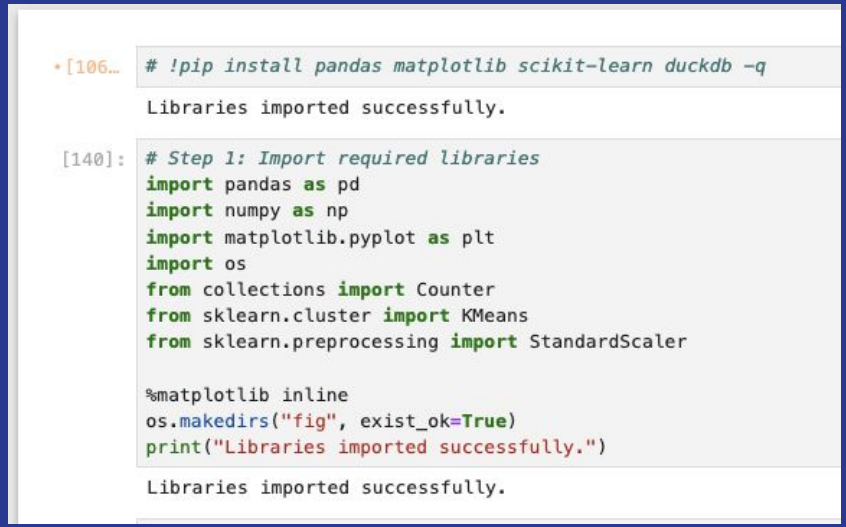
YouTube Trending Analysis — Canada

Full Data Pipeline & Visual Insights

Group 2 Lirui Liu

Step 1 — Import Libraries

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import os
from collections import Counter
from sklearn.cluster import KMeans
from sklearn.preprocessing import StandardScaler

%matplotlib inline
os.makedirs("fig", exist_ok=True)
print("Libraries imported successfully.")
```



```
[106…] # !pip install pandas matplotlib scikit-learn duckdb -q

Libraries imported successfully.

[140]: # Step 1: Import required libraries
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import os
from collections import Counter
from sklearn.cluster import KMeans
from sklearn.preprocessing import StandardScaler

%matplotlib inline
os.makedirs("fig", exist_ok=True)
print("Libraries imported successfully.")

Libraries imported successfully.
```

Step 2 — Load Dataset

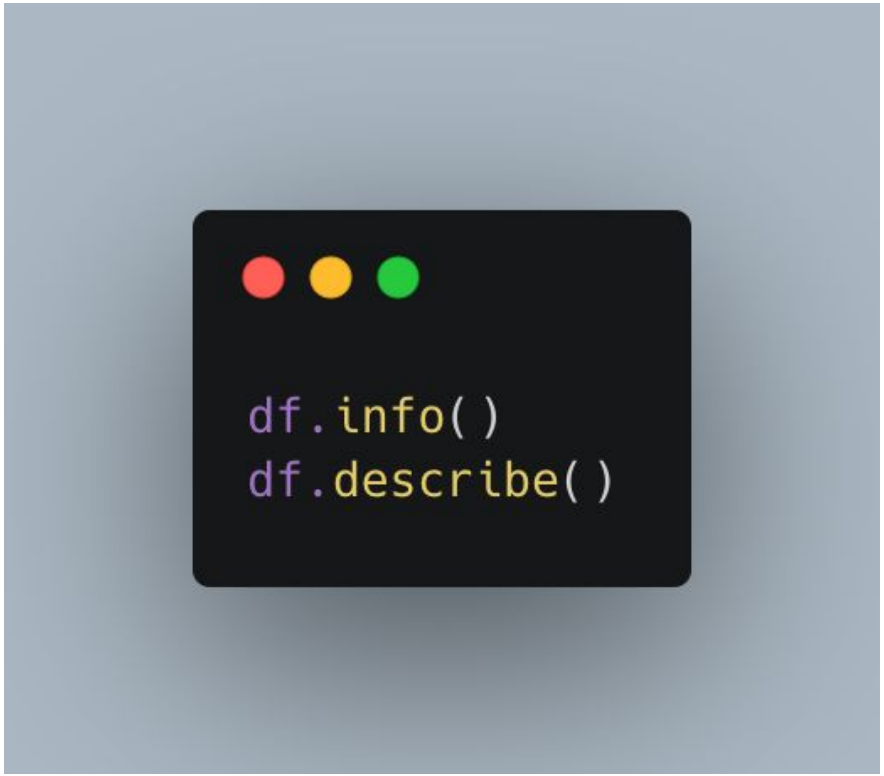
```
df = pd.read_csv('CAvideos.csv', encoding='utf-8')
print("DataFrame loaded. Shape:", df.shape)
df.head()
```

```
DataFrame loaded. Shape: (40881, 16)
```

[142]:

	video_id	trending_date	title	channel_title	category_id	publish_time	tags	views	likes
0	n1WpP7iowLc	17.14.11	Eminem - Walk On Water (Audio) ft. Beyoncé	EminemVEVO	10	2017-11-10T17:00:03.000Z	Eminem|"Walk"|"On"|"Water"|"Aftermath/Shady/In...	17158579	787425
1	0dBIkQ4Mz1M	17.14.11	PLUSH - Bad Unboxing Fan Mail	iDubbbzTV	23	2017-11-13T17:00:00.000Z	plush|"bad unboxing"|"unboxing"|"fan mail"|"id...	1014651	127794
2	5qpjK5DgCt4	17.14.11	Racist Superman | Rudy Mancuso, King Bach & Le...	Rudy Mancuso	23	2017-11-12T19:05:24.000Z	racist superman|"rudy"|"mancuso"|"king"|"bach"...	3191434	146035
3	d380meD0W0M	17.14.11	I Dare You: GOING BALD!?	nigahiga	24	2017-11-12T18:01:41.000Z	ryan|"higa"|"higatv"|"nigahiga"|"i dare you"|"...	2095828	132239
4	2Vv-BfVoq4g	17.14.11	Ed Sheeran - Perfect (Official Music Video)	Ed Sheeran	10	2017-11-09T11:04:14.000Z	edsheeran|"ed sheeran"|"acoustic"|"live"|"cove...	33523622	1634130

Step 3 — Data Overview




```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 40881 entries, 0 to 40880
Data columns (total 16 columns):
 #   Column                  Non-Null Count  Dtype
---  ------                  --------------  -----
 0   video_id                40881 non-null  object
 1   trending_date           40881 non-null  object
 2   title                   40881 non-null  object
 3   channel_title           40881 non-null  object
 4   category_id             40881 non-null  int64
 5   publish_time            40881 non-null  object
 6   tags                    40881 non-null  object
 7   views                   40881 non-null  int64
 8   likes                   40881 non-null  int64
 9   dislikes                40881 non-null  int64
 10  comment_count           40881 non-null  int64
 11  thumbnail_link          40881 non-null  object
 12  comments_disabled       40881 non-null  bool
 13  ratings_disabled        40881 non-null  bool
 14  video_error_or_removed  40881 non-null  bool
 15  description             39585 non-null  object
dtypes: bool(3), int64(5), object(8)
memory usage: 4.2+ MB
```

[144]:

	category_id	views	likes	dislikes	comment_count
count	40881.000000	4.088100e+04	4.088100e+04	4.088100e+04	4.088100e+04
mean	20.795553	1.147036e+06	3.958269e+04	2.009195e+03	5.042975e+03
std	6.775054	3.390913e+06	1.326895e+05	1.900837e+04	2.157902e+04
min	1.000000	7.330000e+02	0.000000e+00	0.000000e+00	0.000000e+00
25%	20.000000	1.439020e+05	2.191000e+03	9.900000e+01	4.170000e+02
50%	24.000000	3.712040e+05	8.780000e+03	3.030000e+02	1.301000e+03
75%	24.000000	9.633020e+05	2.871700e+04	9.500000e+02	3.713000e+03
max	43.000000	1.378431e+08	5.053338e+06	1.602383e+06	1.114800e+06

Step 4 — Cleaning

```python
print("Missing values per column:")
print(df.isnull().sum())

duplicate_count = df.duplicated().sum()
print("Duplicated rows:", duplicate_count)

if duplicate_count > 0:
    df.drop_duplicates(inplace=True)
    print("Duplicates removed. New shape:", df.shape)

df_clean = df.copy()
```

```
Missing values per column:
video_id                      0
trending_date                 0
title                         0
channel_title                 0
category_id                   0
publish_time                  0
tags                          0
views                         0
likes                         0
dislikes                      0
comment_count                 0
thumbnail_link                0
comments_disabled             0
ratings_disabled              0
video_error_or_removed        0
description                1296
dtype: int64
Duplicated rows: 0
```

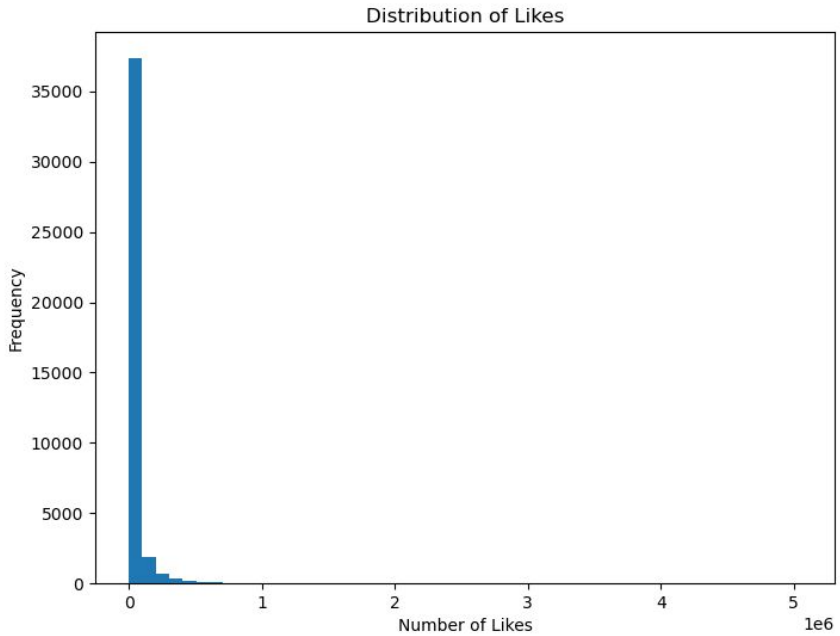
Step 5 — Datetime Conversion

```python
if 'publish_time' in df_clean.columns:
    df_clean['publish_time'] = pd.to_datetime(df_clean['publish_time'], errors='coerce')
    df_clean['publish_year'] = df_clean['publish_time'].dt.year
    df_clean['publish_month'] = df_clean['publish_time'].dt.month
    df_clean['publish_day'] = df_clean['publish_time'].dt.day
    display(df_clean[['publish_time', 'publish_year', 'publish_month', 'publish_day']].head())
else:
    print("'publish_time' column does not exist.")

df_clean['trending_date'] = pd.to_datetime(df_clean['trending_date'], errors='coerce')
```

	publish_time	publish_year	publish_month	publish_day
0	2017-11-10 17:00:03+00:00	2017	11	10
1	2017-11-13 17:00:00+00:00	2017	11	13
2	2017-11-12 19:05:24+00:00	2017	11	12
3	2017-11-12 18:01:41+00:00	2017	11	12
4	2017-11-09 11:04:14+00:00	2017	11	9

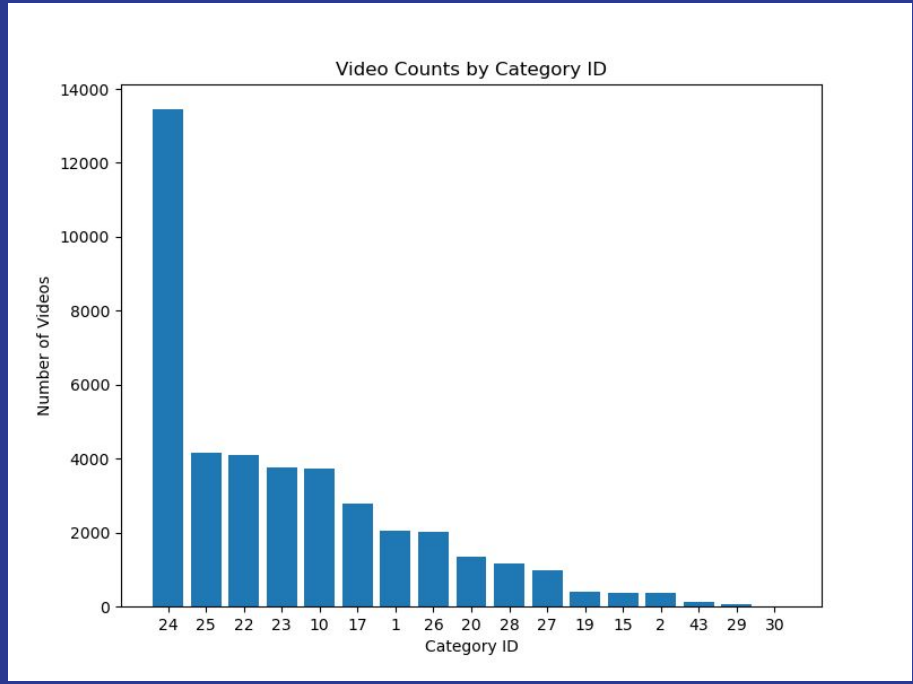
Step 6 — Likes Histogram

```
plt.figure(figsize=(8,6))
plt.hist(df_clean['likes'], bins=50)
plt.title("Distribution of Likes")
plt.xlabel("Number of Likes")
plt.ylabel("Frequency")
plt.savefig("fig/likes_hist.png")
plt.show()
```



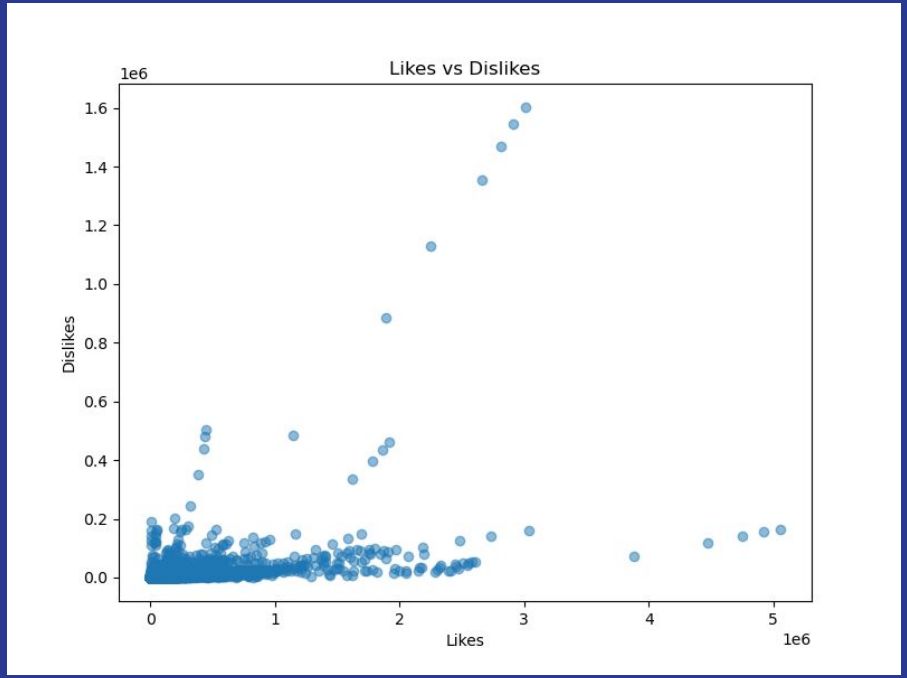
Step 7 — Category Bar Chart

```python
if 'category_id' in df_clean.columns:
    category_counts = df_clean['category_id'].value_counts()
    plt.figure(figsize=(8,6))
    plt.bar(category_counts.index.astype(str), category_counts.values)
    plt.title("Video Counts by Category ID")
    plt.xlabel("Category ID")
    plt.ylabel("Number of Videos")
    plt.savefig("fig/category_bar.png")
    plt.show()
else:
    print("'category_id' column does not exist.")
```



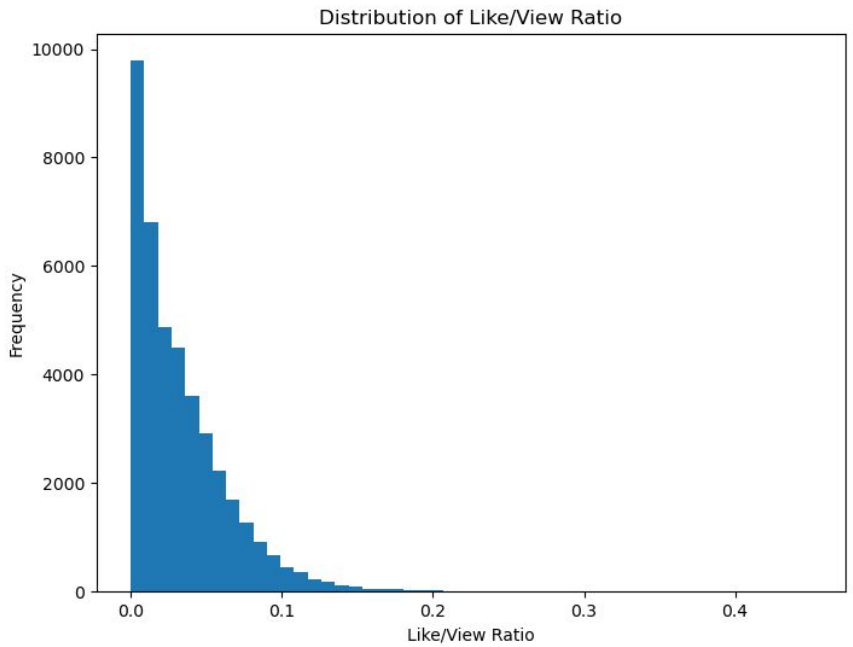
Step 8 — Likes vs Dislikes

```python
if 'likes' in df_clean.columns and 'dislikes' in df_clean.columns:
    plt.figure(figsize=(8,6))
    plt.scatter(df_clean['likes'], df_clean['dislikes'], alpha=0.5)
    plt.title("Likes vs Dislikes")
    plt.xlabel("Likes")
    plt.ylabel("Dislikes")
    plt.savefig("fig/likes_vs_dislikes.png")
    plt.show()
else:
    print("Required columns not found.")
```



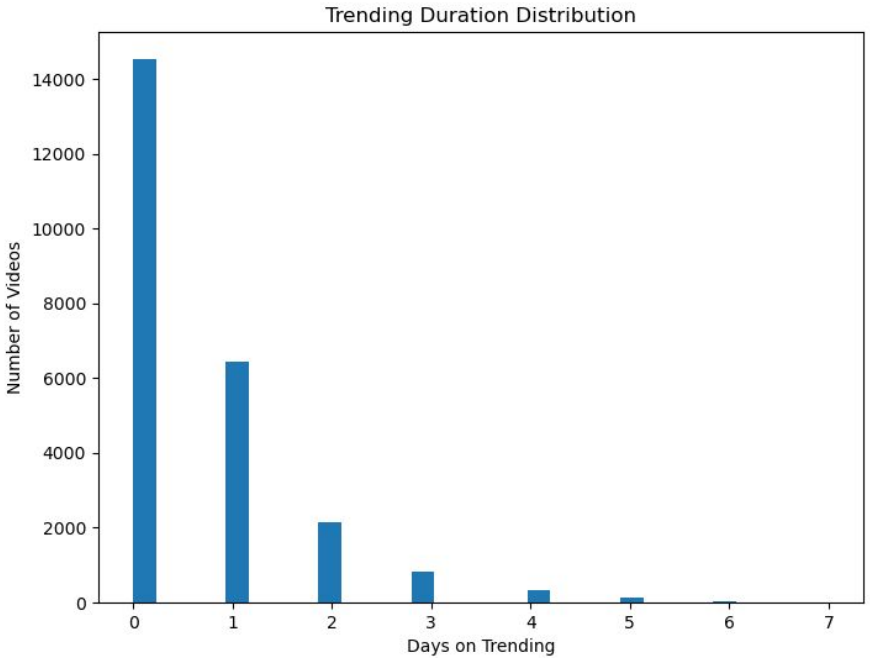
Step 9 — Engagement Ratios

```python
eps = 1e-6
df_clean['like_ratio'] = df_clean['likes'] / (df_clean['views'] + eps)
df_clean['dislike_ratio'] = df_clean['dislikes'] / (df_clean['views'] + eps)
df_clean['comment_ratio'] = df_clean['comment_count'] / (df_clean['views'] + eps)
df_clean['like_dis_ratio'] = (df_clean['likes'] + eps) / (df_clean['dislikes'] + eps)

plt.figure(figsize=(8,6))
plt.hist(df_clean['like_ratio'], bins=50)
plt.title("Distribution of Like/View Ratio")
plt.xlabel("Like/View Ratio")
plt.ylabel("Frequency")
plt.savefig("fig/like_ratio_hist.png")
plt.show()
```



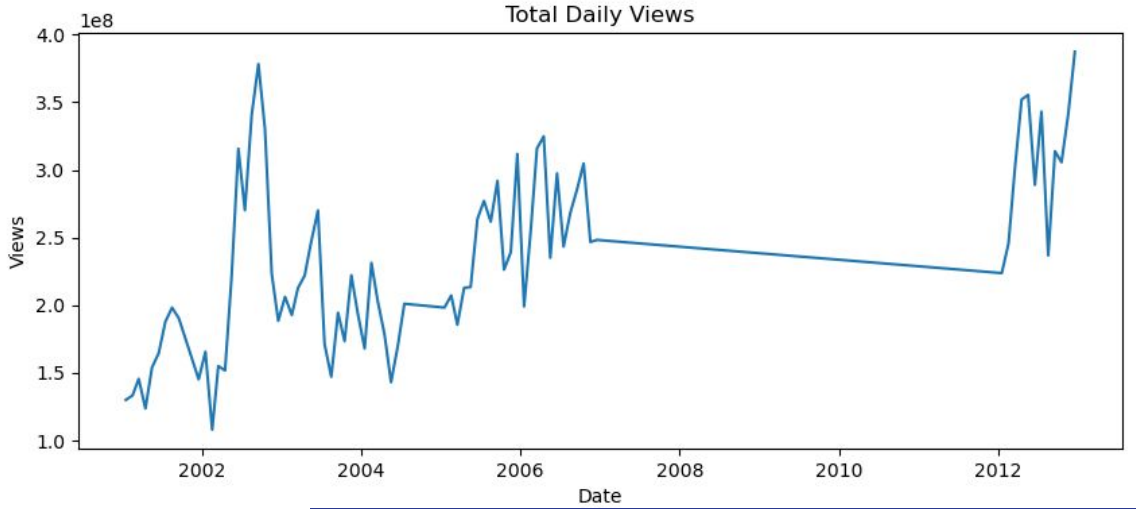
Step 10 — Trending Duration

```
duration = df_clean.groupby('video_id')['trending_date'].nunique().reset_index(name='days_on_trending')

plt.figure(figsize=(8,6))
plt.hist(duration['days_on_trending'], bins=30)
plt.title("Trending Duration Distribution")
plt.xlabel("Days on Trending")
plt.ylabel("Number of Videos")
plt.savefig("fig/trending_duration_hist.png")
plt.show()

duration.sort_values('days_on_trending', ascending=False).head(10)
```



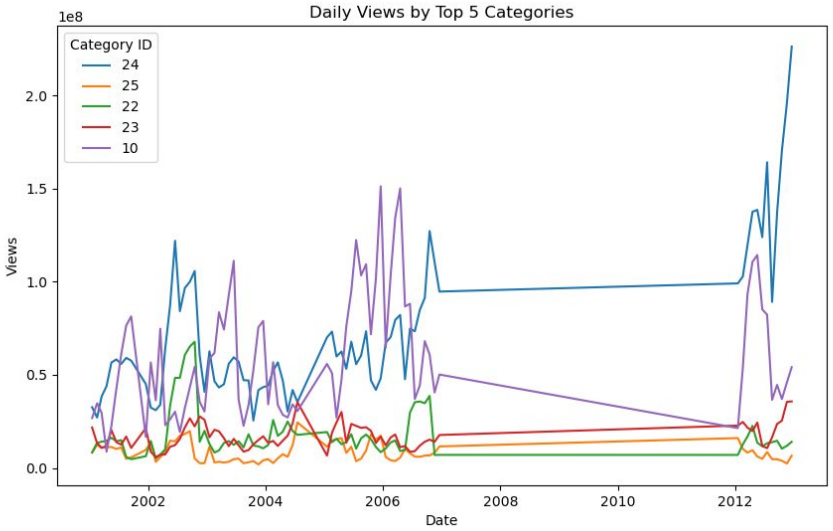
Step 11 — Daily Views

```
daily_views = df_clean.groupby('trending_date')['views'].sum()
plt.figure(figsize=(10,4))
plt.plot(daily_views.index, daily_views.values)
plt.title("Total Daily Views")
plt.xlabel("Date")
plt.ylabel("Views")
plt.savefig("fig/daily_views_trend.png")
plt.show()
```



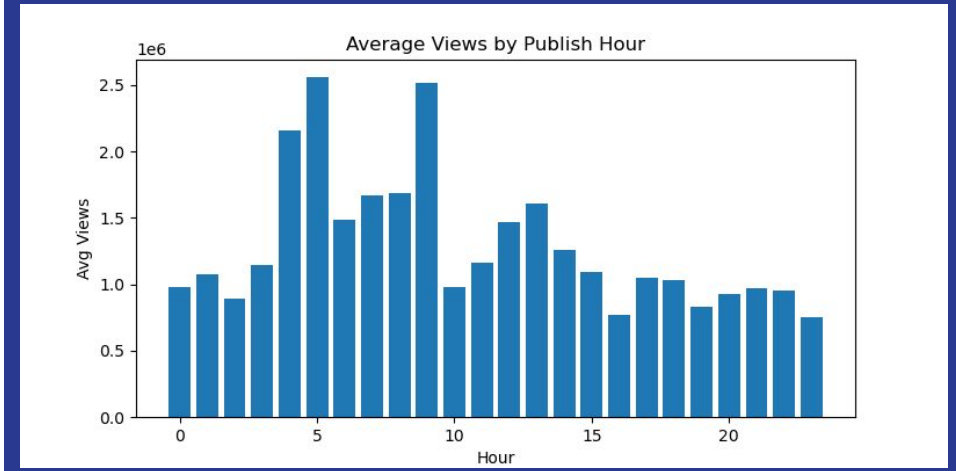
Step 12 — Top 5 Categories Trend

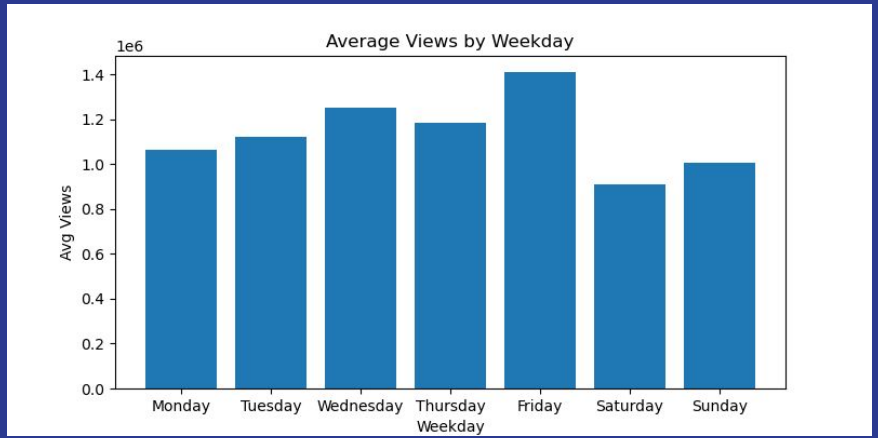
```python
top5_cats = df_clean['category_id'].value_counts().head(5).index
plt.figure(figsize=(10,6))
for cid in top5_cats:
    series = df_clean[df_clean['category_id'] == cid].groupby('trending_date')['views'].sum()
    plt.plot(series.index, series.values, label=str(cid))
plt.title("Daily Views by Top 5 Categories")
plt.xlabel("Date")
plt.ylabel("Views")
plt.legend(title="Category ID")
plt.savefig("fig/category_trend.png")
plt.show()
```



Step 13 — Publish Time Effect

```python
if 'publish_time' in df_clean.columns:
    df_clean['publish_hour'] = df_clean['publish_time'].dt.hour
    df_clean['publish_weekday'] = df_clean['publish_time'].dt.day_name()

    hour_views = df_clean.groupby('publish_hour')['views'].mean()
    plt.figure(figsize=(8,4))
    plt.bar(hour_views.index, hour_views.values)
    plt.title("Average Views by Publish Hour")
    plt.xlabel("Hour")
    plt.ylabel("Avg Views")
    plt.savefig("fig/views_by_hour.png")
    plt.show()

    weekday_order = ['Monday','Tuesday','Wednesday','Thursday','Friday','Saturday','Sunday']
    weekday_views = df_clean.groupby('publish_weekday')['views'].mean().reindex(weekday_order)
    plt.figure(figsize=(8,4))
    plt.bar(weekday_views.index, weekday_views.values)
    plt.title("Average Views by Weekday")
    plt.xlabel("Weekday")
    plt.ylabel("Avg Views")
    plt.savefig("fig/views_by_weekday.png")
    plt.show()
else:
    print("publish_time column missing.")
```





Step 14 — Top Like Ratio Videos

```
top10_like_ratio = df_clean.sort_values('like_ratio', ascending=False).head(10)
top10_like_ratio[['video_id', 'title', 'views', 'likes', 'like_ratio']]
```

Weekday

[174]:
```
# Step 14: Top 10 videos by like ratio
top10_like_ratio = df_clean.sort_values('like_ratio', ascending=False).head(10)
top10_like_ratio[['video_id', 'title', 'views', 'likes', 'like_ratio']]
```

[174]:

	video_id	title	views	likes	like_ratio
16999	NV-3s2wwC8c	BlocBoy JB & Drake Look Alive Prod By: Tay Kei...	38441	17318	0.450509
6309	-K9ujx8vO_A	PADMAN Official Trailer | Akshay Kumar | Sonam...	178709	71984	0.402800
4508	u2Ba65YELoo	The Reaction of The Streets (I Wait-Day6 Edition)	88889	25599	0.287988
10200	LsoLEjrDogU	Bruno Mars - Finesse (Remix) [Feat. Cardi B] [...	567412	159390	0.280907
17918	2xM0Peo7JNI	Un Film Pour Raphael	6463	1724	0.266749
17708	2xM0Peo7JNI	Un Film Pour Raphael	5232	1377	0.263188
19531	STEUAcTmXTg	[MIXTAPE] I.M - Fly With Me (MV)	429082	106915	0.249171
37889	E5yFcdPAGv0	Gorillaz - Humility (Official Video)	722936	176713	0.244438
38388	D_6QmL6rExk	BTS (방탄소년단) 'FAKE LOVE' Official MV (Extended ...	5884233	1437903	0.244365
25038	DqihQBYEPas	Il fallait que je vous dise...	4739	1137	0.239924

Impact

XX% sales increase