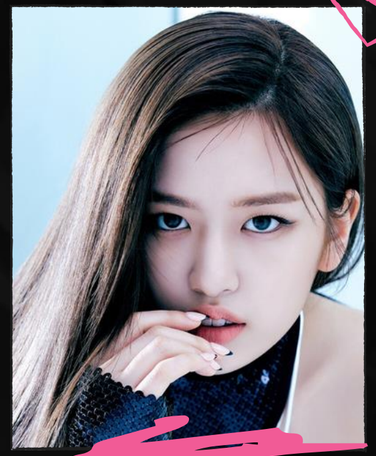
FACE DETECTION AND RECOGNIZATION

IVE



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ขั้นตอน AGENDA

- OBJECTIVE
- DATA UNDERSTANDING
- DATA PREPARARATION
- MODELING
- EVALUATION

OBJECTIVE

ทำ Face Detection และ Face Recognition จาก 2 วิดิโอคลิปใน youtube โดยใช้ Dataset Idol เกาหลี วง IVE

1. https://www.youtube.com/watch?v=l5LpxzgW4J0
2. https://www.youtube.com/watch?v=6ZUIwj3FgUY

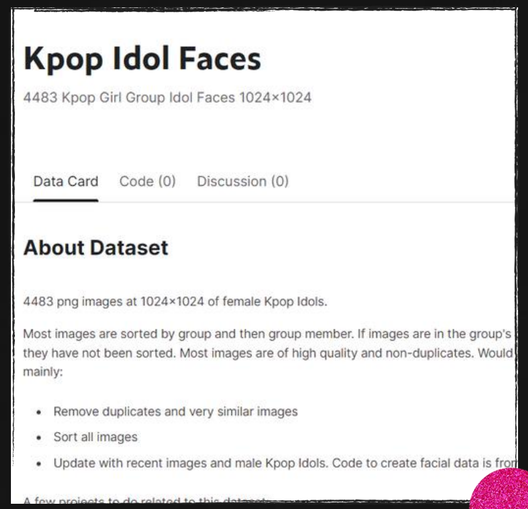
แผนการดำเนินงาน

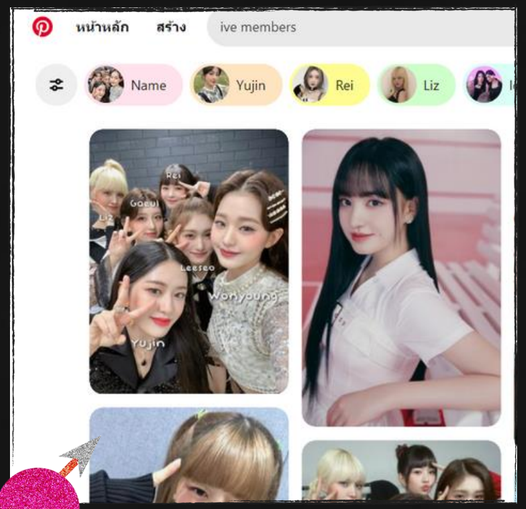
01 ทำ Face Detection ของทุกคนในวง

02 ทำ Face Recognition ของ WonYoung คนเดียว

03 ทำ Face Recognition ของ สมาชิกทุกคนในวง

DATA UNDERSTANDING





- Dataset from Kaggle
- Save image from Pinterest
- Idol web and Block
- Video capture
- Separate data to 6 class
  - Wonyoung
  - Gaeul
  - Rei
  - Yujin
  - Jiwon
  - Leeseo

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3 DATA PREPARARATION

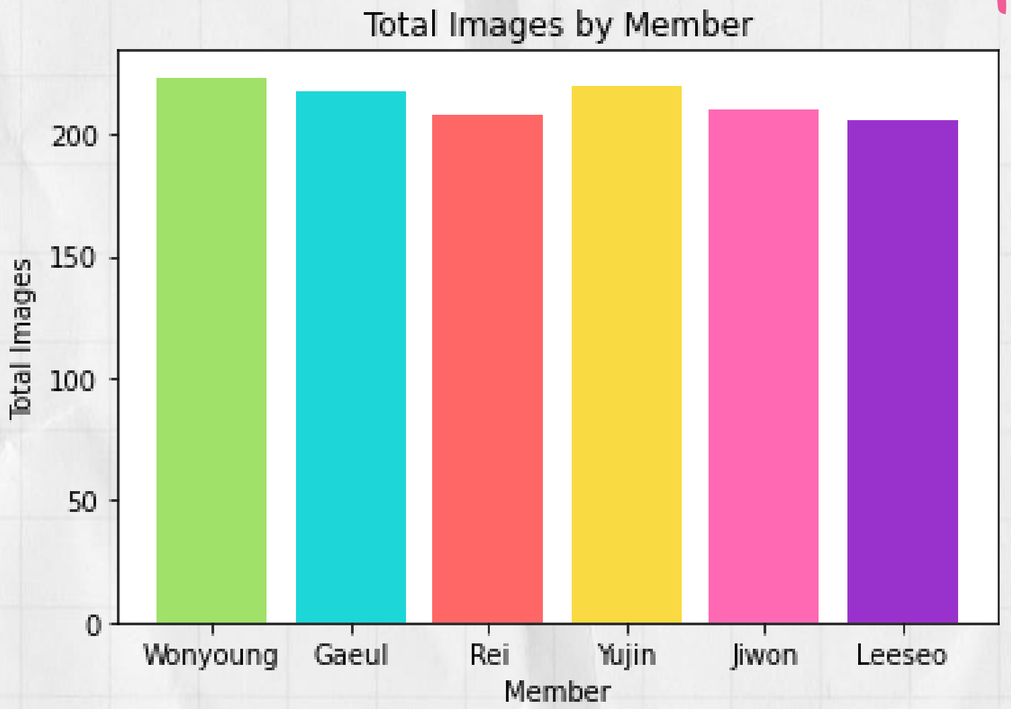
```python
def encode_faces(images):
    face_encodings = []
    for image in images:
        face_encoding = face_recognition.face_encodings(image)
        if face_encoding:
            face_encodings.append(face_encoding[0])
    return face_encodings
```

```python
# Encode faces
person1_face_encodings = encode_faces(person1_images)
person2_face_encodings = encode_faces(person2_images)
person3_face_encodings = encode_faces(person3_images)
person4_face_encodings = encode_faces(person4_images)
person5_face_encodings = encode_faces(person5_images)
person6_face_encodings = encode_faces(person6_images)

# Use average face encoding for each person
average_person1_face_encoding = sum(person1_face_encodings) / len(person1_face_encodings)
average_person2_face_encoding = sum(person2_face_encodings) / len(person2_face_encodings)
average_person3_face_encoding = sum(person3_face_encodings) / len(person3_face_encodings)
average_person4_face_encoding = sum(person4_face_encodings) / len(person4_face_encodings)
average_person5_face_encoding = sum(person5_face_encodings) / len(person5_face_encodings)
average_person6_face_encoding = sum(person6_face_encodings) / len(person6_face_encodings)

known_face_encodings = [average_person1_face_encoding, average_person2_face_encoding,average_person3_face_encoding,average_
known_face_names = ["Wonyoung", "Gaeul","Rei","Yujin","Jiwon","Leeseo"]
```

01 ทำ Data collection และ Face Encodings



02 เช็ค Imbalance data

3 DATA PREPARARATION

Read Single Frame

4 การ MODELING

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4.1 CODE MODELING Interview

Call Function Get Image

```
known_face_encodings = []
known_face_names = []

face_encode, face_names = getImage("./images/Won_yong", "Jang Won-young")
known_face_encodings.extend(face_encode)
known_face_names.extend(face_names)

face_encode, face_names = getImage("./images/Ahn_Yu_jin", "Ahn Yu-jin")
known_face_encodings.extend(face_encode)
known_face_names.extend(face_names)

face_encode, face_names = getImage("./images/Liz", "Liz")
known_face_encodings.extend(face_encode)
known_face_names.extend(face_names)

face_encode, face_names = getImage("./images/Rei", "Rei")
known_face_encodings.extend(face_encode)
known_face_names.extend(face_names)

face_encode, face_names = getImage("./images/Leeseo", "Leeseo")
known_face_encodings.extend(face_encode)
known_face_names.extend(face_names)

#ประกาศตัวแปร
face_locations = []
face_encodings = []
face_names = []
face_percent = []
```

4.1 CODE MODELING Interview

Get Image Function

```
def getImage(path, name):
    imagePath = [os.path.join(path, f) for f in os.listdir(path)]
    faces=[]
    names=[]
    for imagePaths in imagePath:
        print(imagePaths)
        if ".DS_Store" in imagePaths:
            continue
        try:
            get_image = face_recognition.load_image_file(imagePaths)
            face_encoding = face_recognition.face_encodings(get_image)[0]
        except:
            print("cannot train", imagePaths)
            continue
        faces.append(face_encoding)
        names.append(name)
    return faces, names
```

4.1 CODE MODELING Interview

```
#Pull in sample video
video_capture = cv2.VideoCapture("./video_input/IVE, OUR 2ND STORY_interview_full.mp4")

# Get the height and width of the frame (required to be an interger)
w4out = int(video_capture.get(3))
h4out = int(video_capture.get(4))

fourcc = cv2.VideoWriter_fourcc(*'mp4v')
out_video = cv2.VideoWriter('./output_video/outv9_4_interview_full.mp4', fourcc, 20, (w4out, h4out))

#loop calculates each frame of the video
idxFrame = 0
```

4.1 CODE MODELING Interview

```
while True:
    #Read each frame from the video.
    ret, frame = video_capture.read()
    if ret:
        #Reduce size twice to increase fps.
        small_frame = cv2.resize(frame, (0,0), fx=0.5,fy=0.5)
        #change bgr to rgb
        rgb_small_frame = np.ascontiguousarray(small_frame[:, :, ::-1])

        face_names = []
        face_percent = []
```

4.1 CODE MODELING Interview

```
#Locate a face in the frame
face_locations = face_recognition.face_locations(rgb_small_frame)

#Bring your face to find various unique features.
face_encodings = face_recognition.face_encodings(rgb_small_frame, face_locations)

#Compare each face
for face_encoding in face_encodings:

    face_distances = face_recognition.face_distance(known_face_encodings, face_encoding)
    best = np.argmin(face_distances)
    face_percent_value = 1-face_distances[best]

    #Filter your face with 50% confidence.
    if face_percent_value >= 0.62:
        name = known_face_names[best]
        percent = round(face_percent_value*100,2)
        face_percent.append(percent)
    else:
        continue

    face_names.append(name)
```

4.1 CODE MODELING Interview

```python
#Draw boxes and text when displayed.
for (top,right,bottom, left), name, percent in zip(face_locations, face_names, face_percent):
    top*= 2
    right*= 2
    bottom*= 2
    left*= 2

    if name == "UNKNOWN":
        color = [46,2,209]
    else:
        color = [255,102,51]

    cv2.rectangle(frame, (left,top), (right,bottom), color, 2)
    cv2.rectangle(frame, (left-1, top -30), (right+1,top), color, cv2.FILLED)
    cv2.rectangle(frame, (left                    ottom+30), color, cv2.FILLED)
    font = cv2.FONT_HERSHEY_DU
    cv2.putText(frame, name, (left+6, top-6), font, 0.6, (255,255,255), 1)
    cv2.putText(frame, "MATCH: "+str(percent)+"%", (left+6, bottom+23), font, 0.6, (255,255,255), 1)

#Show results
cv2.imshow("Video", frame)

out_video.write(frame)

if cv2.waitKey(1) & 0xFF == ord('q'):
    break
```

(variable) left: int

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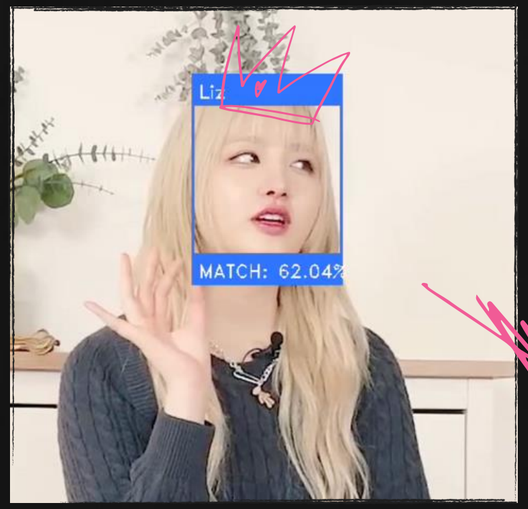
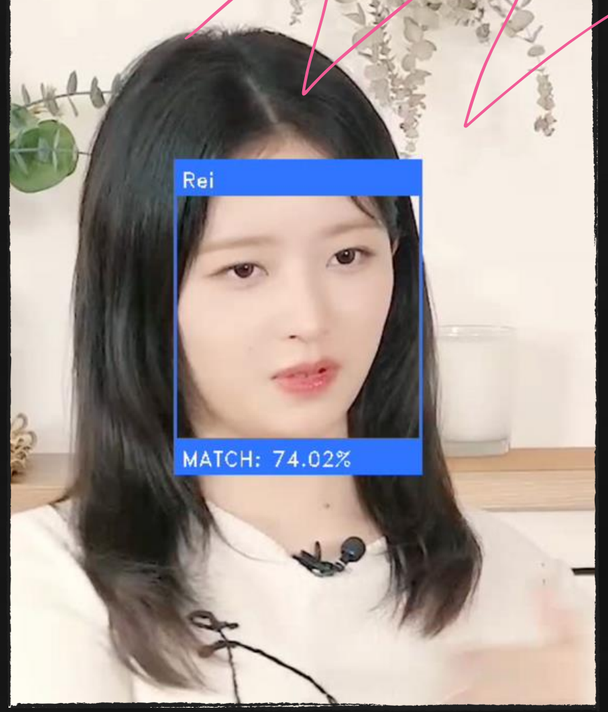
EVALUATION

Interview





4.2 CODE MODELING I' AM MV

```
import os
import face_recognition
from PIL import Image, ImageDraw
import cv2
import numpy as np
```

[1] ✓ 3.3s Python

```
def load_images(folder):
    images = []
    for filename in os.listdir(folder):
        image_path = os.path.join(folder, filename)
        image = face_recognition.load_image_file(image_path)
        images.append(image)
    return images

def encode_faces(images):
    face_encodings = []
    for image in images:
        face_encoding = face_recognition.face_encodings(image)
        if face_encoding:
            face_encodings.append(face_encoding[0])
    return face_encodings
```

[2] ✓ 0.0s

```
# Load images
person1_images = load_images(person1_images)
person2_images = load_images(person2_images)
person3_images = load_images(person3_images)
person4_images = load_images(person4_images)
person5_images = load_images(person5_images)
person6_images = load_images(person6_images)

# Encode faces
person1_face_encodings = encode_faces(person1_images)
person2_face_encodings = encode_faces(person2_images)
person3_face_encodings = encode_faces(person3_images)
person4_face_encodings = encode_faces(person4_images)
person5_face_encodings = encode_faces(person5_images)
person6_face_encodings = encode_faces(person6_images)

# Use average face encoding for each person
average_person1_face_encoding = sum(person1_face_encodings) / len(person1_face_encodings)
average_person2_face_encoding = sum(person2_face_encodings) / len(person2_face_encodings)
average_person3_face_encoding = sum(person3_face_encodings) / len(person3_face_encodings)
average_person4_face_encoding = sum(person4_face_encodings) / len(person4_face_encodings)
average_person5_face_encoding = sum(person5_face_encodings) / len(person5_face_encodings)
average_person6_face_encoding = sum(person6_face_encodings) / len(person6_face_encodings)

known_face_encodings = [average_person1_face_encoding, average_person2_face_encoding,average_person3_face_encoding,average_per
known_face_names = ["Wonyoung", "Gaeul","Rei","Yujin","Jiwon","Leeseo"]
```

✓ 19m 37.8s

I' AM MV

Check Imbalance data

```
import pandas as pd
import matplotlib.pyplot as plt

# Your DataFrame data
data = {'member': ['Wonyoung', 'Gaeul', 'Rei', 'Yujin', 'Jiwon', 'Leeseo'],
        'total_img': [len(person1_images), len(person2_images), len(person3_images), len(person4_images), len(person5_images), len(person6_images)]}

df = pd.DataFrame(data)
df
```

56] ✓ 0.2s

	member	total_img
0	Wonyoung	223
1	Gaeul	217
2	Rei	208
3	Yujin	219
4	Jiwon	210
5	Leeseo	206

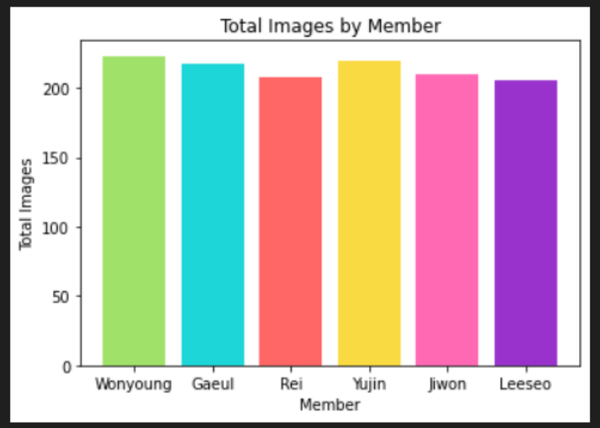
```
normalize_rgb = lambda rgb: (rgb[0] / 255, rgb[1] / 255, rgb[2] / 255)
colors = [normalize_rgb((160, 225, 105)), normalize_rgb((29,214,216)), normalize_rgb((255,102,102)),  normalize_rgb((249,218,66)), normalize_rgb((255,1
218,112,214

plt.bar(df['member'], df['total_img'], color=colors)

plt.xlabel('Member')
plt.ylabel('Total Images')
plt.title('Total Images by Member')

plt.show()
```

79] ✓ 0.1s Python



I' AM MV

```python
# Start program
face_cascade = cv2.CascadeClassifier(cv2.data.haarcascades + 'haarcascade_frontalface_default.xml')


# Open a video capture object
video_path = './videos/hw2_hd.mp4'
cap = cv2.VideoCapture(video_path)


if not cap.isOpened():
    print("Error: Could not open video.")
    exit()

frame_skip = 5  # Process every 5th frame
resize_factor = 0.7  # Resize frames to 50%
threshold = 0.3  # Adjust this threshold as needed

w = int(cap.get(3))
h = int(cap.get(4))
fps = cap.get(cv2.CAP_PROP_FPS)

fourcc = cv2.VideoWriter_fourcc(*'XVID')
output_video = cv2.VideoWriter('mv2_compare_faces.avi', fourcc, fps, (w,h))

while cap.isOpened():
    # Read a single frame
    ret, frame = cap.read()

    # Break the loop if the video has ended
    if not ret:
        break

    # Convert the frame from BGR to RGB (OpenCV uses BGR by default)
    rgb_frame = cv2.cvtColor(frame, cv2.COLOR_BGR2RGB)

    # Create a Pillow ImageDraw object to draw on the image
    pil_image = Image.fromarray(rgb_frame)
    draw = ImageDraw.Draw(pil_image)


    # Recognize faces in the current frame
    frame_with_recognition = recognize_faces(rgb_frame, known_face_encodings, known_face_names)
```

I' AM MV

Use compare_faces

```python
def recognize_faces(unknown_image, known_face_encodings, known_face_names):
    face_locations = face_recognition.face_locations(unknown_image)
    face_encodings = face_recognition.face_encodings(unknown_image, face_locations)

    for (top, right, bottom, left), face_encoding in zip(face_locations, face_encodings):
        matches = face_recognition.compare_faces(known_face_encodings, face_encoding,tolerance=0.4)
        name = "Unknown"

        # Count the number of True matches
        num_matches = sum(matches)

        # Calculate accuracy as a percentage
        accuracy_percent = (num_matches / len(known_face_encodings)) * 100
```

Use face_distance

```python
def compare_faces(known_face_encodings, face_encoding, threshold=0.4):
    # Calculate cosine similarity between the known face encodings and the current face encod
    similarities = face_recognition.face_distance(known_face_encodings, face_encoding)
    # Compare each similarity with the threshold to determine matches
    matches = list(similarity <= threshold for similarity in similarities)

    return matches, similarities



def recognize_faces(unknown_image, known_face_encodings, known_face_names):
    face_locations = face_recognition.face_locations(unknown_image)
    face_encodings = face_recognition.face_encodings(unknown_image, face_locations)

    for (top, right, bottom, left), face_encoding in zip(face_locations, face_encodings):
        matches, similarities = compare_faces(known_face_encodings, face_encoding, threshold=
        name = "Unknown"

        # Find the index of the best match (lowest distance)
        best_match_index = np.argmin(similarities)

        # Get the accuracy percentage for the best match
        accuracy_percent = (1 - similarities[best_match_index]) * 100
```

I' AM MV

```python
if matches[best_match_index]:
    match_index = matches.index(True)
    name = known_face_names[match_index]
    label = f"{name} : ({accuracy_percent:.2f}%)"

    if match_index == 0:
        cv2.rectangle(frame, (left, top), (right, bottom), (105,225,160), 2)
        cv2.rectangle(frame, (left, bottom -20), (right, bottom), (105,225,160), cv2.FILLED)
        # Label the face
        cv2.putText(frame, label, (left + 6, bottom-6), cv2.FONT_HERSHEY_SIMPLEX, 0.7, (255, 255, 255),2)
    elif match_index == 1:
        cv2.rectangle(frame, (left, top), (right, bottom), (216,214,29), 2)
        cv2.rectangle(frame, (left, bottom-20), (right, bottom), (216,214,29), cv2.FILLED)
        # Label the face
        cv2.putText(frame, label, (left + 6, bottom-6), cv2.FONT_HERSHEY_SIMPLEX, 0.7, (255, 255, 255), 2)
    elif match_index == 2:
        cv2.rectangle(frame, (left, top), (right, bottom), (102,102,255), 2)
        cv2.rectangle(frame, (left, bottom-20), (right, bottom), (102,102,255), cv2.FILLED)
        # Label the face
        cv2.putText(frame, label, (left + 6, bottom-6), cv2.FONT_HERSHEY_SIMPLEX, 0.7, (255, 255, 255), 2)
    elif match_index == 3:
        cv2.rectangle(frame, (left, top), (right, bottom), (66,218,249), 2)
        cv2.rectangle(frame, (left, bottom-20), (right, bottom), (66,218,249), cv2.FILLED)
        # Label the face
        cv2.putText(frame, label, (left + 6, bottom-6), cv2.FONT_HERSHEY_SIMPLEX, 0.7, (255, 255, 255), 2)
    elif match_index == 4:
        cv2.rectangle(frame, (left, top), (right, bottom), (180,105,255), 2)
        cv2.rectangle(frame, (left, bottom-20), (right, bottom), (180,105,255), cv2.FILLED)
        # Label the face
        cv2.putText(frame, label, (left + 6, bottom-6), cv2.FONT_HERSHEY_SIMPLEX, 0.7, (255,255,255), 2)
    elif match_index == 5:
        cv2.rectangle(frame, (left, top), (right, bottom), (204,50,153), 2)
        cv2.rectangle(frame, (left, bottom-20), (right, bottom), (204,50,153), cv2.FILLED)
        # Label the face
        cv2.putText(frame, label, (left + 6, bottom-6), cv2.FONT_HERSHEY_SIMPLEX, 0.7, (255,255,255), 2)
```

```python
    output_video.write(frame)

    # Display the resulting frame
    cv2.imshow('Face Recognition Result', frame)

    # Break the loop if 'q' key is pressed
    if cv2.waitKey(1) & 0xFF == ord('q'):
        break


# Release the video capture object and close all windows
cap.release()
output_video.release()
# output_video = cv2.VideoWriter('output2_mv2.avi', fourcc, 30, (w, h))
cv2.destroyAllWindows()
```

✓ 222m 38.7s

I' AM MV

ใส่เพลง

```python
import cv2
from moviepy.editor import VideoFileClip
from moviepy.audio.io.AudioFileClip import AudioFileClip

# Replace 'input_video.mp4' and 'input_audio.wav' with the paths to your video and audio files
input_video_path = 'mv2_distance.avi'
input_audio_path = './videos/hw2_hd.mp4'

# Replace 'output_video_with_audio.mp4' with the desired name for your output video file
output_video_path = 'mv2_with_audio_v3_distance.mp4'

# Load video clip
video_clip = VideoFileClip(input_video_path)

# Load audio clip
audio_clip = AudioFileClip(input_audio_path)

# Set video duration to match audio duration
video_clip = video_clip.set_duration(audio_clip.duration)

# Set audio of the video clip
video_clip = video_clip.set_audio(audio_clip)

# Write the new video file
video_clip.write_videofile(output_video_path, codec='libx264', audio_codec='aac')

# Close the clips
video_clip.close()
audio_clip.close()
```

EVALUATION
I' AM MV