



EAST WEST UNIVERSITY

CSE477

Section: 02

Lab: 01 Report

Topic: Exploratory Data Analysis on YouTube Data

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PART 1: Getting Ready (Tools, Setup, and Verified References)

A. Install Python: I already have Python, and the version is **Python 3.11.9**

Command: `python --version`

```
Microsoft Windows [Version 10.0.19045.3803]
(c) Microsoft Corporation. All rights reserved.

C:\Users\Admin>python --version
Python 3.11.9
```

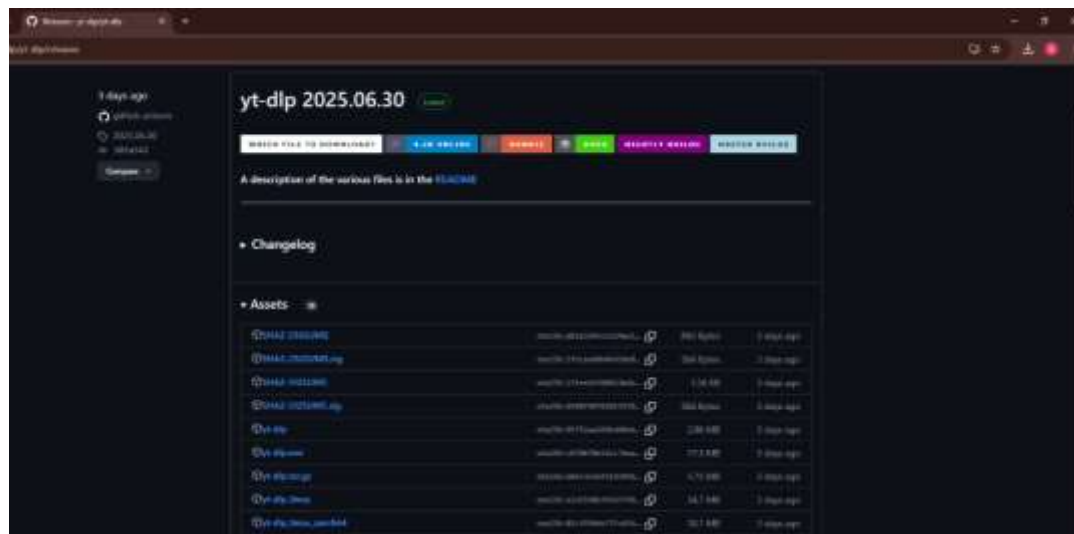
B. Install yt-dlp (Both Methods, All Verified):

Method 1 (Install with pip): I already have yt-dlp on my computer environment.

Command: `pip install yt-dlp`

```
C:\Users\Admin>pip install yt-dlp
Defaulting to user installation because normal site-packages is not writeable
Requirement already satisfied: yt-dlp in c:\users\admin\appdata\local\packages\pythonsoftwarefoundation.python.3
```

Method 2: Download Standalone Executable: Download **yt-dlp.exe** from the official GitHub Releases page: <https://github.com/yt-dlp/yt-dlp/releases>



➔ Download it to a particular workable folder.

[illegible]

C. Install Python Libraries:

Change to the particular folder disk path, which is **D:**

Command: pip install pandas matplotlib webvtt-py

```
C:\Users\Admin>D:
D:>cd \CSE 477\Lab_01
D:\CSE 477\Lab_01>C:
C:\Users\Admin>pip install pandas matplotlib webvtt-py
Defaulting to user installation because normal site-packages is not writeable
Requirement already satisfied: pandas in c:\users\admin\appdata\local\packages\pythonsoftwarefoundation.python.3.12_qbz5n2kfra8
Requirement already satisfied: matplotlib in c:\users\admin\appdata\local\packages\pythonsoftwarefoundation.python.3.12_qbz5n2k
Requirement already satisfied: webvtt-py in c:\users\admin\appdata\local\packages\pythonsoftwarefoundation.python.3.12_qbz5n2kf
Requirement already satisfied: numpy<2,>=1.26.0 in c:\users\admin\appdata\local\packages\pythonsoftwarefoundation.python.3.12_q
Requirement already satisfied: python-dateutil>=2.8.2 in c:\users\admin\appdata\local\packages\pythonsoftwarefoundation.python.
Requirement already satisfied: pytz>=2020.1 in c:\users\admin\appdata\local\packages\pythonsoftwarefoundation.python.3.12_qbz5n
Requirement already satisfied: tzdata>=2022.1 in c:\users\admin\appdata\local\packages\pythonsoftwarefoundation.python.3.12_qbz
Requirement already satisfied: contourpy>=1.0.1 in c:\users\admin\appdata\local\packages\pythonsoftwarefoundation.python.3.12_q
Requirement already satisfied: cycler>=0.10 in c:\users\admin\appdata\local\packages\pythonsoftwarefoundation.python.3.12_qbz5n
Requirement already satisfied: fonttools>=4.22.0 in c:\users\admin\appdata\local\packages\pythonsoftwarefoundation.python.3.12_
Requirement already satisfied: kiwisolver>=1.3.1 in c:\users\admin\appdata\local\packages\pythonsoftwarefoundation.python.3.12_
Requirement already satisfied: packaging>=20.0 in c:\users\admin\appdata\local\packages\pythonsoftwarefoundation.python.3.12_q
Requirement already satisfied: pillow>=8 in c:\users\admin\appdata\local\packages\pythonsoftwarefoundation.python.3.12_qbz5n2kf
Requirement already satisfied: pyparsing>=2.3.1 in c:\users\admin\appdata\local\packages\pythonsoftwarefoundation.python.3.12_q
Requirement already satisfied: six>=1.5 in c:\users\admin\appdata\local\packages\pythonsoftwarefoundation.python.3.12_qbz5n2kfr
```

PART 2: Data Collection & Selection (Channels, Ethics, and Procedures)

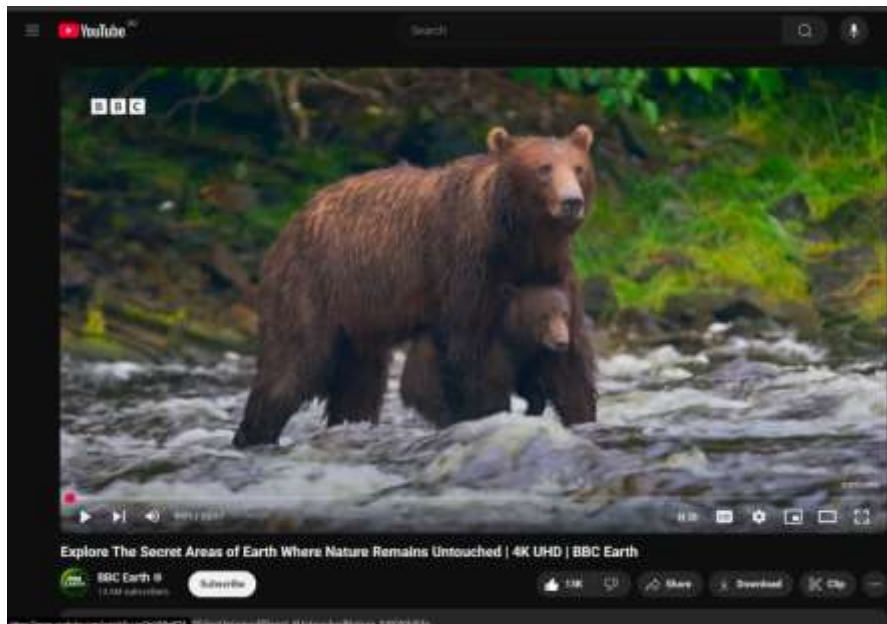
A. Selecting a YouTube Channel/Video (All Channels Verified Neutral) Criteria: I chose a video, and it is from **BBC Earth**

YouTube link: <https://www.youtube.com/watch?v=T7oExc711xE>

Video Description:

“Explore The Secret Areas of Earth Where Nature Remains Untouched | 4K UHD | BBC Earth”

1. Time length is 15.57 mins
2. 258 comments
3. CC English generated

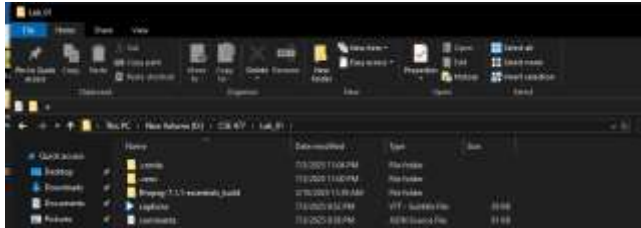


B. Download Captions (Subtitles) Using yt-dlp:

Command: `yt-dlp --write-auto-sub --sub-lang en --skip-download`
<https://www.youtube.com/watch?v=T7oExc711xE>

```
D:\CSE 477\Lab_01>yt-dlp --write-auto-sub --sub-lang en --skip-download "https://www.youtube.com/watch?v=T7oExc711xE"
[youtube] Extracting URL: https://www.youtube.com/watch?v=T7oExc711xE
[youtube] T7oExc711xE: Downloading webpage
[youtube] T7oExc711xE: Downloading tv client config
[youtube] T7oExc711xE: Downloading tv player API JSON
[youtube] T7oExc711xE: Downloading ios player API JSON
[youtube] T7oExc711xE: Downloading m3u8 information
[info] T7oExc711xE: Downloading subtitles: en
WARNING: ffmpeg not found. The downloaded format may not be the best available. Installing ffmpeg is strongly recommended: htt
[info] T7oExc711xE: Downloading 1 format(s): 18
[info] Writing video subtitles to: Explore The Secret Areas of Earth Where Nature Remains Untouched | 4K UHD | BBC Earth [T7
[download] Destination: Explore The Secret Areas of Earth Where Nature Remains Untouched | 4K UHD | BBC Earth [T7oExc711xE].
[download] 100% of 28.77KiB in 00:00:00 at 173.05KiB/s
```

➔ A VTT file is downloaded. Which I named **captions.VTT**



C. Downloading Comments Using a Script:

Commands: pip install youtube-comment-downloader

```

C:\Command Prompt
Collecting pytz==2024.2 (from dataparser-youtube-comment-downloader)
  Downloading pytz-2025.2-py3-none-any.whl.metadata (2.2 kB)
Collecting regex==2024.9.11 (from dataparser-youtube-comment-downloader)
  Downloading regex-2024.11.6-cp312-cp312-win_amd64.whl.metadata (41 kB)
.....
Requirement already satisfied: tloocal==0.2 in c:\users\admin\appdata\local\packages\pythonsoftwarefoundation.python.3.12_qbz5n2kfra8p0\localcache\local-packages\python312\s
(3.9.2)
Requirement already satisfied: charset-normalizer==2 in c:\users\admin\appdata\local\packages\pythonsoftwarefoundation.python.3.12_qbz5n2kfra8p0\localcache\local-packages
(3.9.2)
Requirement already satisfied: idna==2.5 in c:\users\admin\appdata\local\packages\pythonsoftwarefoundation.python.3.12_qbz5n2kfra8p0\localcache\local-packages\python312\s
Requirement already satisfied: urllib3==3.1.21.1 in c:\users\admin\appdata\local\packages\pythonsoftwarefoundation.python.3.12_qbz5n2kfra8p0\localcache\local-packages\pytho
(2.2.4)
Requirement already satisfied: certifi==2024.4.17 in c:\users\admin\appdata\local\packages\pythonsoftwarefoundation.python.3.12_qbz5n2kfra8p0\localcache\local-packages\pytho
(2023.11.17)
Requirement already satisfied: six==1.5 in c:\users\admin\appdata\local\packages\pythonsoftwarefoundation.python.3.12_qbz5n2kfra8p0\localcache\local-packages\python312\site-
(1.16.4)
Requirement already satisfied: ttdata in c:\users\admin\appdata\local\packages\pythonsoftwarefoundation.python.3.12_qbz5n2kfra8p0\localcache\local-packages\python112\site-pa
(2023.4)
Downloading youtube-comment-downloader-0.1.70-py3-none-any.whl (8.2 kB)
Downloading dataparser-1.2.1-py3-none-any.whl (215 kB)
.....
Downloading pytz-2025.2-py3-none-any.whl (180 kb)
.....
Downloading regex-2024.11.6-cp312-cp312-win_amd64.whl (273 kb)
.....
Installing collected packages: pytz, regex, dataparser, youtube-comment-downloader
Attempting uninstall: pytz
  Found existing installation: pytz 2023.3.post1
  Uninstalling pytz-2023.3.post1:
    Successfully uninstalled pytz-2023.3.post1
Successfully installed dataparser-1.2.2 pytz-2025.2 regex-2024.11.6 youtube-comment-downloader-0.1.70

```

PART 3: Data Processing & Lab Experiments (Python Skeletons & Analysis)

A. Loading Comments and Captions in Python:

Comments:

```
import json
```

```
def load_json_comments(filepath='comments.json'):
```

```
comments = []
```

with `open(filepath, 'r', encoding='utf-8')` as `f`:

```
for line in f:
```

try:

```
obj = json.loads(line)
```

```
comments.append(obj['text']) # You can also access other fields like obj['time']
```

```
except json.JSONDecodeError:
```

```
continue # Skip lines that aren't valid JSON
```

return comments

```
# Load and print
```

```
raw_comments = load_json_comments()
```

```
print(f"Loaded {len(raw_comments)} comment lines.")
```

```
print(raw_comments[:5])
```

```

1 # Import json
2
3 # If load_json_comments(filepath="comments.json"):
4     comments = []
5     with open(filepath, 'r', encoding="utf-8") as f:
6         for line in f:
7             try:
8                 obj = json.loads(line)
9                 comments.append(obj["text"]) # this var also access other fields like obj["time"]
10             except json.JSONDecodeError:
11                 continue # skip lines that aren't valid json
12
13 # Print comments
14
15 row_comments = load_json_comments()
16 print(f"Loaded {len(row_comments)} comment lines.")
17 print(row_comments[1])
18

```

Comments Output :

```

return W3CWebSocket("ws://localhost:8080", "wss://localhost:8080");
}

// This is the main function that will be called when the user clicks the button.
// It will create a new WebSocket object and connect it to the server.
// It will also set up event listeners for the WebSocket object.
// It will then return the WebSocket object.
function createWebSocket() {
    // Create a new WebSocket object.
    const ws = new W3CWebSocket("ws://localhost:8080", "wss://localhost:8080");

    // Set up event listeners for the WebSocket object.
    ws.addEventListener("open", () => {
        // The connection is open.
        console.log("WebSocket connection established.");
    });

    ws.addEventListener("message", (event) => {
        // A message was received from the server.
        console.log("Received message from server: " + event.data);
    });

    ws.addEventListener("close", () => {
        // The connection is closed.
        console.log("WebSocket connection closed.");
    });

    ws.addEventListener("error", (event) => {
        // An error occurred.
        console.log("WebSocket error: " + event.message);
    });

    // Return the WebSocket object.
    return ws;
}

// Call the createWebSocket function when the user clicks the button.
document.getElementById("connect").addEventListener("click", () => {
    createWebSocket();
});

```

Captions:

```
def load_vtt_captions(filepath='captions.vtt'):
```

```
captions = []
```

```

with open(filepath, 'r', encoding='utf-8') as f:

    for line in f:

        line = line.strip()

        # Ignore metadata and timestamps

        if '-->' not in line and line and not line.isdigit() and 'WEBVTT' not in line:

            captions.append(line)

    return captions

# Load and print

raw_captions = load_vtt_captions()

print(f"Loaded {len(raw_captions)} caption lines.")

print(raw_captions[:5])

```

Captions Output:



```

Python 3.7.4 Shell
PS C:\Users\johnd> python extract_captions.py
0:00
[00:00:00.000 -> 00:00:00.000] Hello, my name is John.
[00:00:00.000 -> 00:00:00.000] I am a student at the University of California,
[00:00:00.000 -> 00:00:00.000] and I am studying for my degree in Computer Science,
[00:00:00.000 -> 00:00:00.000] and I am very interested in Artificial Intelligence,
[00:00:00.000 -> 00:00:00.000] and I am looking forward to learning more about it.
PS C:\Users\johnd>

```

B. Required Lab Experiments

1. Histogram of Lengths (Captions vs. Comments):

```

import json

import matplotlib.pyplot as plt

# -----

# Load captions from .vtt file

# -----

def load_vtt_captions(filepath='captions.vtt'):

    captions = []

    with open(filepath, 'r', encoding='utf-8') as f:

        for line in f:

```

```

        line = line.strip()

        # Ignore metadata and timestamps

        if '-->' not in line and line and not line.isdigit() and 'WEBVTT' not in line:

            captions.append(line)

    return captions


# -----

# Load comments from .json file

# -----

def load_json_comments(filepath='comments.json'):

    comments = []

    with open(filepath, 'r', encoding='utf-8') as f:

        for line in f:

            try:

                obj = json.loads(line)

                comments.append(obj['text'])

            except json.JSONDecodeError:

                continue

    return comments


# Load data

raw_captions = load_vtt_captions()

raw_comments = load_json_comments()


# Print previews

print(f"Loaded {len(raw_captions)} caption lines.")

```



```
print(raw_captions[:5])

print(f"Loaded {len(raw_comments)} comment lines.")

print(raw_comments[:5])


# Plot Histogram of Lengths

caption_lengths = [len(x) for x in raw_captions]

comment_lengths = [len(x) for x in raw_comments]


plt.hist(caption_lengths, bins=20, alpha=0.7, label='Captions')

plt.hist(comment_lengths, bins=20, alpha=0.7, label='Comments')


plt.legend()

plt.xlabel('Length (characters)')

plt.ylabel('Frequency')

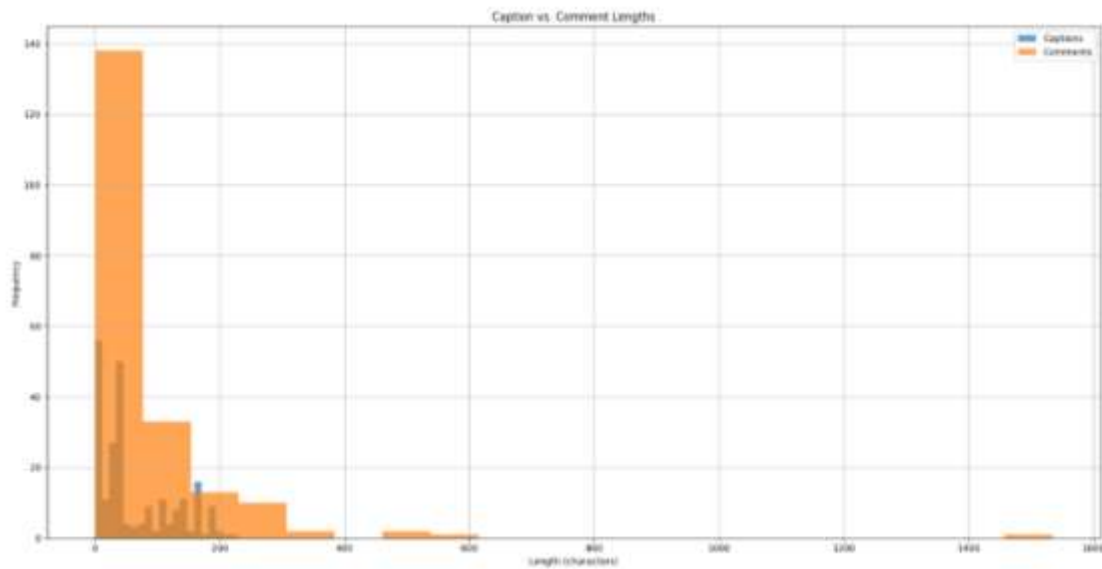
plt.title('Caption vs. Comment Lengths')

plt.grid(True)

plt.tight_layout()

plt.show()
```

Output :



2. Vocabulary Diversity (Type-Token Ratio):

```
def type_token_ratio(lines):

    words = [word.lower() for line in lines for word in line.split()]

    unique = set(words)

    return len(unique) / len(words) if words else 0

# Print TTR for captions and comments

print("Caption TTR:", type_token_ratio(raw_captions))

print("Comment TTR:", type_token_ratio(raw_comments))

print("Total Captions:", len(raw_captions))

print("Total Comments:", len(raw_comments))
```

Output :

```

1 4 new release of this is available:
2 1 To update, run:
3 1 $ curl -L https://raw.githubusercontent.com/0x00sec/0x00sec/master/0x00sec.py -o 0x00sec.py
4 1 $ python 0x00sec.py
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1026
102
```

3. Top-N Word Frequency (After Stopword Removal):

```
import matplotlib.pyplot as plt

plt.bar(['Captions', 'Comments'], [len(raw_captions), len(raw_comments)], color=['skyblue', 'orange'])

plt.ylabel('Count')

plt.title('Number of Captions vs Comments')

plt.show()

# Print first few captions and comments

import pandas as pd

df_caps = pd.DataFrame({'text': raw_captions})

df_caps['length'] = df_caps['text'].apply(len)

print(df_caps.describe())

plt.hist(df_caps['length'], bins=20, alpha=0.7, label='Caption Lengths')

plt.xlabel('Caption Length (characters)')

plt.ylabel('Frequency')

plt.title('Caption Length Distribution')

plt.legend()

plt.grid(True)

plt.show()

# Assuming you've extracted timestamps already

df_caps['timestamp'] = [...] # e.g., in seconds or minutes

plt.scatter(df_caps['timestamp'], df_caps['length'])

plt.xlabel('Time (sec)')

plt.ylabel('Caption Length')

plt.title('Caption Length vs Timestamp')

plt.show()

# Example: parsing comment JSON into a DataFrame
```

```

import json

comments = []

with open('comments.json', 'r', encoding='utf-8') as f:
    for line in f:
        obj = json.loads(line)
        comments.append({
            'text': obj['text'],
            'likes': obj.get('likes', 0),
            'length': len(obj['text'])
        })

df_comments = pd.DataFrame(comments)

plt.scatter(df_comments['length'], df_comments['likes'])

plt.xlabel('Comment Length')

plt.ylabel('Likes')

plt.title('Comment Length vs Likes')

plt.grid(True)

plt.show()

plt.scatter(df_caps['timestamp'], df_caps['length'])

plt.title('Caption Lengths Over Time')

plt.xlabel('Time (sec)')

plt.ylabel('Length')

plt.grid(True)

plt.show()

plt.hist(df_comments['length'], bins=30, color='orange')

```

```

plt.title('Comment Length Distribution')
plt.xlabel('Comment Length')
plt.ylabel('Frequency')
plt.grid(True)
plt.show()

# Assuming `df_comments['minute']` is the parsed minute mark
df_by_minute = df_comments.groupby('minute').size()
df_by_minute.plot(kind='line')
plt.xlabel('Minute')
plt.ylabel('Number of Comments')
plt.title('Comments per Minute')
plt.grid(True)
plt.show()

```

Output :

