Import dependies/libraries

```
import pandas as pd
from collections import Counter
import matplotlib.pyplot as plt
import numpy as np
pd.set_option('display.max_rows', None)
pd.set_option('display.max_columns', None)
import nltk
import seaborn as sns
import string
from sklearn.preprocessing import LabelEncoder


# Download NLTK stopwords if not already downloaded
nltk.download('stopwords')

# Import stopwords
from nltk.corpus import stopwords
```

```
[nltk_data] Downloading package stopwords to C:\Users\Swetanshu
[nltk_data]     Pandey\AppData\Roaming\nltk_data...
[nltk_data]   Package stopwords is already up-to-date!
```

Load Data

```
df = pd.read_csv(r"bbc.csv")
```

1) Explore the dataset and describe the data, clean it up if necessary:

```
# Display the first few rows of the dataset to understand its
structure
df.head()
```

```
   position                channel_id channel_title     video_id  \
0         1  UCCj956IF62FbT7Gouszaj9w           BBC  8qH0pGdjB_U
1         2  UCCj956IF62FbT7Gouszaj9w           BBC  lqeS-rOoBSw
2         3  UCCj956IF62FbT7Gouszaj9w           BBC  JMfkBavl1ks
3         4  UCCj956IF62FbT7Gouszaj9w           BBC  T_6RRmkLOSs
4         5  UCCj956IF62FbT7Gouszaj9w           BBC  3-mayD_9Yg8

           published_at
video_title  \
0  2020-08-13T15:00:02Z  Colin Robinson's Origins of the Species -
What...
1  2020-08-13T14:30:04Z  Maisie Smith and Zack Morris on EastEnders'
la...
2  2020-08-13T05:50:21Z  A-level results to arrive in year with no
```

```
exam...
3  2020-08-12T13:00:13Z  8 signs you're in survival mode and how to
sta...
4  2020-08-12T11:00:02Z  The secret Heathrow lounge that costs £2700
ju...

                                   video_description
video_category_id  \
0  Subscribe and 🔔 to OFFICIAL BBC YouTube 👉 http...
24
1  Subscribe and 🔔 to OFFICIAL BBC YouTube 👉 http...
24
2  Subscribe and 🔔 to OFFICIAL BBC YouTube 👉 http...
27
3  Subscribe and 🔔 to OFFICIAL BBC YouTube 👉 http...
27
4  Subscribe and 🔔 to OFFICIAL BBC YouTube 👉 http...
24

  video_category_label  duration  duration_sec dimension definition
caption  \
0        Entertainment   PT5M23S           323        2d         hd
False
1        Entertainment   PT3M15S           195        2d         hd
False
2            Education  PT14M48S           888        2d         hd
False
3            Education   PT3M50S           230        2d         hd
False
4        Entertainment   PT1M52S           112        2d         hd
False

   licensed_content  view_count  like_count  dislike_count
favorite_count  \
0               1.0         738        76.0            7.0
0
1               1.0         512        55.0            9.0
0
2               NaN       19888       326.0           50.0
0
3               1.0       14515       324.0          532.0
0
4               1.0       15644       331.0           14.0
0

   comment_count
0            4.0
1           13.0
2          128.0
```

```
3          282.0
4           22.0
```

```
# shape of Data
df.shape
```

```
(12456, 20)
```

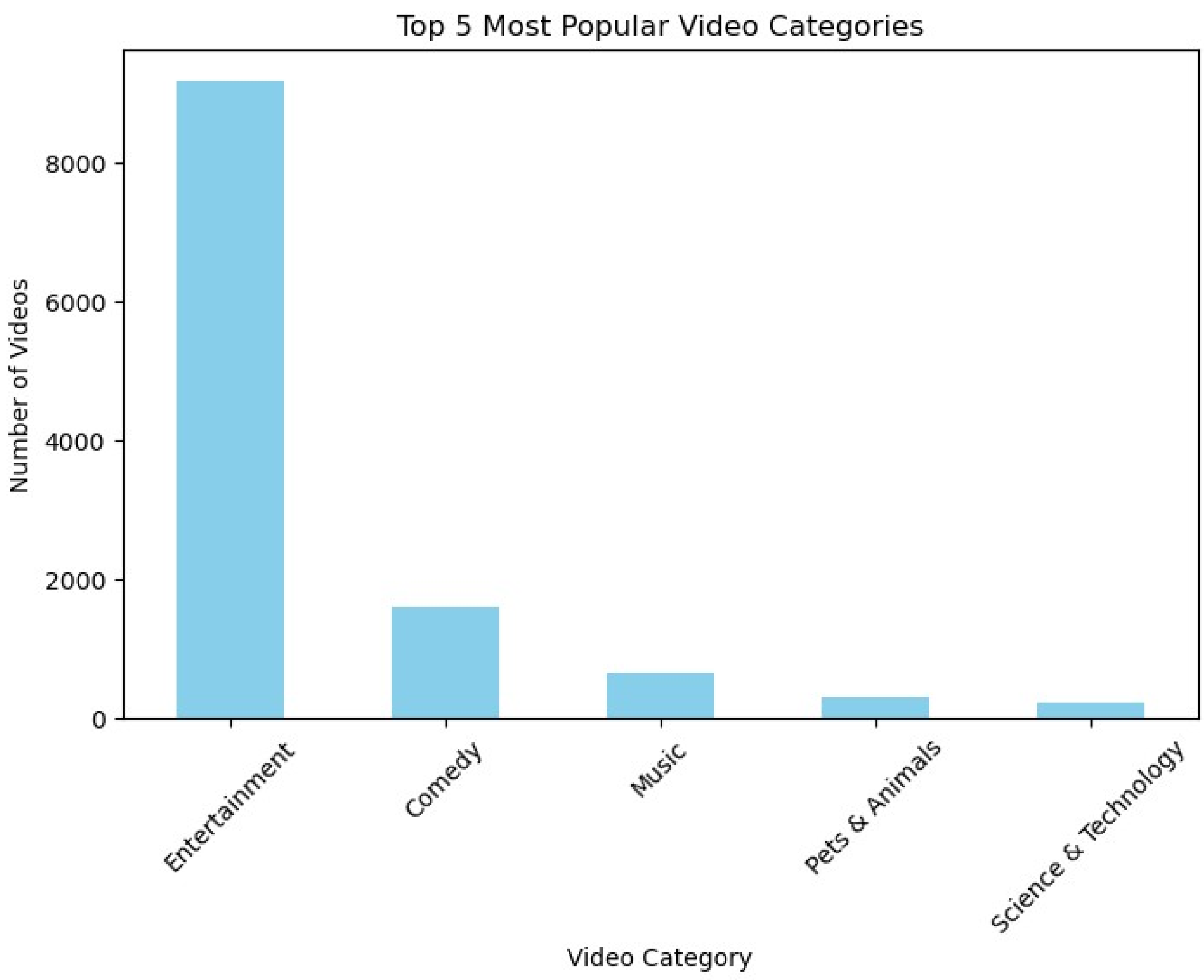
```
# get info of the data
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 12456 entries, 0 to 12455
Data columns (total 20 columns):
 #   Column                Non-Null Count  Dtype  
---  ------                --------------  -----  
 0   position              12456 non-null  int64  
 1   channel_id            12456 non-null  object 
 2   channel_title         12456 non-null  object 
 3   video_id              12456 non-null  object 
 4   published_at          12456 non-null  object 
 5   video_title           12456 non-null  object 
 6   video_description     12456 non-null  object 
 7   video_category_id     12456 non-null  int64  
 8   video_category_label  12456 non-null  object 
 9   duration              12456 non-null  object 
 10  duration_sec          12456 non-null  int64  
 11  dimension             12456 non-null  object 
 12  definition            12456 non-null  object 
 13  caption               12456 non-null  bool   
 14  licensed_content      11878 non-null  float64
 15  view_count            12456 non-null  int64  
 16  like_count            12454 non-null  float64
 17  dislike_count         12454 non-null  float64
 18  favorite_count        12456 non-null  int64  
 19  comment_count         12361 non-null  float64
dtypes: bool(1), float64(4), int64(5), object(10)
memory usage: 1.8+ MB
```

```
# Check data types of each column
(pd.DataFrame(df.dtypes.reset_index()))
```

```
                   index       0
0               position   int64
1             channel_id  object
2          channel_title  object
3               video_id  object
4           published_at  object
5            video_title  object
6      video_description  object
7      video_category_id   int64
```

```
8   video_category_label   object
9               duration   object
10          duration_sec    int64
11             dimension   object
12            definition   object
13               caption     bool
14      licensed_content  float64
15            view_count    int64
16            like_count  float64
17         dislike_count  float64
18        favorite_count    int64
19         comment_count  float64

# What is the minimum and maximum value for a published time header
(‘parsed_time_pub’))? Present it in a year (YYYY) format.

# Convert 'published_at' column to datetime format
df['parsed_time_pub'] = pd.to_datetime(df['published_at'])

# Find minimum and maximum published time
min_published_time = df['parsed_time_pub'].min().strftime('%Y')
max_published_time = df['parsed_time_pub'].max().strftime('%Y')

print("Minimum published time (YYYY):", min_published_time)
print("Maximum published time (YYYY):", max_published_time)

Minimum published time (YYYY): 2007
Maximum published time (YYYY): 2020

# Group by video category label and count the number of occurrences
category_counts = df['video_category_label'].value_counts().head(5)

# Visualize the result
plt.figure(figsize=(8, 5))
category_counts.plot(kind='bar', color='skyblue')
plt.title('Top 5 Most Popular Video Categories')
plt.xlabel('Video Category')
plt.ylabel('Number of Videos')
plt.xticks(rotation=45)

# Set x-axis tick labels to video categories
plt.xticks(ticks=range(len(category_counts.index)),
labels=category_counts.index)

plt.show()
```



```
# identify missing dataset

def missing_data(data):
    total = data.isnull().sum()
    percent = (data.isnull().sum()/data.isnull().count()*100)
    tt = pd.concat([total, percent], axis=1, keys=['Total',
'Percent'])
    types = []
    for col in data.columns:
        dtype = str(data[col].dtype)
        types.append(dtype)
    tt['Types'] = types
    return tt

missing_data(df)
```

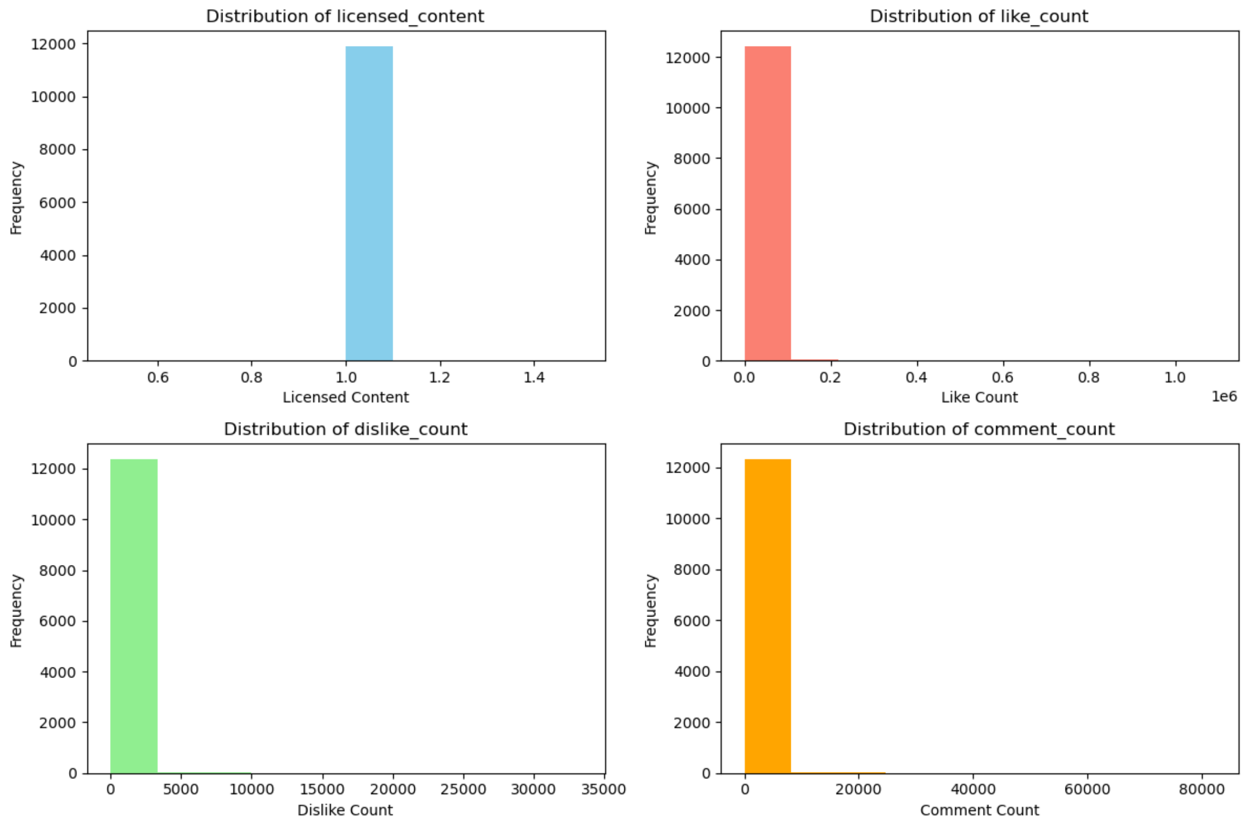
```
                      Total   Percent                Types
position                  0  0.000000                int64
channel_id                0  0.000000               object
```

```
channel_title            0  0.000000                 object
video_id                 0  0.000000                 object
published_at             0  0.000000                 object
video_title              0  0.000000                 object
video_description        0  0.000000                 object
video_category_id        0  0.000000                  int64
video_category_label     0  0.000000                 object
duration                 0  0.000000                 object
duration_sec             0  0.000000                  int64
dimension                0  0.000000                 object
definition               0  0.000000                 object
caption                  0  0.000000                   bool
licensed_content       578  4.640334                float64
view_count               0  0.000000                  int64
like_count               2  0.016057                float64
dislike_count            2  0.016057                float64
favorite_count           0  0.000000                  int64
comment_count           95  0.762685                float64
parsed_time_pub          0  0.000000  datetime64[ns, UTC]
```

```python
# Show unique values

def unique_values(data):
    total = data.count()
    tt = pd.DataFrame(total)
    tt.columns = ['Total']
    uniques = []
    for col in data.columns:
        unique = data[col].nunique()
        uniques.append(unique)
    tt['Uniques'] = uniques
    return tt

unique_values(df)
```

```
                      Total  Uniques
position              12456    12456
channel_id            12456        1
channel_title         12456        1
video_id              12456    12456
published_at          12456    11973
video_title           12456    12421
video_description     12456    11778
video_category_id     12456       15
video_category_label  12456       15
duration              12456      913
duration_sec          12456      897
dimension             12456        2
definition            12456        2
caption               12456        2
```

```
licensed_content      11878        1
view_count            12456    12142
like_count            12454     4317
dislike_count         12454     1014
favorite_count        12456        1
comment_count         12361     1480
parsed_time_pub       12456    11973

fig, axes = plt.subplots(2,2, figsize=(12, 8))

# Plot histograms
df['licensed_content'].plot(kind='hist', ax=axes[0, 0],
color='skyblue')
axes[0, 0].set_title('Distribution of licensed_content')
axes[0, 0].set_xlabel('Licensed Content')
axes[0, 0].set_ylabel('Frequency')

df['like_count'].plot(kind='hist', ax=axes[0, 1], color='salmon')
axes[0, 1].set_title('Distribution of like_count')
axes[0, 1].set_xlabel('Like Count')
axes[0, 1].set_ylabel('Frequency')

df['dislike_count'].plot(kind='hist', ax=axes[1, 0],
color='lightgreen')
axes[1, 0].set_title('Distribution of dislike_count')
axes[1, 0].set_xlabel('Dislike Count')
axes[1, 0].set_ylabel('Frequency')

df['comment_count'].plot(kind='hist', ax=axes[1, 1], color='orange')
axes[1, 1].set_title('Distribution of comment_count')
axes[1, 1].set_xlabel('Comment Count')
axes[1, 1].set_ylabel('Frequency')

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



```python
# Fill missing values
df['licensed_content'].fillna(0, inplace=True)
df['like_count'].fillna(df['like_count'].median(), inplace=True)
df['dislike_count'].fillna(df['dislike_count'].median(), inplace=True)
df['comment_count'].fillna(df['comment_count'].median(), inplace=True)
```

2) Slice the dataset by cutting the following columns:

```python
# SLicing the dataset
df = df.drop(columns=["published_at", "video_category_id", "duration",
"dimension", "licensed_content", "favorite_count"])

# Defining a here function to clean the video titles
def clean_video_title(title):
    # Remove punctuation
    title = title.translate(str.maketrans('', '', string.punctuation))

    # Remove digits
    title = ''.join([i for i in title if not i.isdigit()])

    # Remove stopwords
    stop_words = set(stopwords.words('english'))
    title = ' '.join([word for word in title.split() if word.lower()
not in stop_words])
```

```
    # Remove specific strings
    strings_to_remove = ['bbc one', 'bbc two', 'bbc three', 'bbc',
'part', 'episode', 'series', 'preview', 'show']
    for s in strings_to_remove:
        title = title.replace(s, '')

    return title.strip()

# Apply the cleaning function to the 'video_title' column
df['video_title_clean'] = df['video_title'].apply(clean_video_title)
```

3) Find the top 5 keywords from the newly generated 'video_title_clean' header for each year represented in the dataset.

```
# Apply the function to create a new 'year' column
df['year'] = df['parsed_time_pub'].dt.year

# Group the DataFrame by year
grouped = df.groupby('year')

# Define a function to extract keywords - here not considering emojis
def extract_top_keywords(titles):
    all_words = ' '.join(titles).split()  # Combine all titles and
split into words
    all_words = (word for word in all_words if word[:1].isalpha()) #
removing any emojis
    word_count = Counter(all_words)  # Count occurrences of each word
    top_keywords = word_count.most_common(5)  # Get the top 5 keywords
    return [keyword[0] for keyword in top_keywords]

# Find top 5 keywords for each year
top_keywords_by_year = {}
for year, group in grouped:
    top_keywords_by_year[year] =
extract_top_keywords(group['video_title_clean'])

# Print the top 5 keywords for each year
for year, keywords in top_keywords_by_year.items():
    print(f"Year {year}: {keywords}")
```

```
Year 2007: ['BBC', 'One', 'Two', 'Show', 'Strictly']
Year 2008: ['BBC', 'One', 'Two', 'Three', 'Dancing']
Year 2009: ['BBC', 'One', 'Preview', 'Episode', 'Three']
Year 2010: ['BBC', 'One', 'Episode', 'Preview', 'Series']
Year 2011: ['BBC', 'One', 'Episode', 'Series', 'Two']
Year 2012: ['BBC', 'One', 'Episode', 'Series', 'Voice']
Year 2013: ['BBC', 'One', 'Episode', 'Series', 'Preview']
Year 2014: ['BBC', 'One', 'Episode', 'Series', 'Two']
Year 2015: ['BBC', 'Episode', 'One', 'Series', 'Two']
Year 2016: ['BBC', 'One', 'Episode', 'Preview', 'Series']
Year 2017: ['BBC', 'One', 'Episode', 'Show', 'Two']
Year 2018: ['BBC', 'One', 'Graham', 'Norton', 'Together']
Year 2019: ['BBC', 'Show', 'Graham', 'Norton', 'Dancer']
Year 2020: ['BBC', 'Coronavirus', 'Covid', 'UK', 'News']
```

```python
# Define a function to extract keywords - here considering emojis
def extract_top_keywords(titles):
    all_words = ' '.join(titles).split()  # Combine all titles and
split into words
    word_count = Counter(all_words)  # Count occurrences of each word
    top_keywords = word_count.most_common(5)  # Get the top 5 keywords
    return [keyword[0] for keyword in top_keywords]

# Find top 5 keywords for each year
top_keywords_by_year = {}
for year, group in grouped:
    top_keywords_by_year[year] =
extract_top_keywords(group['video_title_clean'])

# Print the top 5 keywords for each year
for year, keywords in top_keywords_by_year.items():
    print(f"Year {year}: {keywords}")
```

```
Year 2007: ['BBC', 'One', 'Two', 'Show', 'Strictly']
Year 2008: ['BBC', 'One', 'Two', 'Three', 'Dancing']
Year 2009: ['BBC', 'One', 'Preview', 'Episode', 'Three']
Year 2010: ['BBC', 'One', 'Episode', 'Preview', 'Series']
Year 2011: ['BBC', 'One', 'Episode', 'Series', 'Two']
Year 2012: ['BBC', 'One', 'Episode', 'Series', 'Voice']
Year 2013: ['BBC', 'One', 'Episode', 'Series', 'Preview']
Year 2014: ['BBC', 'One', 'Episode', 'Series', 'Two']
Year 2015: ['BBC', 'Episode', 'One', 'Series', 'Two']
Year 2016: ['BBC', 'One', 'Episode', 'Preview', 'Series']
Year 2017: ['BBC', 'One', 'Episode', 'Show', 'Two']
Year 2018: ['BBC', 'One', 'Graham', 'Norton', 'Together']
Year 2019: ['BBC', 'Show', 'Graham', 'Norton', 'Dancer']
Year 2020: ['BBC', 'Coronavirus', '◯', 'Covid', 'UK']
```

4) Calculate and assign a new column 'engagement rate' for each row using the following formula: total engagements (likes, comments, dislikes) divided by the number of views per post, then multiply the result by 100 and round it up to 1 decimal.

```python
# Calculate total engagements for each row
total_engagements = df['like_count'] + df['comment_count'] +
df['dislike_count']

# Calculate views per post
views_per_post = df['view_count']

# Calculate engagement rate
engagement_rate = (total_engagements / views_per_post) * 100

# Round the engagement rate to 1 decimal place
engagement_rate = engagement_rate.round(1)

# Assign the calculated engagement rate to a new column
df['engagement_rate'] = engagement_rate

# Display the DataFrame with the new 'engagement_rate' column
df.head()
```

```
   position                channel_id channel_title     video_id  \
0         1  UCCj956IF62FbT7Gouszaj9w           BBC  8qH0pGdjB_U
1         2  UCCj956IF62FbT7Gouszaj9w           BBC  lqeS-rOoBSw
2         3  UCCj956IF62FbT7Gouszaj9w           BBC  JMfkBavl1ks
3         4  UCCj956IF62FbT7Gouszaj9w           BBC  T_6RRmkLOSs
4         5  UCCj956IF62FbT7Gouszaj9w           BBC  3-mayD_9Yg8

                                         video_title  \
0  Colin Robinson's Origins of the Species - What...
1  Maisie Smith and Zack Morris on EastEnders' la...
2  A-level results to arrive in year with no exam...
3  8 signs you're in survival mode and how to sta...
4  The secret Heathrow lounge that costs £2700 ju...

                                   video_description
video_category_label  \
0  Subscribe and 🔔 to OFFICIAL BBC YouTube 👉 http...
Entertainment
1  Subscribe and 🔔 to OFFICIAL BBC YouTube 👉 http...
Entertainment
2  Subscribe and 🔔 to OFFICIAL BBC YouTube 👉 http...
Education
3  Subscribe and 🔔 to OFFICIAL BBC YouTube 👉 http...
```

```
Education
4  Subscribe and 🔔 to OFFICIAL BBC YouTube 👉 http...
Entertainment

   duration_sec definition  caption  view_count  like_count
dislike_count  \
0           323         hd    False         738        76.0
7.0
1           195         hd    False         512        55.0
9.0
2           888         hd    False       19888       326.0
50.0
3           230         hd    False       14515       324.0
532.0
4           112         hd    False       15644       331.0
14.0

   comment_count            parsed_time_pub  \
0            4.0 2020-08-13 15:00:02+00:00
1           13.0 2020-08-13 14:30:04+00:00
2          128.0 2020-08-13 05:50:21+00:00
3          282.0 2020-08-12 13:00:13+00:00
4           22.0 2020-08-12 11:00:02+00:00

                                   video_title_clean  year
engagement_rate
0         Colin Robinsons Origins Species Shadows BBC  2020
11.8
1  Maisie Smith Zack Morris EastEnders latest tee...  2020
15.0
2  Alevel results arrive year exams Covid Top sto...  2020
2.5
3          signs youre survival mode start living BBC  2020
7.8
4           secret Heathrow lounge costs £ get QI BBC  2020
2.3
```

5) Calculate the length of characters in ‘video_title_clean’ and assign it to ‘title_len’ column.

```
# Calculate the length of characters in 'video_title_clean' and assign
it to a new column
df['title_len'] = df['video_title_clean'].apply(len)

# Display the DataFrame with the new 'title_len' column
df.head()

   position                channel_id channel_title     video_id  \
0         1  UCCj956IF62FbT7Gouszaj9w           BBC  8qH0pGdjB_U
```

```
1         2  UCCj956IF62FbT7Gouszaj9w           BBC  lqeS-rOoBSw
2         3  UCCj956IF62FbT7Gouszaj9w           BBC  JMfkBavl1ks
3         4  UCCj956IF62FbT7Gouszaj9w           BBC  T_6RRmkLOSs
4         5  UCCj956IF62FbT7Gouszaj9w           BBC  3-mayD_9Yg8

                                         video_title  \
0  Colin Robinson's Origins of the Species - What...
1  Maisie Smith and Zack Morris on EastEnders' la...
2  A-level results to arrive in year with no exam...
3  8 signs you're in survival mode and how to sta...
4  The secret Heathrow lounge that costs £2700 ju...

                                   video_description
video_category_label  \
0  Subscribe and 🔔 to OFFICIAL BBC YouTube 👉 http...
Entertainment
1  Subscribe and 🔔 to OFFICIAL BBC YouTube 👉 http...
Entertainment
2  Subscribe and 🔔 to OFFICIAL BBC YouTube 👉 http...
Education
3  Subscribe and 🔔 to OFFICIAL BBC YouTube 👉 http...
Education
4  Subscribe and 🔔 to OFFICIAL BBC YouTube 👉 http...
Entertainment

   duration_sec definition  caption  view_count  like_count
dislike_count  \
0           323         hd    False         738        76.0
7.0
1           195         hd    False         512        55.0
9.0
2           888         hd    False       19888       326.0
50.0
3           230         hd    False       14515       324.0
532.0
4           112         hd    False       15644       331.0
14.0

   comment_count           parsed_time_pub  \
0            4.0 2020-08-13 15:00:02+00:00
1           13.0 2020-08-13 14:30:04+00:00
2          128.0 2020-08-13 05:50:21+00:00
3          282.0 2020-08-12 13:00:13+00:00
4           22.0 2020-08-12 11:00:02+00:00

                                   video_title_clean  year
engagement_rate  \
0        Colin Robinsons Origins Species Shadows BBC  2020
11.8
1  Maisie Smith Zack Morris EastEnders latest tee...  2020
```

```
15.0
2  Alevel results arrive year exams Covid Top sto...  2020
2.5
3         signs youre survival mode start living BBC  2020
7.8
4          secret Heathrow lounge costs £ get QI BBC  2020
2.3

   title_len
0         43
1         59
2         62
3         42
4         41
```

6) Assign a dichotomized score for engagement rate in a separate column, where ‘top 50%’ (engagement rate >=0.6) is represented by 1 , and ‘bottom 50%’ is represented by 0.

```
# Calculate the engagement rate threshold for top 50%
engagement_rate_threshold = df['engagement_rate'].quantile(0.5)

# Assign a dichotomized score based on engagement rate
df['engagement_score'] = (df['engagement_rate'] >=
engagement_rate_threshold).astype(int)

# Display the DataFrame with the new 'engagement_score' column
df.head()

   position                channel_id channel_title     video_id  \
0         1  UCCj956IF62FbT7Gouszaj9w           BBC  8qH0pGdjB_U
1         2  UCCj956IF62FbT7Gouszaj9w           BBC  lqeS-rOoBSw
2         3  UCCj956IF62FbT7Gouszaj9w           BBC  JMfkBavl1ks
3         4  UCCj956IF62FbT7Gouszaj9w           BBC  T_6RRmkLOSs
4         5  UCCj956IF62FbT7Gouszaj9w           BBC  3-mayD_9Yg8

                                         video_title  \
0  Colin Robinson's Origins of the Species - What...
1  Maisie Smith and Zack Morris on EastEnders' la...
2  A-level results to arrive in year with no exam...
3  8 signs you're in survival mode and how to sta...
4  The secret Heathrow lounge that costs £2700 ju...

                                   video_description
video_category_label  \
0  Subscribe and 🔔 to OFFICIAL BBC YouTube 👉 http...
Entertainment
```

```
1  Subscribe and 🔔 to OFFICIAL BBC YouTube 👉 http...
Entertainment
2  Subscribe and 🔔 to OFFICIAL BBC YouTube 👉 http...
Education
3  Subscribe and 🔔 to OFFICIAL BBC YouTube 👉 http...
Education
4  Subscribe and 🔔 to OFFICIAL BBC YouTube 👉 http...
Entertainment

   duration_sec definition  caption  view_count  like_count
dislike_count  \
0           323         hd    False         738        76.0
7.0
1           195         hd    False         512        55.0
9.0
2           888         hd    False       19888       326.0
50.0
3           230         hd    False       14515       324.0
532.0
4           112         hd    False       15644       331.0
14.0

   comment_count           parsed_time_pub  \
0            4.0 2020-08-13 15:00:02+00:00
1           13.0 2020-08-13 14:30:04+00:00
2          128.0 2020-08-13 05:50:21+00:00
3          282.0 2020-08-12 13:00:13+00:00
4           22.0 2020-08-12 11:00:02+00:00

                                   video_title_clean  year
engagement_rate  \
0        Colin Robinsons Origins Species Shadows BBC  2020
11.8
1  Maisie Smith Zack Morris EastEnders latest tee...  2020
15.0
2  Alevel results arrive year exams Covid Top sto...  2020
2.5
3          signs youre survival mode start living BBC  2020
7.8
4           secret Heathrow lounge costs £ get QI BBC  2020
2.3

   title_len  engagement_score
0         43                 1
1         59                 1
2         62                 1
3         42                 1
4         41                 1
```

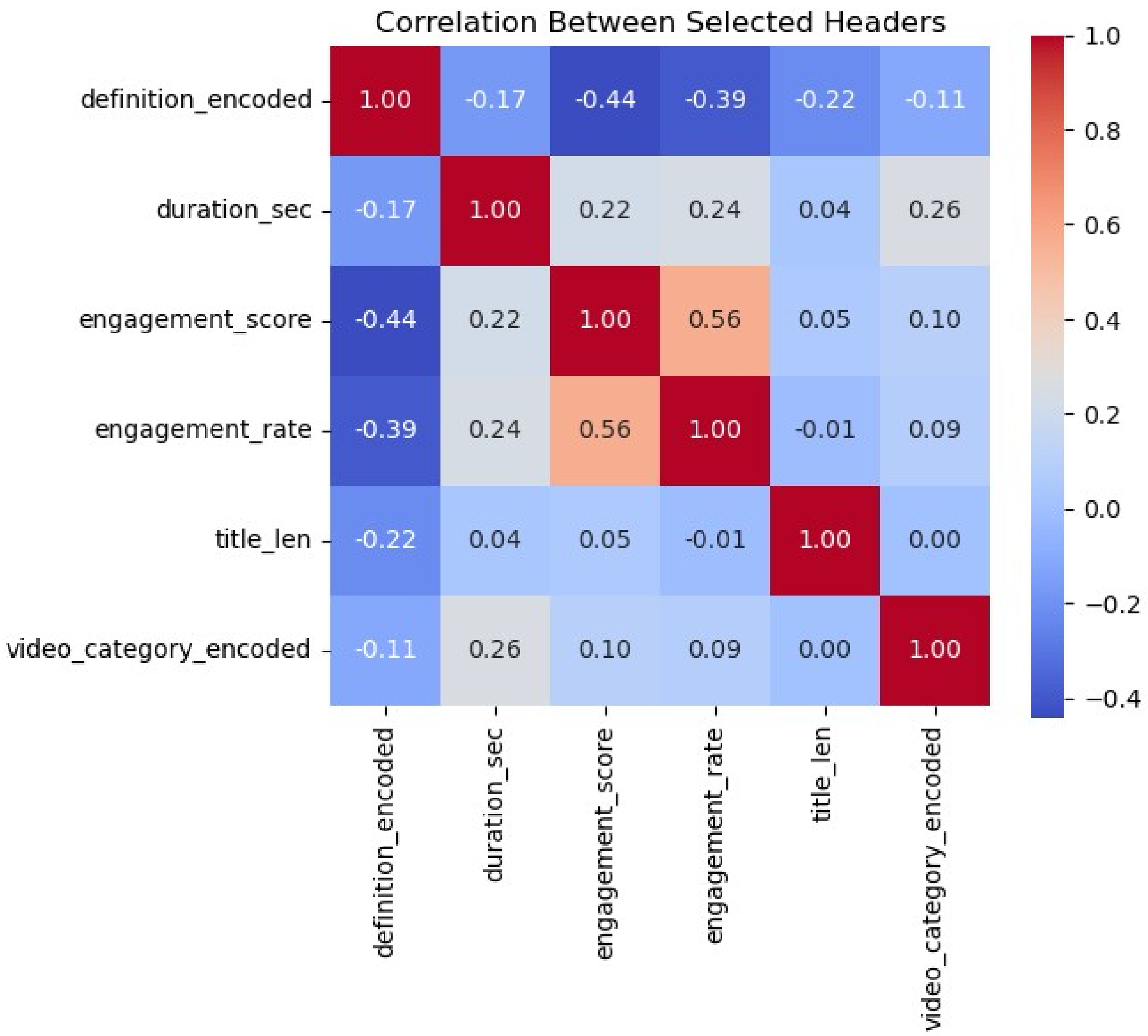
7) Encode ‘video category labels' and ‘definition’ labels to numeric values.

```
# Create LabelEncoder objects
category_encoder = LabelEncoder()
definition_encoder = LabelEncoder()

# Fit and transform the 'video_category_label' column
df['video_category_encoded'] =
category_encoder.fit_transform(df['video_category_label'])

# Fit and transform the 'definition' column
df['definition_encoded'] =
definition_encoder.fit_transform(df['definition'])
```

8) Visualize a correlation between following headers: definition, duration, dichotomized score, parsed_time_pub, engagement rate, title length, video_category_label.

```
# Select the relevant columns
columns_to_visualize = ['definition_encoded', 'duration_sec',
'engagement_score', 'parsed_time_pub', 'engagement_rate', 'title_len',
'video_category_encoded']

# Calculate the correlation matrix
correlation_matrix = df[columns_to_visualize].corr()

# Plot the correlation heatmap
plt.figure(figsize=(6, 5))
sns.heatmap(correlation_matrix, annot=True, cmap='coolwarm',
fmt=".2f", square=True)
plt.title('Correlation Between Selected Headers')
plt.show()
```

```
C:\Users\Swetanshu Pandey\AppData\Local\Temp\
ipykernel_19156\2642008056.py:5: FutureWarning: The default value of
numeric_only in DataFrame.corr is deprecated. In a future version, it
will default to False. Select only valid columns or specify the value
of numeric_only to silence this warning.
  correlation_matrix = df[columns_to_visualize].corr()
```



	definition_encoded	duration_sec	engagement_score	engagement_rate	title_len	video_category_encoded
definition_encoded	1.00	-0.17	-0.44	-0.39	-0.22	-0.11
duration_sec	-0.17	1.00	0.22	0.24	0.04	0.26
engagement_score	-0.44	0.22	1.00	0.56	0.05	0.10
engagement_rate	-0.39	0.24	0.56	1.00	-0.01	0.09
title_len	-0.22	0.04	0.05	-0.01	1.00	0.00
video_category_encoded	-0.11	0.26	0.10	0.09	0.00	1.00

9) Describe in your own words what correlations you observe there. Put it in a comment in the code.

About Correlation:-

1. Strength of Correlation:

- Correlation coefficients (r) range from -1 to 1.

- The closer the absolute value of the correlation coefficient is to 1, the stronger the correlation.

- A correlation coefficient of 1 or -1 indicates a perfect linear relationship.

- A correlation coefficient close to 0 indicates a weak or no linear relationship.

2. Direction of Correlation:

- A positive correlation (r > 0) means that as one variable increases, the other variable also tends to increase.

- A negative correlation (r < 0) means that as one variable increases, the other variable tends to decrease.

3. Interpretation:

- Strong positive correlation: The variables move in the same direction and the correlation coefficient is close to +1 (e.g., 0.8 to 1.0).

- Weak positive correlation: The variables move in the same direction, but the correlation coefficient is closer to 0 than to +1 (e.g., 0.2 to 0.6).

- Strong negative correlation: The variables move in opposite directions and the correlation coefficient is close to -1 (e.g., -0.8 to -1.0).

- Weak negative correlation: The variables move in opposite directions, but the correlation coefficient is closer to 0 than to -1 (e.g., -0.2 to -0.6).

- No correlation: The correlation coefficient is close to 0 (e.g., -0.2 to 0.2).

```
# So we can see that:-
# 1. Duration_sec and definition_encoded don't have any correlation
# 2. engagement_score and definition_encoded are weak negatively correlated. (A negative correlation (r < 0) means that as one variable increases, the other variable tends to decrease.)
# 3. engagement_rate and definition_encoded are weak negatively correlated.
# 4. title_len and definition_encoded are weak negatively correlated.
# 5. video_category_encoded and definition_encoded don't have any correlation
# 6. Duration_sec and engagement_score are weak positively correlated.
(Weak positive correlation: The variables move in the same direction,
but the correlation coefficient is closer to 0 than to +1 (e.g., 0.2
to 0.6).)
# 7. Duration_sec and engagement_rate are weak positively correlated.
# 8. title_len and Duration_sec don't have any correlation.
# 9. Duration_sec and video_category_encoded are weak positively
correlated.


# 10. engagement_score and engagement_rate are weak positively
correlated.
# 11. engagement_score and title_len don't have any correlation.
# 12. engagement_score and video_category_encoded don't have any
correlation.


# 13. engagement_rate and title_len don't have any correlation.
# 14. engagement_rate and video_category_encoded don't have any
correlation.


# 15. title_len and video_category_encoded don't have any correlation.
```