in candidate_paths:
        try:
            return pd.read_csv(p)
        except FileNotFoundError as e:
            last_err = e
            continue
    raise last_err

df = load_netflix_dataset()

# Precompute primary country for this analysis
df['primary_country'] =
df['countries'].fillna('Unknown').str.split(',').str[0].str.strip()

print("\n" + "="*50)
print("QUESTION 15: Top 5 Countries - Content Type Breakdown")
print("="*50)

top5_countries = df['primary_country'].value_counts().head(5).index
top5_df = df[df['primary_country'].isin(top5_countries)]
country_type_pivot = pd.crosstab(top5_df['primary_country'],
top5_df['type'])

print("\nTop 5 Countries Content Breakdown:")
print(country_type_pivot)

ax = country_type_pivot.plot(kind='bar', color=['#E50914', '#B20710'],
figsize=(12, 6))
plt.title('Top 5 Countries: Movies vs TV Shows', fontsize=16,
weight='bold', pad=20)
plt.xlabel('Country', fontsize=12, weight='bold')
plt.ylabel('Number of Titles', fontsize=12, weight='bold')
plt.legend(title='Content Type', fontsize=10)
plt.xticks(rotation=45, ha='right')
plt.grid(True, alpha=0.3, axis='y')
plt.tight_layout()
```

```
plt.show()
```

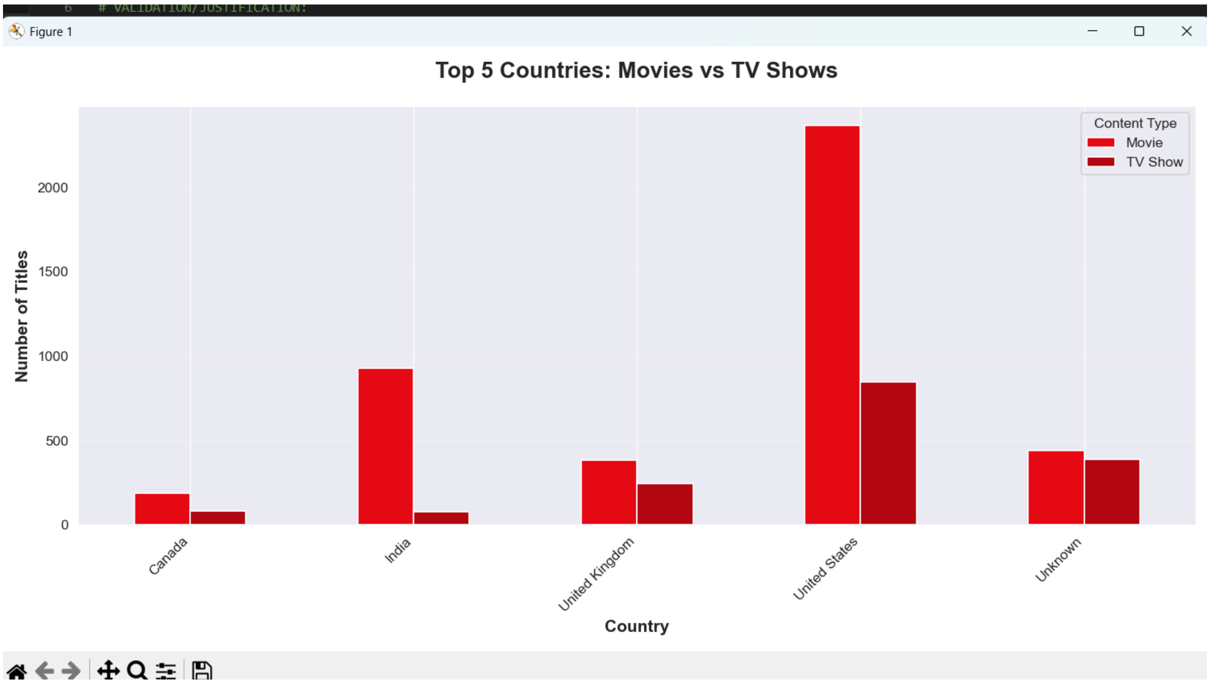


Figure 1
Top 5 Countries: Movies vs TV Shows
Content Type
Movie
TV Show
Number of Titles
0
500
1000
1500
2000
Canada
India
United Kingdom
United States
Unknown
Country