

# YouTube Video Performance Analytics Project

Project: - YouTube Video Performance Analytics and Reporting Using Data Analytics Tools.

Team Member: -

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Introduction: -

Origins and Evolution

- **Founded on February 14, 2005**, by Chad Hurley, Steve Chen, and Jawed Karim, YouTube began as a simple platform for sharing personal videos.
- In **2006**, Google acquired YouTube for \$1.65 billion, integrating it into its ecosystem and accelerating its growth.
- Today, YouTube is a subsidiary of **Alphabet Inc.**, headquartered in San Bruno, California.

Scale and Reach

- As of 2025, YouTube has over **2.7 billion active users** globally.
- It hosts more than **20 billion uploaded videos**, including music, tutorials, entertainment, podcasts, and Shorts.
- Available in **over 100 countries** and supports **80+ languages**, making it one of the most accessible platforms worldwide.

## Platform Features

- **YouTube Studio:** Analytics and management tools for creators
- **YouTube Shorts:** Short-form vertical videos competing with TikTok
- **YouTube Music:** Music streaming and discovery
- **YouTube Premium:** Ad-free experience with offline viewing
- **YouTube TV:** Live TV streaming service
- **YouTube Kids:** Curated content for children

## Purpose and Mission

- YouTube's mission is to "**give everyone a voice and show them the world**".
- It empowers creators, educators, entertainers, and businesses to reach global audiences.
- The platform fosters community-building, storytelling, and learning through video.

## Monetization and Creator Economy

- Creators earn revenue through **ads, memberships, Super Chats, and merchandise.**
- YouTube's Partner Program allows eligible creators to monetize their content.
- In 2023, YouTube generated **\$31.5 billion in revenue**, largely through advertising.
- YouTube continues to evolve with **AI-driven recommendations, interactive features, and expanded monetization tools.**
- It remains central to the creator's economy and digital media landscape.

## Problem Statement: –

In the digital age, YouTube has emerged as a dominant platform for content creation, entertainment, education, and marketing. With millions of videos uploaded daily, creators and businesses face the challenge of understanding which content performs well, why it performs well, and how to optimize future uploads for better engagement and reach. Despite YouTube Studio offering basic analytics, many users struggle to interpret the data effectively or extract deeper insights. Key performance indicators such as views, watch time, click-through rate (CTR), audience retention, and engagement metrics are often underutilized due to lack of analytical expertise or limited visualization tools.

Moreover, creators lack a unified dashboard that combines multiple metrics, identifies trends, and provides actionable recommendations. This gap hinders content strategy, audience growth, and monetization potential.

Therefore, there is a need to develop a data analytics solution that:

- Collects and organizes YouTube video performance data using the YouTube Data API
- Applies descriptive and exploratory analytics to uncover patterns and correlations
- Visualizes key metrics through interactive dashboards
- Generates insights to help creators make data-driven decisions

This project aims to address these challenges by building a Python-based analytics and reporting system that empowers users to understand and improve their YouTube content performance.

## Objectives of the Study: –

### To Collect and Organize YouTube Video Performance Data

- Utilize the YouTube Data API to extract relevant metrics such as views, likes, comments, watch time, and upload dates.
- Build a structured dataset that can be used for further analysis and visualization.

### To Perform Descriptive

- Summarize key performance indicators (KPIs) using statistical techniques.
- Identify patterns, trends, and anomalies in video performance across time, categories, and audience segments.
- Understand relationships between variables such as video length, upload time, and engagement rate.

### To Visualize Video Performance Metrics

- Create clear and interactive visualizations using Python libraries (e.g., Matplotlib, Seaborn, Plotly).
- Develop dashboards that display metrics like top-performing videos, monthly view trends, and audience retention.

### To Derive Actionable Insights for Content Optimization

- Analyze which types of content generate higher engagement and retention

## To Enhance Analytical Skills and Technical Proficiency

- Strengthen understanding of data collection, cleaning, and analysis of workflows.
- Gain hands-on experience with APIs, Python programming, and data visualization.
- Apply theoretical knowledge of data science to a real-world digital media problem.

## Objectives of the Study: -

- To collect video performance data using the YouTube Data API.
- To analyze trends in views, likes, comments, and audience retention.
- To identify factors that influence higher engagement (like title, category, tags, duration, upload time, etc.).
- To create visual dashboards for better understanding of performance.
- To generate reports and recommendations for improving future videos.

## Methodology: -

### Data Collection

- Use YouTube Data API v3 to extract data such as.

API Key: - AIzaSyDFJ\_THPq-MbhyLiQ3nDCUl-OtvY79RAZ8

```
[2] 2s   Channel Id: - UC00ifCvU8YOOzbL3RdiSTDw
[3] 0s   ➔ from googleapiclient.discovery import build
        api_key = 'AIzaSyDFJ_THPq-MbhyLiQ3nDCUl-OtvY79RAZ8'
        youtube = build('youtube', 'v3', developerKey=api_key)

        request = youtube.channels().list(
            part='snippet,statistics',
            id = 'UC00ifCvU8YOOzbL3RdiSTDw'

        )
        response = request.execute()

        for item in response['items']:
            print("Channel Title:", item['snippet']['title'])
            print("Subscribers:", item['statistics']['subscriberCount'])
            print("Views:", item['statistics']['viewCount'])
            print("Videos:", item['statistics']['videoCount'])

    Channel Title: GetsetflySCIENCE by Gaurav Thakur
    Subscribers: 9560000
    Views: 1364189536
    Videos: 502
```

```
[4] ✓ 0s ➤ # Step 1: Get video IDs from a channel
search_response = youtube.search().list(
    part='snippet',
    channelId='UC00ifCvU8YOOzbL3RdiSTDw',
    maxResults=1000,
    order='date'
).execute()

video_ids = [item['id']['videoId'] for item in search_response['items'] if 'videoId' in item['id']]

# Step 2: Get statistics for each video
video_response = youtube.videos().list(
    part='snippet,statistics',
    id='.'.join(video_ids)
).execute()

for video in video_response['items']:
    print("Title:", video['snippet']['title'])
    print("Views:", video['statistics']['viewCount'])
    print("Likes:", video['statistics'].get('likeCount', 'N/A'))
    print("Comments:", video['statistics'].get('commentCount', 'N/A'))
```

➤ Title: I Drove at 90° North Pole on a Nuclear Icebreaker  
Views: 1192349  
Likes: 38737  
Comments: 2213  
Title: Why Early Humans Died At The Age of 12?  
Views: 1997573  
Likes: 45147  
Comments: 2253

- Store data in CSV or database format for analysis

```
[6] ✓ 0s ➤ from google.colab import files
files.download('youtube_502_video_stats.csv')
```

➤

## Data Cleaning & Preprocessing

- Our data that we extract from the YouTube Data API v3 in the CSV format on the Excel sheet.

	A	B	C	D	E
1	Title	Published Date	Views	Likes	Comments
2	I Drove at 90° North Pole on a Nuclear Icebreaker	2025-10-19T06:28:31Z	1192349	38738	2213
3	Why Early Humans Died At The Age of 12?	2025-09-03T15:26:36Z	1997573	45147	2253
4	Get Glass Skin Instantly   Bodyhacking Expert Reveals Secrets to Reverse Aging   Palak Midha	2025-08-12T13:29:22Z	379045	11456	807
5	How Skyscrapers May Soon Become our Future Homes	2025-08-08T14:38:52Z	1740212	36187	1908
6	Poison in Bottle ?	2025-08-01T13:30:26Z	3113083	145248	1764
7	→ Rise of Sudden Death	2025-07-26T15:52:16Z	224607	15668	253
8	REWRITE Your Brain for Happiness   Science of Happiness	2025-07-24T15:53:08Z	2017796	71113	3452
9	This Everyday Habit is Silently Destroying Your Brain	2025-07-04T15:21:19Z	1196419	46443	2144
10	Did Scientists Finally Prove The Existence of Soul?	2025-06-21T06:28:38Z	3606029	86092	4132
11	New Evidence Found ?	2025-06-17T07:54:41Z	1812587	94287	698
12	Why Did Air India AI-171 Plane Crash?   Possible Explanations	2025-06-15T09:49:40Z	5621909	114050	4045
13	Something STRANGE Found in Deep Sea   The Dark Oxygen Mystery	2025-05-31T16:06:21Z	6879770	121805	3350
14	How to DETOXIFY Your Liver in 7 Days	2025-05-23T14:57:51Z	3444845	97666	2780
15	Good News for Indians!	2025-05-17T14:14:46Z	523909	35861	233
16	Indian Origin Scientist finds Biggest Alien Life Evidence on K2-18B Planet	2025-05-10T06:22:58Z	5462082	97576	3925
17	The Dark Science of Andlviishwas Exposed	2025-04-27T13:51:07Z	1484426	37349	4010
18	→ Stop Bloating from Protein	2025-03-31T15:05:32Z	995329	19109	320
19	Is Deep Sea in Danger?   Full Documentary	2025-03-28T15:01:21Z	3949794	88147	3509
20	→ Heat Alert! Be prepared	2025-03-19T14:23:07Z	5052847	376291	2020
21	Why are Girls Attracted to Unattractive Guys?   Science of Female Attraction	2025-03-16T06:41:52Z	5065156	188705	15705

## ➤ Handle missing values

A	B	C	D	E
Title	Published Date	Views	Likes	Comments
I Dove at 90° North Pole on a Nuclear Icebreaker	2025-10-19T06:28:31Z	1192349	38738	2213
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There is no any missing value in my project's csv file.

## ➤ Duplicate entries

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## ➤ Conditional Formatting

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## Data Analysis: -

Perform descriptive analysis using Pandas and NumPy.

```
[10]  ✓ 0s
    ➔ import pandas as pd

    df= pd.read_csv('/content/drive/MyDrive/Data analytics and reporting2/youtube_502_video_stats (1).csv')
    df.head()

    ➔
```

	Title	Published Date	Views	Likes	Comments
0	I Drove at 90° North Pole on a Nuclear Icebreaker	2025-10-19T06:28:31Z	1192349	38738	2213
1	Why Early Humans Died At The Age of 12?	2025-09-03T15:26:36Z	1997573	45147	2253
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4	Poison in Bottle ?	2025-08-01T13:30:26Z	3113083	145248	1764

Next steps: ( Generate code with df ) ( New interactive sheet )

➤ Understand the Structure of Your Data

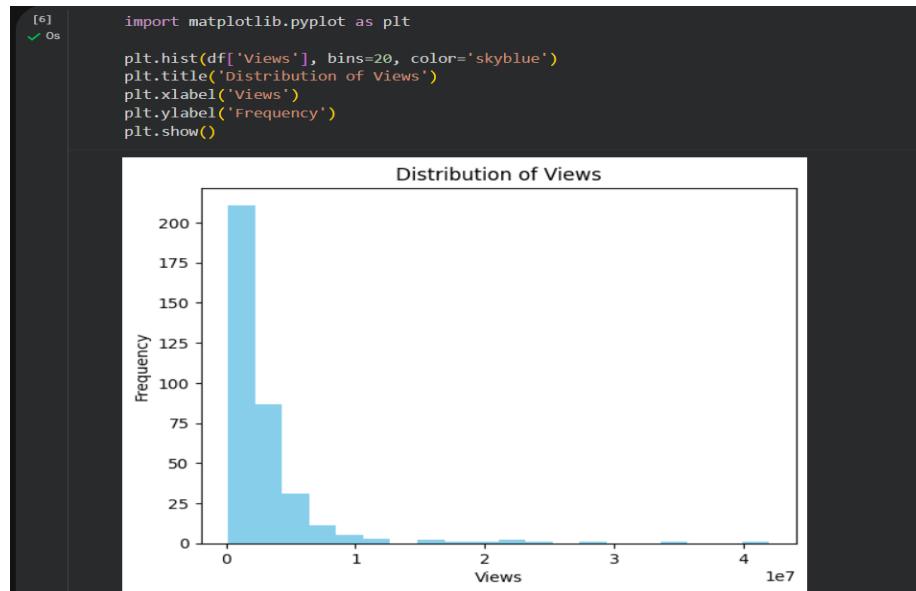
```
df.info()  
df.describe()  
df.columns  
  
<class 'pandas.core.frame.DataFrame'>  
RangeIndex: 358 entries, 0 to 357  
Data columns (total 5 columns):  
 #   Column           Non-Null Count  Dtype     
 ---  --  
 0   Title            358 non-null    object    
 1   Published Date  358 non-null    object    
 2   Views             358 non-null    int64     
 3   Likes             358 non-null    int64     
 4   Comments          358 non-null    int64     
 dtypes: int64(3), object(2)  
 memory usage: 14.1+ KB  
Index(['Title', 'Published Date', 'Views', 'Likes', 'Comments'], dtype='object')
```

➤ Distribution Analysis

```
os  
  print("Total Videos:", len(df))  
  print("Total Views:", df['Views'].astype(int).sum())  
  print("Average Likes:", df['Likes'].astype(int).mean())  
  print("Max Comments:", df['Comments'].astype(int).max())  
  
  ➔ Total Videos: 358  
  Total Views: 1079969884  
  Average Likes: 116795.3407821229  
  Max Comments: 26368
```

## Data Visualization: -

- Create graphs
  - Histogram



- Scatter Graph



➤ Visualize metrics

```
0s   print("Total Videos:", len(df))
      print("Total Views:", df['Views'].astype(int).sum())
      print("Average Likes:", df['Likes'].astype(int).mean())
      print("Max Comments:", df['Comments'].astype(int).max())

→ Total Videos: 358
    Total Views: 1079969884
    Average Likes: 116795.3407821229
    Max Comments: 26368
```

```
0s   df.corr(numeric_only=True)
```

	Views	Likes	Comments	
Views	1.000000	0.899620	0.309519	
Likes	0.899620	1.000000	0.230253	
Comments	0.309519	0.230253	1.000000	

## Reporting & Insights: -

➤ Generate summarized reports

```
0s   summary = df.describe()
      summary.to_csv('summary_stats.csv')
      from google.colab import files
      files.download('summary_stats.csv')
```

Output: -

	A	B	C	D	E
1	Title	Views	Likes	Comments	Month
2	count	358	358	358	358
3	mean	3016676	116795.3	2921.19	6.527933
4	std	4373886	180081.1	3232.147	3.462978
5	min	143298	4377	135	1
6	25%	978983.3	39570.75	1068.75	4
7	50%	1788826	64618.5	1811.5	6
8	75%	3379717	111888.3	3510.5	10
9	max	41968429	1570220	26368	12

## Tools and Technologies Used: -

Category	Tools/Technologies
Programming	Python
Libraries	Pandas, NumPy Matplotlib
API	YouTube Data API v3
Visualization	Google Colab

## Expected Outcomes: -

- A working analytical dashboard that shows YouTube video performance visually.
- Identification of factors that influence engagement and reach.
- Clear data-driven insights for creators to improve video strategies.
- A report summarizing key findings and recommendations

## Applications: -

- Capstone or Final Year Project: Demonstrates practical use of data science, APIs, and visualization tools.
- Skill Development: Enhances proficiency in Python, data analysis, and dashboarding.
- Research Contribution: Can be extended into a research paper on digital media analytics or content optimization.
- Predictive Modeling: Forecasts future views or engagement using regression or time series analysis.
- Clustering and Segmentation: Groups videos based on performance for targeted strategy.
- Sentiment Analysis: Analyzes viewer comments to gauge audience sentiment.
- Performance Monitoring: Helps creators track views, likes, comments, and retention over time.
- Content Strategy: Identifies which topics, formats, or upload times perform best.
- Audience Insights: Reveals viewer demographics, traffic sources, and engagement patterns.

## Conclusion: -

- This project demonstrates how data analytics can transform raw YouTube metrics into meaningful insights.
- By automating data collection and visualization, creators can make informed decisions.
- The outcome of this work will help improve content quality, viewer engagement, and channel growth.