Sentiment-Driven Video Recommendations

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🎯 Sentiment-Driven Video Recommendations 🎯

Personalized video recommendation system based on **video content**, **user interactions**, and **sentiment analysis** from comments to recommend relevant videos to users.

📹 Input:

video_id	title
Z5s4cWbZX6E	The Ethics of Artificial Intelligence

🔝 Top 5 Recommendations

video_id	title	final_score
Aof4BxK0UlY	Artificial Intelligence Advances, and the Ethical Choices Ahead	1.36436
kX4oTF-2_kM	#12np: Artificial Intelligence is Hard to See: Social & ethical impacts of AI	1.30757
7Azhgh0nhBY	Artificial Intelligence: How It Will Impact the Financial Industry	1.2211
AT8JCkJH9pY	The Future of Artificial Intelligence - Shaping our AI Futures	1.1094
yIRL4xtmXE4	How Will Artificial Intelligence Change Ethics? - Pedro Domingos	1.10072

PROCESO


Video_id
01
02
03
Videos recomendados
MATRIZ DE SIMILITUD
ANÁLISIS DE SENTIMIENTOS
CLUSTERING

OBTENCIÓN DE DATOS REALES

YOUTUBE API SEARCH

TOPIC: Inteligencia Artificial

```
queries = [
    "What is artificial intelligence?" ,
    "Artificial intelligence applications in healthcare" ,
    "AI in autonomous vehicles" ,
    "Machine learning vs deep learning" ,
    "Artificial intelligence in finance" ,
    "How does AI work?" ,
    "Top AI tools for data science" ,
    "Artificial intelligence in robotics" ,
    "AI-driven innovation in business" ,
]
```

```
params = {
    'part': 'snippet',
    'type': 'video',
    'maxResults': 50,
    'key': api_key,
    'order': 'viewCount',
    'videoDuration': 'any',
    'regionCode': 'US'
}
```

DATAFRAMES

Canales

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 2010 entries, 0 to 2009
Data columns (total 8 columns):
 #   Column            Non-Null Count  Dtype
---  ------            --------------  -----
 0   channel_id        2010 non-null   object
 1   title             2010 non-null   object
 2   description       1857 non-null   object
 3   published_at      2010 non-null   object
 4   subscriber_count  2010 non-null   int64
 5   video_count       2010 non-null   int64
 6   view_count        2010 non-null   int64
 7   region            1583 non-null   object
dtypes: int64(3), object(5)
memory usage: 125.8+ KB
```

Videos

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 2711 entries, 0 to 2710
Data columns (total 16 columns):
 #   Column          Non-Null Count  Dtype
---  ------          --------------  -----
 0   videoId         2711 non-null   object
 1   title           2711 non-null   object
 2   channelId       2711 non-null   object
 3   description     2535 non-null   object
 4   publishedAt     2711 non-null   object
 5   thumbnail_url   2711 non-null   object
 6   tags            2711 non-null   object
 7   live_broadcast  2711 non-null   object
 8   categoryId      2711 non-null   int64
 9   viewCount       2711 non-null   int64
 10  likeCount       2711 non-null   int64
 11  commentCount    2711 non-null   int64
 12  licensed        2711 non-null   bool
 13  duration        2711 non-null   object
 14  caption         2711 non-null   bool
 15  language        2711 non-null   object
dtypes: bool(2), int64(4), object(10)
memory usage: 301.9+ KB
```

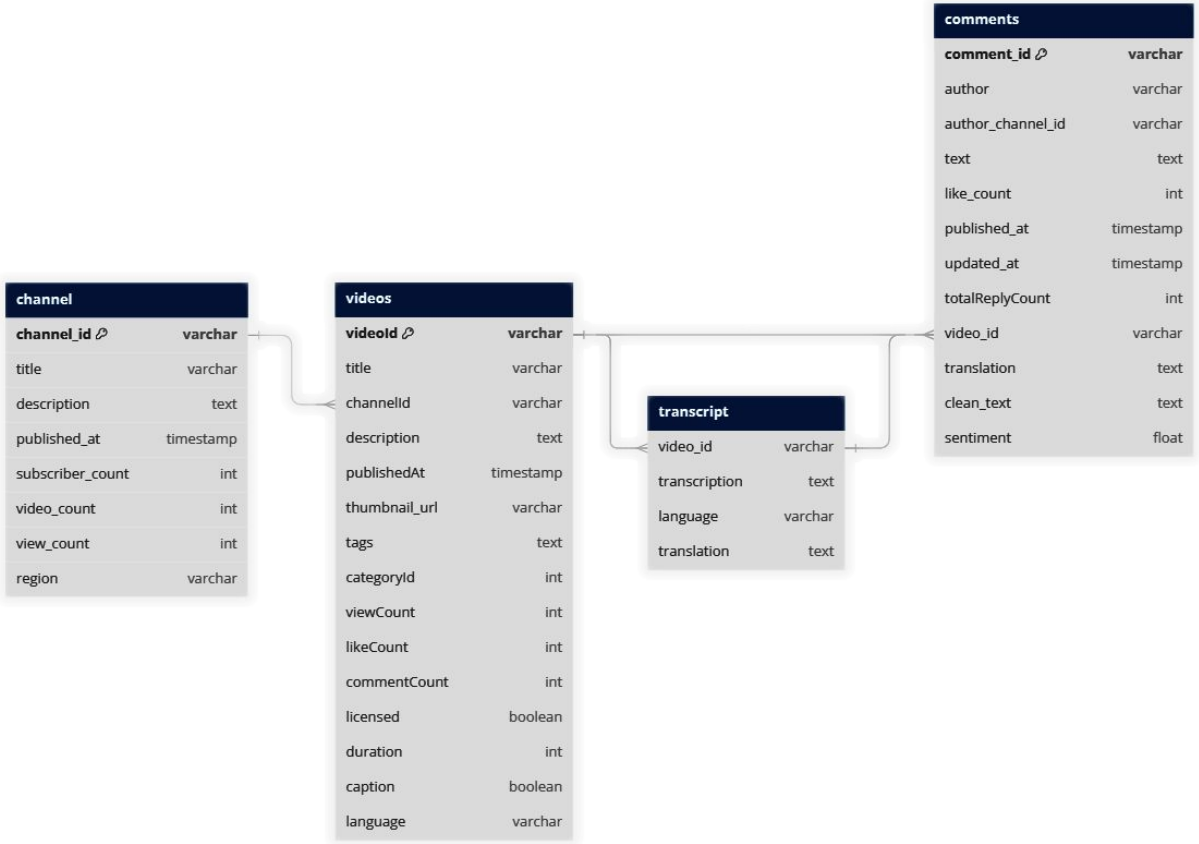
Transcripciones

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1787 entries, 0 to 1786
Data columns (total 3 columns):
 #   Column         Non-Null Count  Dtype
---  ------         --------------  -----
 0   video_id       1787 non-null   object
 1   transcription  1787 non-null   object
 2   language       1787 non-null   object
dtypes: object(3)
memory usage: 42.0+ KB
```

Comentarios

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 185382 entries, 0 to 185381
Data columns (total 9 columns):
 #   Column             Non-Null Count   Dtype
---  ------             --------------   -----
 0   comment_id         185382 non-null  object
 1   author             185003 non-null  object
 2   author_channel_id  185109 non-null  object
 3   text               185109 non-null  object
 4   like_count         184944 non-null  float64
 5   published_at       184944 non-null  object
 6   updated_at         184779 non-null  object
 7   totalReplyCount    184779 non-null  float64
 8   video_id           184779 non-null  object
dtypes: float64(2), object(7)
memory usage: 12.7+ MB
```

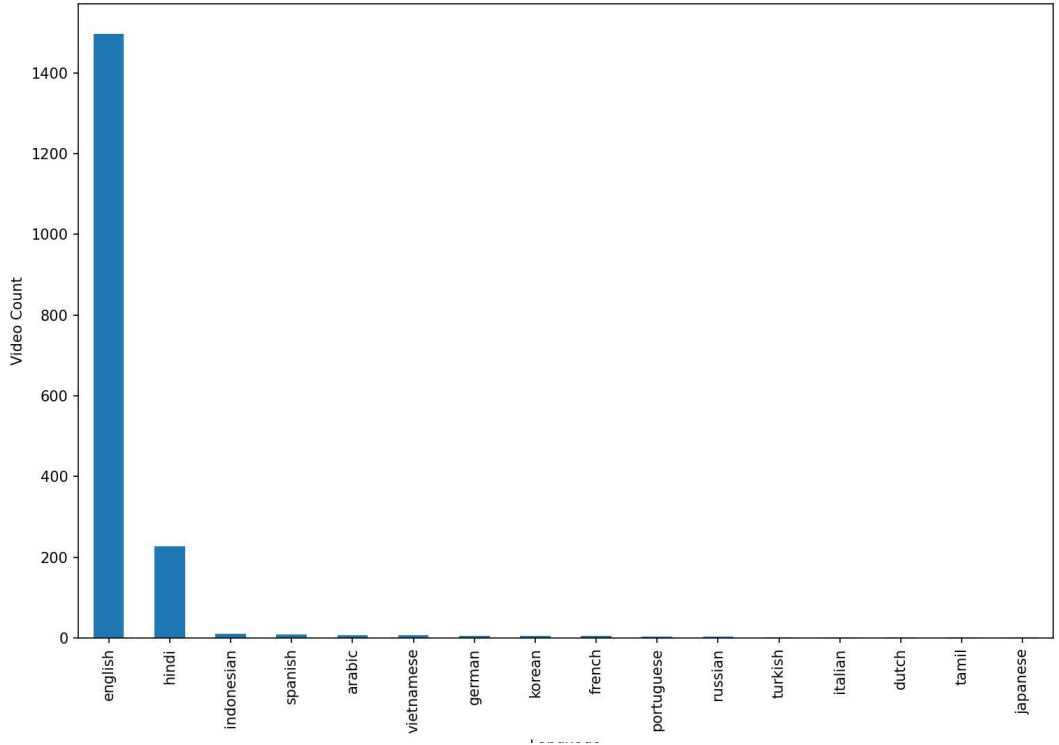
DATABASE


channel
channel_id varchar
title varchar
description text
published_at timestamp
subscriber_count int
video_count int
view_count int
region varchar
videos
videoId varchar
title varchar
channelId varchar
description text
publishedAt timestamp
thumbnail_url varchar
tags text
categoryId int
viewCount int
likeCount int
commentCount int
licensed boolean
duration int
caption boolean
language varchar
transcript
video_id varchar
transcription text
language varchar
translation text
comments
comment_id varchar
author varchar
author_channel_id varchar
text text
like_count int
published_at timestamp
updated_at timestamp
totalReplyCount int
video_id varchar
translation text
clean_text text
sentiment float

MATRIZ DE SIMILITUD
[Transcripciones]

TRADUCCIÓN DE TRANSCRIPCIONES

	video_id	original_language	transcription	language
0	qtlUwwtvuEg	English (auto-generated)	[Music] thank you hello everyone I hope you ar...	english
1	QaoDXYYtgK0	English (auto-generated)	number three [Music] Facebook has enacted an e...	english
2	PqDwddEHswU	English (auto-generated)	in this series we're going to introduce deep l...	english
3	B-Y7rnOa43w	English (auto-generated)	this is how to earn money with AI and it's par...	english
4	vyit-1zKsZ4	English (auto-generated)	when current Medical Science has run out of op...	english



PREPROCESAMIENTO DEL TEXTO

```
import nltk
from nltk.corpus import stopwords
from nltk.stem import WordNetLemmatizer
import string
import re

# Descargar recursos de NLTK si no están descargados
nltk.download('wordnet')
nltk.download('stopwords')

# Inicializar el lematizador en inglés
lemmatizer = WordNetLemmatizer()

# Cargar las stopwords en inglés
stop_words = set(stopwords.words('english'))

def preprocess_text(text):
    if text is None:
        return None
    text = re.sub(r'[^a-zA-Z\s]', '', text)
    text = text.lower()
    text = text.translate(str.maketrans('', '',
string.punctuation))
    text = ' '.join([lemmatizer.lemmatize(word) for word in
text.split() if word not in stop_words])
    return text
```

- **Limpieza de caracteres**: Se eliminan caracteres no alfabéticos.
- **Normalización**: Convierte el texto a minúsculas.
- **Eliminación de ruido**: Se eliminan las puntuaciones y las stopwords.
- **Lematización**: Se reduce cada palabra a su forma básica o lema.

TF-IDF: Term Frequency - Inverse Document Frequency

$$\text{TF-IDF}(t, d) = \text{TF}(t, d) \times \text{IDF}(t, D)$$

Donde:

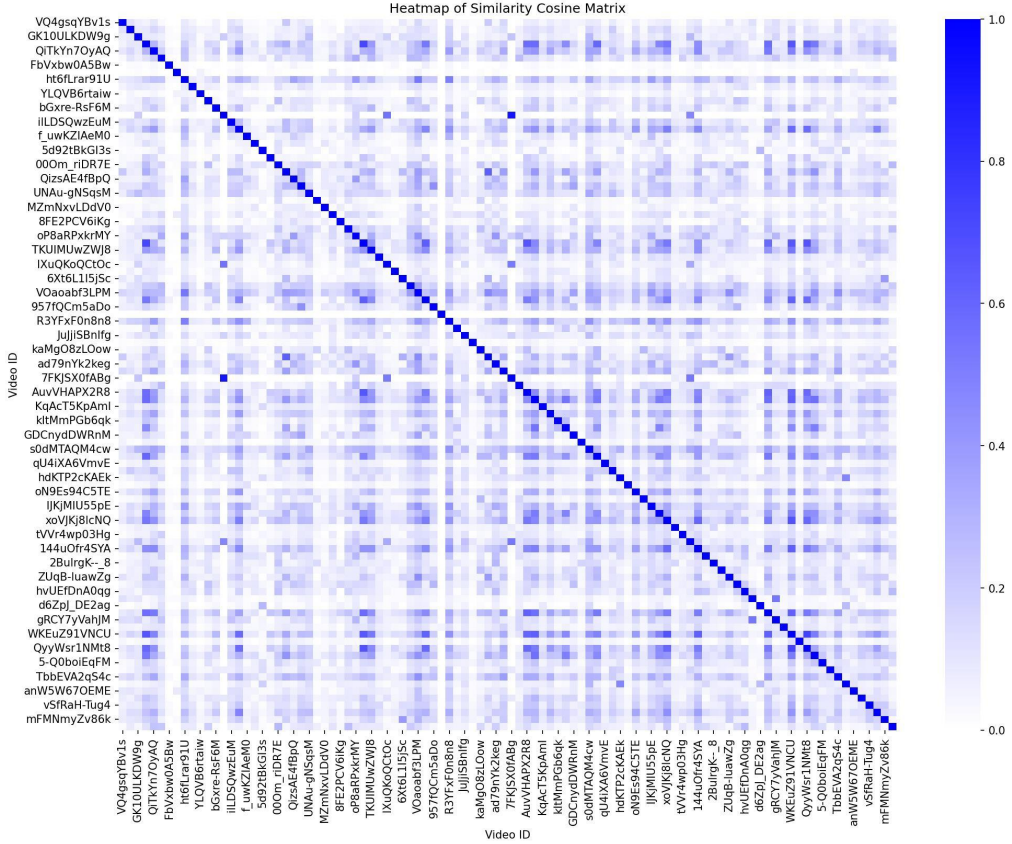
- **TF (Term Frequency)**: Mide la frecuencia con la que un término t aparece en un documento d. Se calcula como:

$$\text{TF}(t, d) = \frac{\text{Número de veces que el término } t \text{ aparece en el documento } d}{\text{Número total de términos en el documento } d}$$

- **IDF (Inverse Document Frequency)**: Mide la importancia de un término en todo el conjunto de documentos D. Se calcula como:

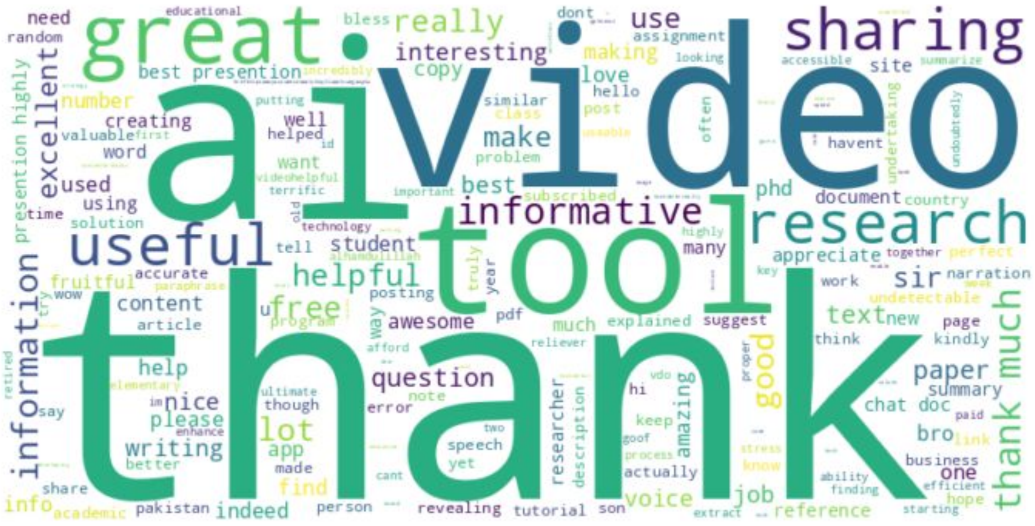
$$\text{IDF}(t, D) = \log\left(\frac{\text{Número total de documentos en el conjunto } D}{\text{Número de documentos que contienen el término } t}\right)$$

MATRIZ DE SIMILITUD: MAPA DE CALOR



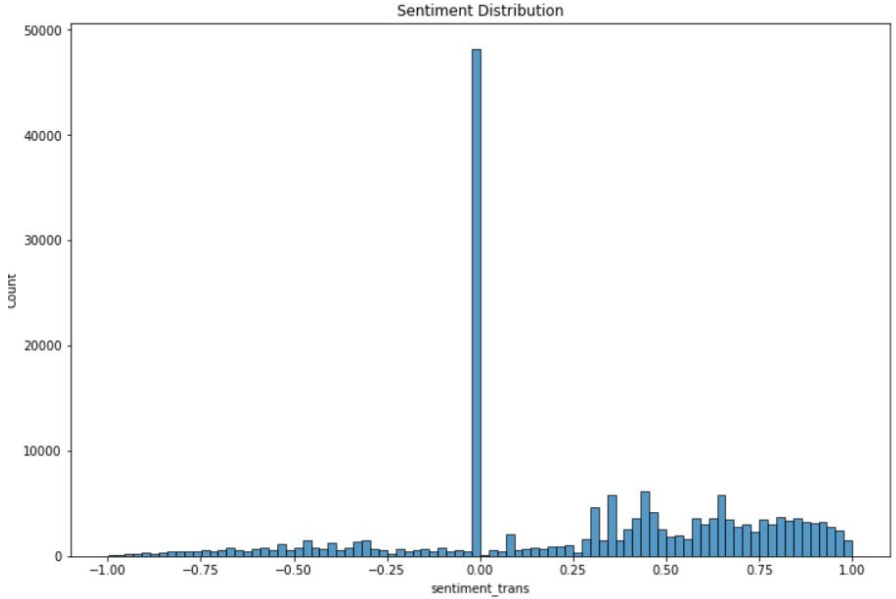
ANÁLISIS DE SENTIMIENTOS
[Comentarios]

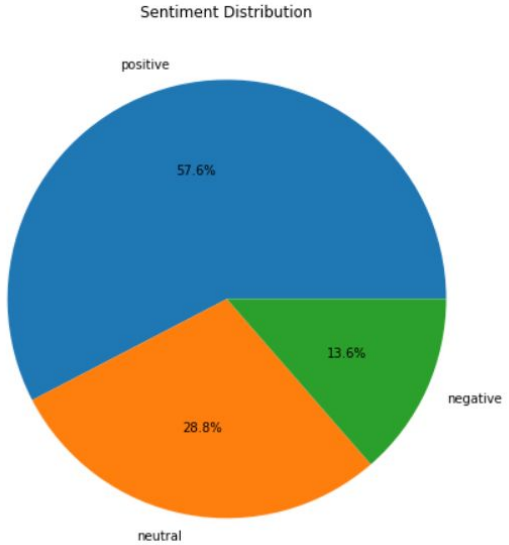
NUBE DE PALABRAS SOBRE COMENTARIO PREPROCESADO



ANÁLISIS DE SENTIMIENTO UTILIZANDO VADER

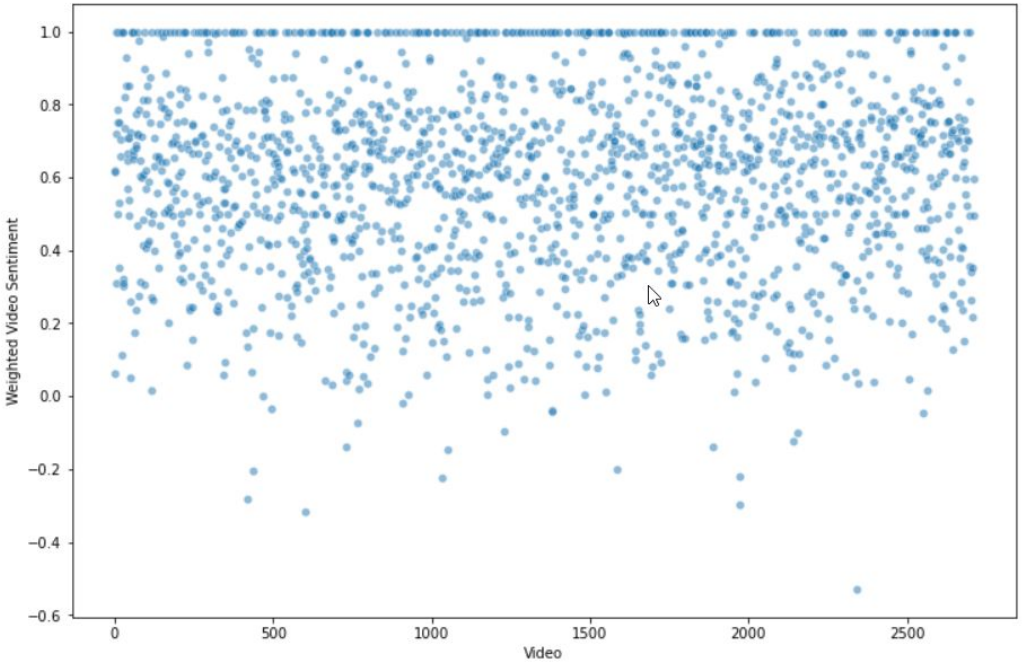
- Modelo que utliza un diccionario que asocia **palabras con valencias o cargas emocionales**:
  - Puntuación 1: máximo valor positivo
  - Puntuación 0: valor neutro
  - Puntuación 1: máximo valor negativo
- **Modificadores de intensidad**:





SENTIMIENTO PONDERADO POR VIDEO

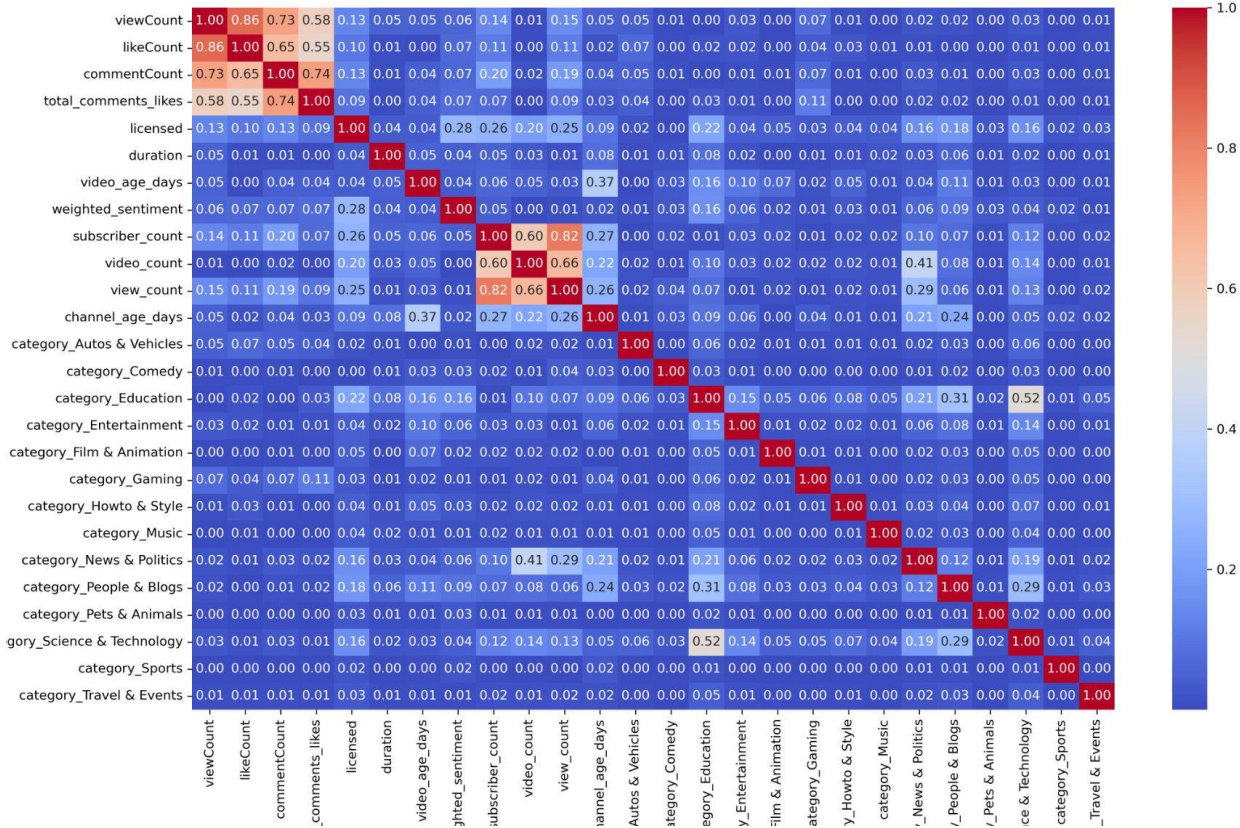
$$\text{sentiment\_media\_video} = \frac{\sum_{i=1}^{n} \left(\text{sentiment\_comment}_i \times (\text{n\_likes\_per\_comment}_i + 1)\right)}{\text{n\_comments} + \text{n\_likes\_total}}$$



CLUSTERING
[Estadísticas de los videos]

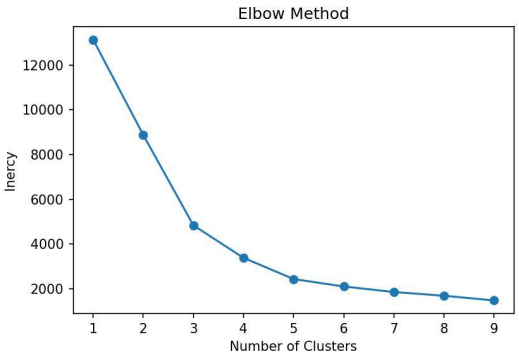
MATRIZ DE CORRELACIÓN

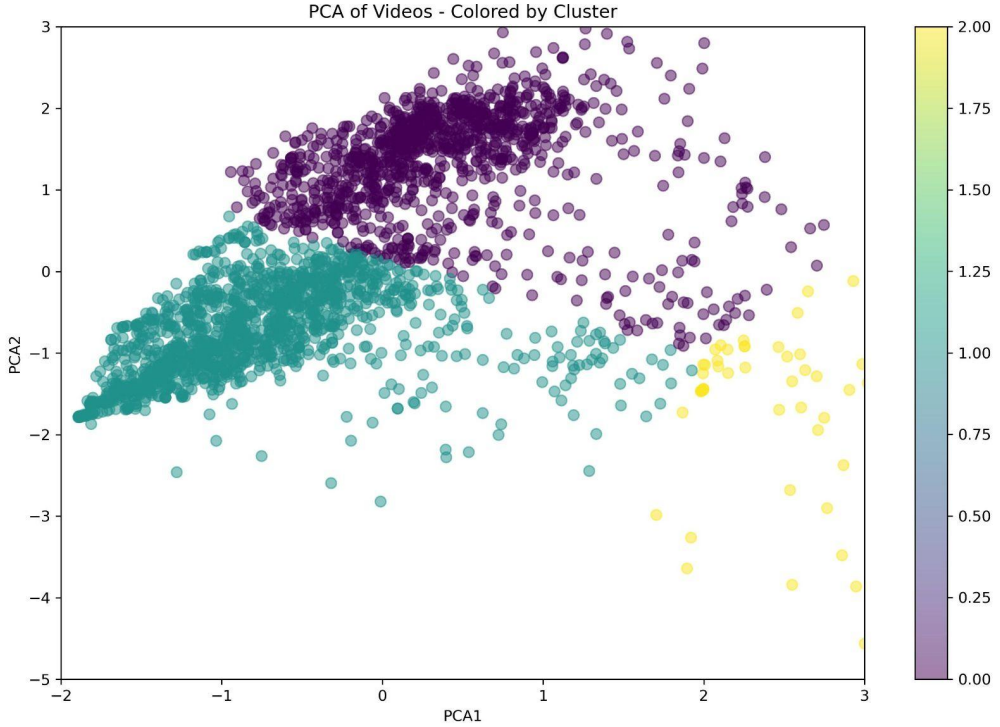
```
var_alta_corr =
['likeCount',
'total_comments_likes
',
'subscriber_count']
```



K-MEANS

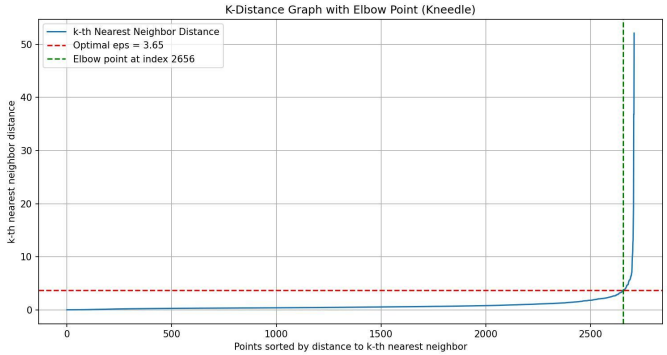
```
kmeans = KMeans(n_clusters=3)

Calculate the silhouette score
silhouette_avg_score = 0.4566
```

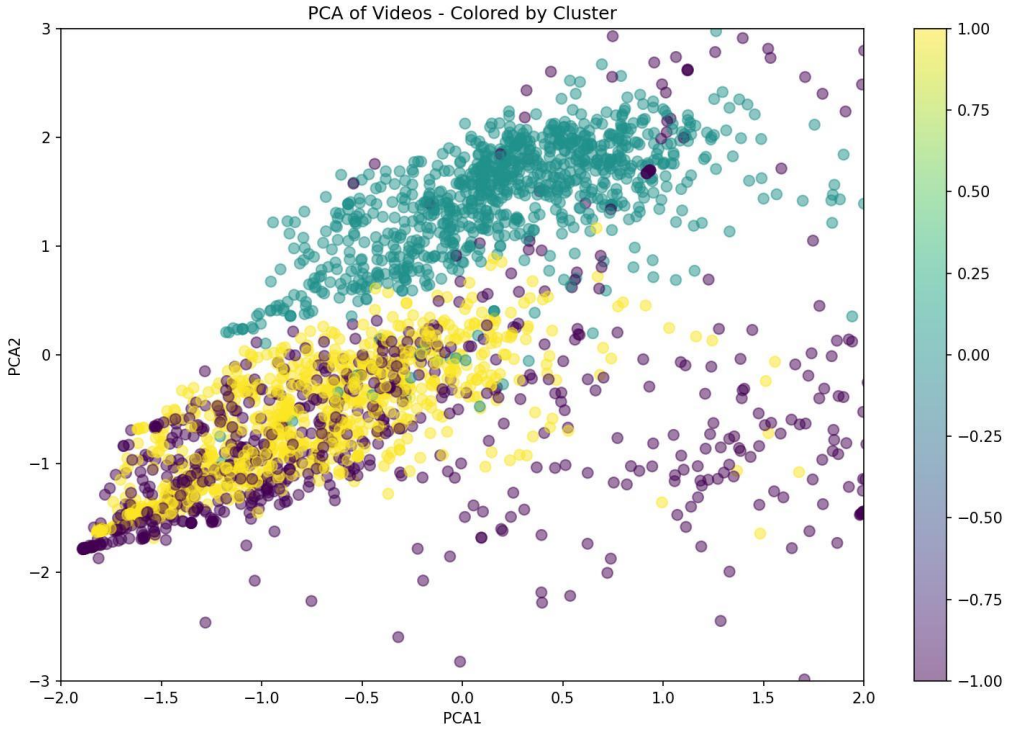




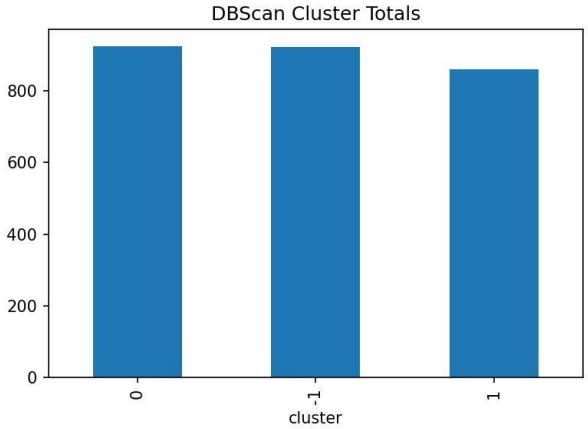
DBSCAN

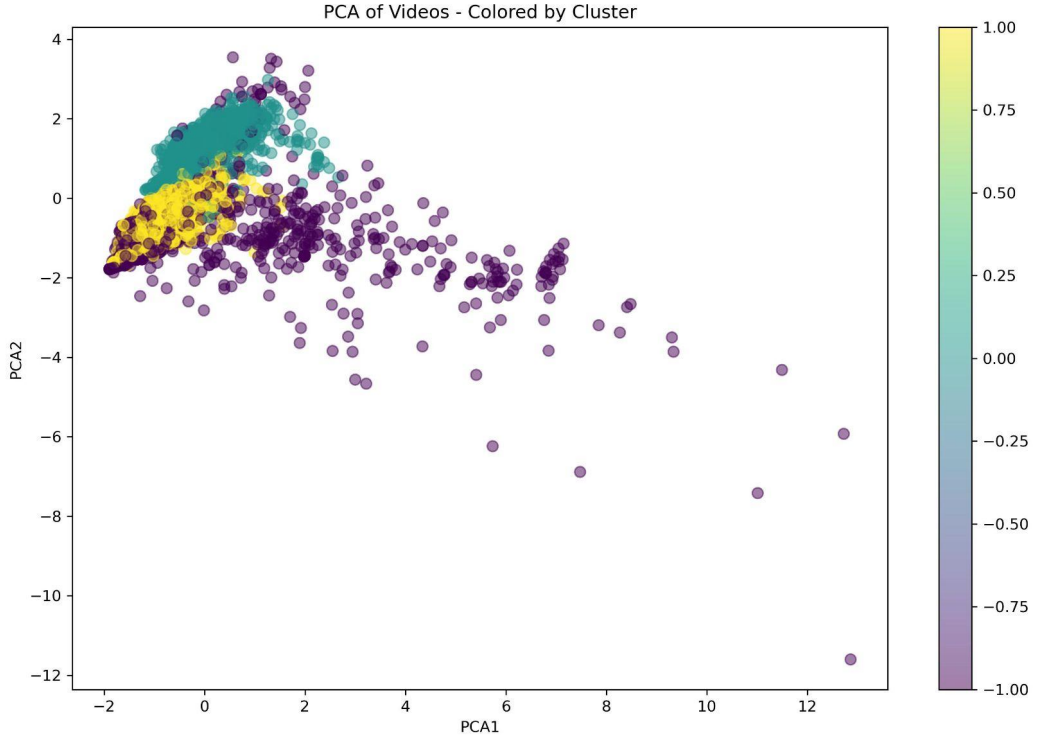
```
dbscan_model = DBSCAN(eps=2.65,
min_samples=450)

Number of clusters: 2
Number of noise points (-1): 762
silhouette_avg_score = 0.3891
```





CLUSTERIZACIÓN ELEGIDA: DBSCAN





APLICACIÓN FINAL

CÁLCULO DEL FINAL_SCORE

Final Score = Matriz Similitud Score x Sentiment Score × Clusters Boost

Sentiment Score = (1 + Weighted Sentiment)
Cluster Boost = 1.2

RESULTADOS

PRUEBA 1

video_id	title
I-aLMhRwfL0	How Warren Buffett INVESTS In Artificial Intelligence #shorts

video_id	title	final_score
-EpRqaPAOz4	Applications of Artificial Intelligence in Business. - [Hindi]- Quick Support	0.440083
wlNJiBWklzg	2021 Artificial intelligence outlook: Language, automation and trust are key to AI: IBM SVP	0.424335
ja06VL8vYmk	#ONPASSIVE - The Future is Now, August 2024 #ai #AI #onpassiveai #aitools #artificialintelligence	0.422861
Pjg3p6DFmlc	Senate hearing on Oversight of A.I.: Rules for Artificial Intelligence	0.380852
NdoydRqVOV4	The Imaging Wire Show - Change Healthcare’s AI Adoption Roadmap	0.357064

PRUEBA 2

video_id	title
BlYFE3jXlKE	😍Top 6 Artificial Intelligence Stocks for Investments#shorts#ytshorts #investing#ai#viral#trending

video_id	title	final_score
NoMpupqag2Y	Is Artificial Intelligence Taking Over Finance	0.402001
LCOK9nO_Dys	Artificial intelligence: Experts warn of AI extinction threat to humans	0.19056
qB4HGMvrhwE	2024 Twelve Best FREE AI tools for Academic Research and Researchers	0.147023
do5wrddhyPU	What is India's role in Artificial Intelligence technology?	0.14112
zKaxW8HduNU	9 Step Guide for a proper Machine Learning model!!!	0.132497

RESULTADOS

PRUEBA 3

video_id	title
QVg37-m4Ia4	The Future of AI in Healthcare

video_id	title	final_score
fFtwJLUVyg8	Applications of AI for Healthcare and Medicine (Muhammad Mamdani, PharmD)	0.916202
u0oTLNmXINE	Revolutionizing Healthcare - AI and machine learning for early detection and diagnosis (1/2)	0.890791
AuvVHAPX2R8	#80 AI - Artificial Intelligence in Healthcare discussion with Dr. Janak Gunatilleke | João Bocas	0.788551
AONZoaWC9v4	AI & Machine Learning in Finance: AI Applications in the Financial Industry - Panel Discussion	0.687893
4gcDNtvXHPM	A.I. Enabled Healthcare: Potential & Challenges. DeepMind's Dr. Alan Karthikesalingam	0.677443

PRUEBA 4

video_id	title
X5ib9dnGERo	Will AI robots rule the world? #ai #robot #airobotics #robotics #uts #technology #innovation

video_id	title	final_score
qIvkEEIA7dA	Myth or Fact? AI will replace all jobs #futureofwork #ai #robotics #robots #technology #uts	0.739898
53K1dMyslJg	The Rise of Artificial Intelligence | Off Book | PBS Digital Studios	0.542543
Z5s4cWbZX6E	The Ethics of Artificial Intelligence	0.427623
S9D7qgcoiYc	Artificial Intelligence, Ethics, and Society | Institute for Advanced Study	0.411608
AT8JCkJH9pY	The Future of Artificial Intelligence - Shaping our AI Futures	0.403217

RESULTADOS

PRUEBA 5

video_id	title
7gEzEAIELgQ	Machine Learning Explained 🔥in 30 Seconds.

PRUEBA 6

video_id	title			final_score
snYHLqEtheI	How to be a Software Engineer , Ethical Hacker , Data Scientist , Artificial Intelligence	Eduport		1.0311
PfY187sxquI	Artificial Intelligence	Explained in Malayalam		0.969247
Al4bwR--BgY	5 free resources to help you get a machine learning job			0.958583
[illegible]	What Is Machine Learning?	What Is Machine Learning And How Does It Work?	Simplilearn	0.903009
b4aE9gWpr0A	Artificial Intelligence in HealthCare	Can AI replace Doctors?	Tamil	Rams Universe	0.777466

video_id	title
IikHET7tR8Y	The future of autonomous vehicles. #autonomousvehicles

video_id	title	final_score
4GPmdmn9_ZE	AI in Transportation Shaping the Future of Autonomous Vehicles and Smart Cities	1.28337
0Z1tVL3Wh8I	AI in Autonomous Vehicles!	0.740036
0CqyPmLw8X4	AI in Transportation From Autonomous Vehicles to Traffic Management #shorts #ai	0.728683
qpoGoI742gA	How AI is Driving the Future: The Rise of Autonomous Vehicles	0.723037
2CLKChuKbcE	How AI is Transforming Transportation: An Inside Look at Autonomous Vehicles!	0.692267

PRÓXIMOS PASOS

- Implementar métricas de evaluación como Precisión@K o Recall@K tras analizar el desempeño de las recomendaciones actuales
- Refinar la agrupación de videos con DBSCAN para mayor diversidad
- Realizar pruebas A/B para valorar las mejoras
- Optimizar el sistema para escalabilidad y recomendaciones en tiempo real

MUCHAS GRACIAS!