

```
In [ ]: import pandas as pd
import numpy as np
import cv2
import matplotlib.pyplot as plt
from glob import glob
import IPython.display as ipd
from tqdm.notebook import tqdm
import subprocess
import speech_recognition as sr
from pydub import AudioSegment
from pydub.silence import split_on_silence
from textblob import TextBlob
import IPython.display as ipd
import os
import nltk
import seaborn as sns
from pydub import AudioSegment
from pydub.effects import normalize, low_pass_filter, high_pass_filter
from vosk import Model, KaldiRecognizer
import wave
import json
```

加载视频

```
In [ ]: input_file = 'Experimenter_CREW_999_1_All_1731617801.mp4'
```

```
In [ ]: ipd.Video(input_file,width= 700)
```

```
Out[ ]:
```

0:01

打开视频并读取元数据

```
In [ ]: # 加载视频采集
cap = cv2.VideoCapture(input_file)

In [ ]: # 帧总数 frames
noFrames = cap.get(cv2.CAP_PROP_FRAME_COUNT)

# 视频高度和宽度
framesHeight = cap.get(cv2.CAP_PROP_FRAME_HEIGHT) # Cap prop frame height
framesWidth = cap.get(cv2.CAP_PROP_FRAME_WIDTH) # Cap prop frame width

# 获取每秒帧数
framesSecond = cap.get(cv2.CAP_PROP_FPS)

print("Total number of frames in the video is",noFrames)
print("Frame Height in the video is",noFrames)
print("Frame Width in the video is",noFrames)
print("Frame per second is",framesSecond)
```

```
Total number of frames in the video is 10691.0
Frame Height in the video is 10691.0
Frame Width in the video is 10691.0
Frame per second is 29.964424428092247
```

```
In [ ]: # 一旦完成工作, 就释放视频, 使 Python 不再使用视频
cap.release()
```

从视频中提取图像

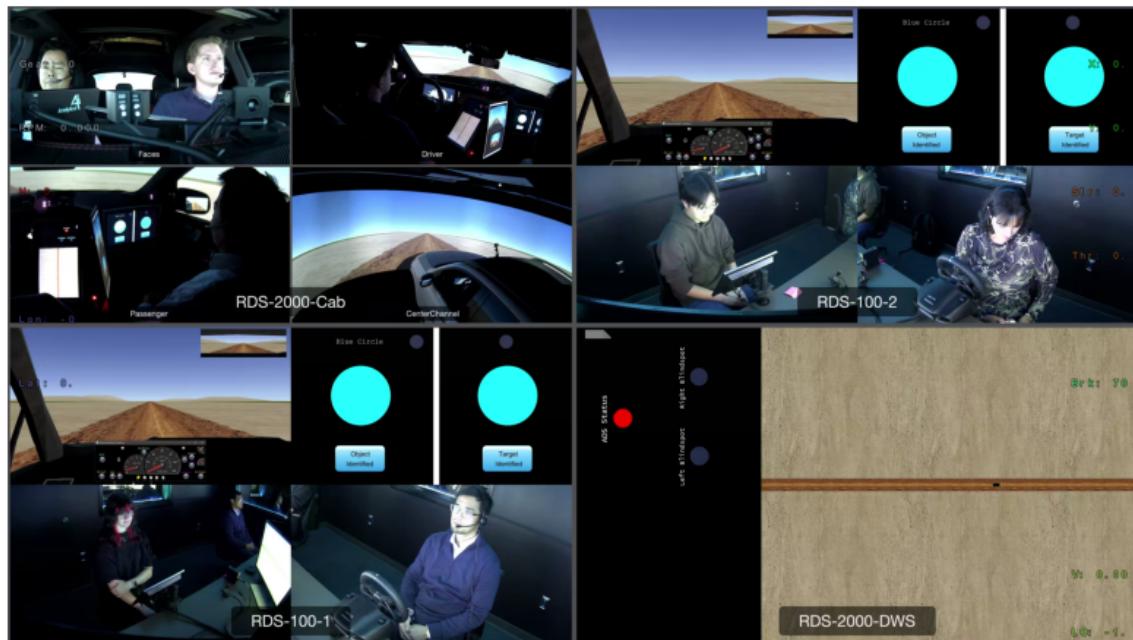
```
In [ ]: cap = cv2.VideoCapture(input_file)

In [ ]: ret, img = cap.read()
print(f'Returned {ret} and img of shape {img.shape} ')
```

```
Returned True and img of shape (2160, 3840, 3)
```

```
In [ ]: # 绘制 opencv 图像的辅助函数
def display_cv2_img(img, figsize = (10,10)):
    img_ = cv2.cvtColor(img, cv2.COLOR_BGR2RGB)
    fig, ax = plt.subplots(figsize = figsize)
    ax.imshow(img_)
    ax.axis("off")
```

```
In [ ]: display_cv2_img(img)
```



```
In [ ]: cap.release()
```

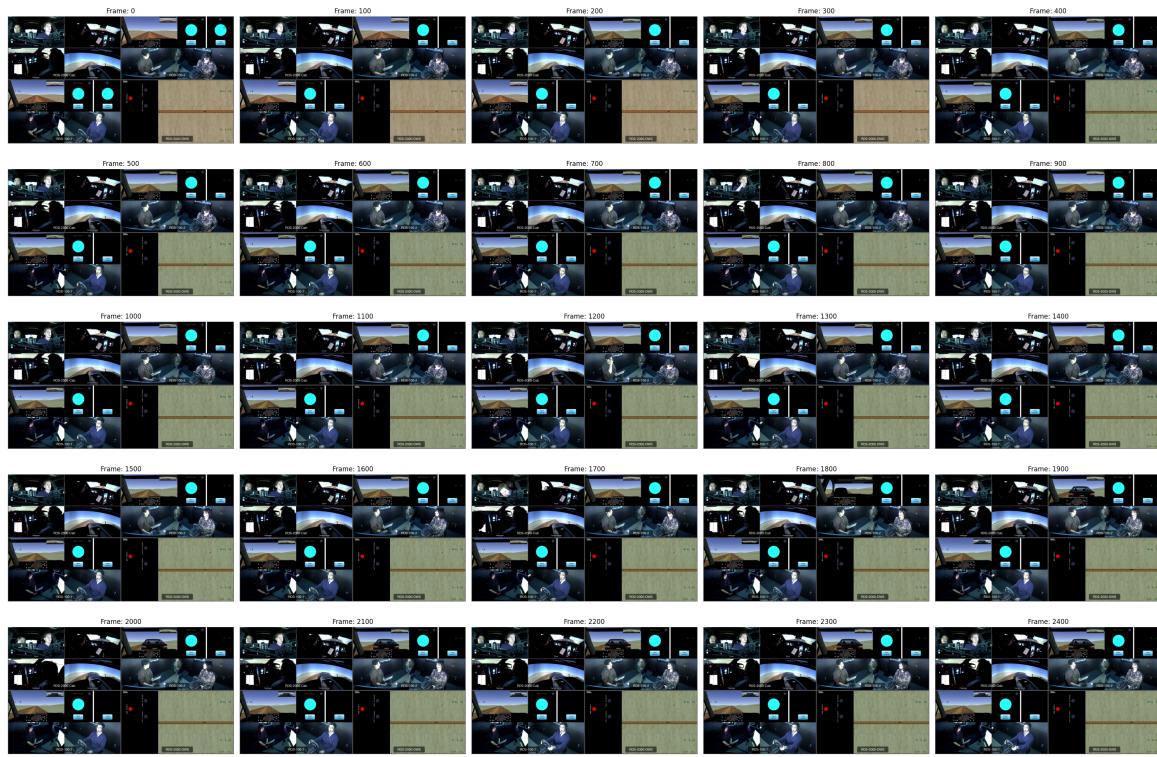
显示视频中的多个帧

```
# 创建一个 5x5 的网格, 整个图像区域为 30x20 英寸
fig, axs = plt.subplots(5, 5, figsize=(30, 20))
# 将返回的二维 axs 数组转换为一维数组, 可以像访问列表一样方便地访问每个子图
axs = axs.flatten()

# 读取视频文件
cap = cv2.VideoCapture(input_file) # 打开指定路径的 input_file 视频文件
n_frames = int(cap.get(cv2.CAP_PROP_FRAME_COUNT)) # 获取视频的总帧数

img_idx = 0 # 初始化索引 img_idx, 选择不同的子图区域进行绘制
for frame in range(n_frames): # 迭代视频的每一帧
    ret, img = cap.read() # 读取视频的当前帧, img 为该帧的图像数据
    if not ret: # 如果成功读取, ret 为 True
        break
    if frame % 100 == 0: # 每 100 帧读取一次。这样只处理视频中的一部分帧,
        if img_idx < len(axs): # 确保 img_idx 不超过 25
            axs[img_idx].imshow(cv2.cvtColor(img, cv2.COLOR_BGR2RGB))
            axs[img_idx].set_title(f'Frame: {frame}') # 设置当前子图的标题
            axs[img_idx].axis('off') # 关闭子图的坐标轴, 以便仅显示图像
            img_idx += 1 # 更新子图索引, 确保下次图像显示在下一个子图中

plt.tight_layout() # 调整子图之间的间距, 使得子图不会重叠
plt.show() # 显示绘制的所有图像
cap.release() # 释放视频捕获对象 cap, 关闭视频文件并释放相关资源
```



提取音频 (wav 格式)

```
In [ ]: # 音频转换为 单声道 (1 声道)、16kHz 采样率、线性 PCM 16-bit, 符合 API 要求
audio_output = "audio.wav" # 音频输出文件路径, 输出保存为 audio.wav
#subprocess.run(["ffmpeg", "-i", input_file, "-q:a", "0", "-map", "0"]
subprocess.run( # 通过 Python 的 subprocess 模块调用外部命令 (在这里是 ffmpeg
    [ # 传递给 ffmpeg 的命令和参数。
        "ffmpeg", # 调用 ffmpeg 工具来处理音频文件
        "-i", input_file, # 指定输入文件, input_file 是音频/视频文件的路径, f
        "-ac", "1", # 设置音频的声音数为 1, 即将音频转换为单声道 (Mono), 符合
        "-ar", "16000", # 设置音频的采样率为 16 kHz (16,000 Hz)。常用的语音采
        "-acodec", "pcm_s16le", # 指定音频编码格式为 pcm_s16le, 即线性 PCM
        audio_output # 输出文件路径, 转换后的音频将保存到这个路径 (即 audio.wav
    ]
)
)

print(f"音频已保存为 {audio_output}")
```

```
ffmpeg version 7.1.1 Copyright (c) 2000-2025 the FFmpeg developers
built with Apple clang version 16.0.0 (clang-1600.0.26.6)
configuration: --prefix=/opt/homebrew/Cellar/ffmpeg/7.1.1_1 --enable-shared --enable-pthreads --enable-version3 --cc=clang --host-cflags= --host-ldflags=' -Wl,-ld_classic' --enable-ffplay --enable-gnutls --enable-gpl --enable-libaom --enable-libaribb24 --enable-libbluray --enable-libdav1d --enable-libharfbuzz --enable-libjxl --enable-libmp3lame --enable-libopus --enable-librav1e --enable-librist --enable-librubberband --enable-libsnapy --enable-libsrt --enable-libssh --enable-libsvtav1 --enable-libtesseract --enable-libtheora --enable-libvidstab --enable-libvmaf --enable-libvorbis --enable-libvpx --enable-libwebp --enable-libx264 --enable-libx265 --enable-libxml2 --enable-libxvid --enable-lzma --enable-libfontconfig --enable-libfreetype --enable-frei0r --enable-libass --enable-libopencore-amrnb --enable-libopencore-amrwb --enable-libopenjpeg --enable-libspeex --enable-li
```

```
bsoxr --enable-libzmq --enable-libzimg --disable-libjack --disable-i
ndev=jack --enable-videotoolbox --enable-audiotoolbox --enable-neon
    libavutil      59. 39.100 / 59. 39.100
    libavcodec     61. 19.101 / 61. 19.101
    libavformat    61.  7.100 / 61.  7.100
    libavdevice    61.  3.100 / 61.  3.100
    libavfilter     10.  4.100 / 10.  4.100
    libswscale      8.  3.100 /  8.  3.100
    libswresample   5.  3.100 /  5.  3.100
    libpostproc    58.  3.100 / 58.  3.100
Input #0, mov,mp4,m4a,3gp,3g2,mj2, from 'Experimenter_CREW_999_1_All
_1731617801.mp4':
    Metadata:
        major_brand     : mp42
        minor_version   : 1
        compatible_brands: isommp41mp42
        creation_time   : 2025-03-04T22:42:51.000000Z
    Duration: 00:05:57.77, start: 0.000000, bitrate: 4031 kb/s
    Stream #0:0[0x1](eng): Video: hevc (Main) (hvc1 / 0x31637668), yuv
j420p(pc), 3840x2160 [SAR 1:1 DAR 16:9], 3880 kb/s, 29.96 fps, 29.97
tbr, 30k tbn (default)
        Metadata:
            creation_time   : 2025-03-04T22:42:51.000000Z
            handler_name    : Core Media Video
            vendor_id       : [0][0][0][0]
            encoder         : HEVC Coding
    Stream #0:1[0x2](eng): Audio: aac (LC) (mp4a / 0x6134706D), 44100
Hz, stereo, fltp, 157 kb/s (default)
        Metadata:
            creation_time   : 2025-03-04T22:42:51.000000Z
            handler_name    : Core Media Audio
            vendor_id       : [0][0][0][0]
    Stream mapping:
        Stream #0:1 -> #0:0 (aac (native) -> pcm_s16le (native))
Press [q] to stop, [?] for help
Output #0, wav, to 'audio.wav':
    Metadata:
        major_brand     : mp42
        minor_version   : 1
        compatible_brands: isommp41mp42
        ISFT           : Lavf61.7.100
    Stream #0:0(eng): Audio: pcm_s16le ([1][0][0][0] / 0x0001), 16000
Hz, mono, s16, 256 kb/s (default)
        Metadata:
            creation_time   : 2025-03-04T22:42:51.000000Z
            handler_name    : Core Media Audio
            vendor_id       : [0][0][0][0]
            encoder         : Lavc61.19.101 pcm_s16le
```

音频已保存为 audio.wav

```
[out#0/wav @ 0x14c10cc20] video:0KiB audio:11180KiB subtitle:0KiB ot
her streams:0KiB global headers:0KiB muxing overhead: 0.000681%
size= 11180KiB time=00:05:57.77 bitrate= 256.0kbits/s speed=1.83e+
03x
```

```
In [ ]: print(os.path.exists("audio.wav")) # 确保文件存在
print(os.path.getsize("audio.wav")) # 确保文件大小不是 0
```

```
ipd.Audio("audio.wav")
True
11448816
Out[ ]: 0:00 5:57
```

加载语音

```
In [ ]: # 加载音频文件
recognizer = sr.Recognizer()
audio_file = "audio.wav"
```

音频切片

```
In [ ]: # 加载音频文件
audio = AudioSegment.from_wav(audio_file)
chunk_length = 5000 # 每个切片 5 秒 (单位: 毫秒)

# 通过列表推导式将音频分割成多个片段, 每个片段的长度为 chunk_length 毫秒。
# range 函数生成一个从 0 到音频长度的序列, 步长为 chunk_length。将音频文件分
# 根据 range 中的索引, 切割音频片段。每个切片的大小为 chunk_length 毫秒
chunks = [audio[i:i + chunk_length] for i in range(0, len(audio), c

# 保存每个音频切片
for i, chunk in enumerate(chunks): # 对每个音频切片进行迭代。i 是切片的索引
    if not os.path.exists("wav"): # 检查输出文件夹 "wav" 是否存在
        os.makedirs("wav") # 如果文件夹不存在, 创建文件夹
    chunk.export(f"wav/chunk_{i}.wav", format="wav") # 将当前音频切片导出为 wav 文件
#print(f"已保存: chunk_{i}.wav ({i + 1}/{len(chunks)})") # 打印已保存的文件数量
try:
    audio = AudioSegment.from_wav(audio_file) # 重新加载原音频文件
except Exception as e:
    print(f"加载音频文件时出错: {e}") # 如果加载音频文件时出错, 打印错误信息
```

音频切片音质加强

```
In [ ]: def enhance_audio(input_audio, output_audio):
    # 加载音频文件
    audio = AudioSegment.from_wav(input_audio)
    # 增强音量
    louder_audio = audio + 10 # 将音频增加 10 分贝 (dB) 来增强音量, 使其更清晰
    # 去除低频噪音, 保留人声
    # 人类的语言通常在 300 Hz 到 3 kHz 之间, 因此保留这个频率范围有助于提高人
    filtered_audio = high_pass_filter(louder_audio, cutoff=300) #
    filtered_audio = low_pass_filter(filtered_audio, cutoff=3000) #
    # 归一化, 平衡音量
    normalized_audio = normalize(filtered_audio) # 归一化音频的目的是让所有音频具有相同的音量
    # 保存处理后的音频
    normalized_audio.export(output_audio, format="wav")
#print(f"处理后的音频已保存: {output_audio}")
```

```
In [ ]: # 调用函数
# enhance_audio("wav/chunk_0.wav", "wavEnhanced/chunk_0_enhanced.wav")

for i in range(len(chunks)): # 遍历所有切片
    chunk_file = f"wav/chunk_{i}.wav"
    enhance_audio(f"wav/chunk_{i}.wav", f"wavEnhanced/chunk_{i}_enhanced.wav")
```

文本识别whisper

```
In [ ]: import whisper

model = whisper.load_model("base") # 可选 "tiny", "base", "small", "large"

# 将音频文件 audio_file 转录成文本
def transcribe_whisper(audio_file):
    try:
        result = model.transcribe(audio_file) # 从返回的字典中获取识别结果
        print(f"Whisper 识别结果: {result['text']}") # 打印出识别结果,
        return result["text"]
    except Exception as e: # 音频文件损坏、格式不支持, 或者其他问题导致模型无法运行
        print(f"错误: {e}")
        return None

#transcribe_whisper("wavEnhanced/chunk_0_enhanced.wav")
```

```
In [ ]: # 将通过 Whisper 模型转录的音频切片文本数据存储到一个 CSV 文件中, 并且每个切片都带有时间戳

# 初始化列表存储转录数据
# 创建空的列表 transcripts, 存储每个音频切片的转录文本及其对应的时间戳。
# 每个元素将是一个包含 [timestamp, transcript] 的列表
transcripts = [] # 存储所有的转录数据

# 遍历音频切片
for i in range(len(chunks)): # chunks 是音频切片的列表, len(chunks) 是切片数
    chunk_file = f"wavEnhanced/chunk_{i}_enhanced.wav" # 对于每一个索引 i, 我们知道切片文件名

    # 识别文本, 转录音频切片
    try:
        transcript = transcribe_whisper(chunk_file) # 使用之前定义的 transcribe_whisper 函数

        # 计算时间戳 (每个切片 5 秒)
        timestamp = i * 5 # 每个音频切片的长度为 5 秒, 因此通过 i * 5 计算

        # 存储转录结果, 存入列表
        transcripts.append([timestamp, transcript]) # 将每个音频切片的结果添加到列表中
    except Exception as e:
        #print(f"无法转录音频切片 {chunk_file}: {e}")
        transcript = "" # 如果失败, 存储空文本
```

```
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
  warnings.warn("FP16 is not supported on CPU; using FP32 instead")
```

Whisper 识别结果:

```
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
```

```
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
```

Whisper 识别结果: Okay, so the

```
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
```

```
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
```

Whisper 识别结果: you're going to complete and use the key automation and the object detection system. So that means you will not need to.

```
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
```

```
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
```

Whisper 识别结果: upgrade vehicle, and keep your needs off the steering wheel and meet off the pedals much better than that drive.

```
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
```

```
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
```

Whisper 识别结果: Okay, so when you see that some driver indicator highlight green make sure you don't hit the brake at any point during

```
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
```

```
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
```

Whisper 识别结果: drive. But this dog, the car cab look at will have the hood yes for getting visual

```
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
```

```
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
```

Whisper 识别结果: that for targets that are in the environment, the car cabboultk outshapaytich, and that screen paid them.

```
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
```

```
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
```

Whisper 识别结果: and if one else turns the mission. Remember to tap the targets on that ODS as well as completing the mission.

```
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
```

```
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
```

Whisper 识别结果: workstation task.

```
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
```

```
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
```

Whisper 识别结果: Alright, so all drivers picture fit on the brake.
You're not removing the brake.

```
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
```

```
warnings.warn("FP16 is not supported on CPU; using FP32 instead")  
Whisper 识别结果: your foot from the brake until I instruct you to remove it or cap driver you may start the car.
```

```
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
```

warnings.warn("FP16 is not supported on CPU; using FP32 instead")
Whisper 雖然支持 CPU，但會強制使用 GPU，因為 FP16 在 CPU 上不受支持。

```
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
```

```
warnings.warn("FP16 is not supported on CPU; using FP32 instead")
```

whisper 识别结果: You drove through me.

/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead

```
warnings.warn("FP16 is not supported on CPU; using FP32 instead")  
Whisper 识别结果: NAS pocket driver
```

/Library/Frameworks/Python.framework

```
te-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
  warnings.warn("FP16 is not supported on CPU; using FP32 instead")
```

```
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU, using FP32 instead
```

```
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
```

Whisper 识别结果: Go back. Car cab driver and only the car cab drive r.

```
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
```

```
warnings.warn("FP16 is not supported on CPU; using FP32 instead")  
Whisper 识别结果: Yes. Yeah, right. Make sure everyone is in the dri
```

/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/si

te-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead

```
warnings.warn("FP16 is not supported on CPU; using FP32 instead")  
Whisper 识别结果: I am now in drive. Car cap driver and only the car
```

```
cap driver.  
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supp
```

```
warnings.warn("FP16 is not supported on CPU; using FP32 instead")
```

Whisper 识别结果: Maybe get moving forward.

```
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
```

```
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
```

Whisper 识别结果: as I drove through the

```
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
```

```
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
```

Whisper 识别结果: some driver on.

```
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
```

```
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
```

Whisper 识别结果: What color skater?

```
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
```

```
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
```

Whisper 识别结果: Do you really like cross- Brigade? Yes it does.

```
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
```

```
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
```

Whisper 识别结果: fuck, bag

```
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
```

```
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
```

Whisper 识别结果: It's draining, out of it.

```
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
```

```
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
```

Whisper 识别结果: I see scooters on both sides of the road.

```
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
```

```
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
```

Whisper 识别结果: this one. Yeah, it motorcycles like an electric scooter.

```
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
```

```
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
```

Whisper 识别结果: Yeah, that's on the left side of the road. Passing now

```
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
```

```
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
```

Whisper 识别结果: Yeah, that was a lot.

```
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
Whisper 识别结果: 알파 이벤트 이벤트

/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
Whisper 识别结果: Do you have any target? Not yet. I hit.

/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
Whisper 识别结果: Okay, that's right, but it's all okay

/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
Whisper 识别结果: Those motorcycles were giving me a car.

/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
Whisper 识别结果: Its kind of peel out there's bok in the sun and the roof uh pass RC it's uh

/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
Whisper 识别结果: 10 o'clock. I think we used.

/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
Whisper 识别结果: and then I saw the© all in from the tank

/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
Whisper 识别结果: We're also passing out our one.

/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
Whisper 识别结果: Why is a car

/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
Whisper 识别结果: three so far behind car two.
```

```
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
Whisper 识别结果: No.

/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
Whisper 识别结果:

/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
Whisper 识别结果: OK, as hard as the gap.

/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
Whisper 识别结果: Is the OTS working?

/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
Whisper 识别结果: Yes, sometimes there is a green butt there. This I can find out.

/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
Whisper 识别结果: No, you won't see anything, but Gapry should see something in the passenger seat of Podia.

/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
Whisper 识别结果: It should be a wide car right now. Right now. It should be a wide car right now.

/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
Whisper 识别结果: You're walking in the white catwalk to see if you can see the catwalk or the catwalk

/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
Whisper 识别结果: Stand or SUV F in the air. Yes, SUV.

/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
```

Whisper 识别结果: I see a camel.

```
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
```

```
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
```

Whisper 识别结果: I got cars coming up.

```
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
```

```
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
```

Whisper 识别结果: There's a driving white car on the left.

```
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
```

```
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
```

Whisper 识别结果: Yeah, it's going to be going to the left. Backpog. But it's not.

```
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
```

```
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
```

Whisper 识别结果: I think that was it. We have another white...

```
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
```

```
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
```

Whisper 识别结果: SUV and passing that one left now.

```
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
```

```
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
```

Whisper 识别结果: I think that was... I'm scared. I'm not scared.

```
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
```

```
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
```

Whisper 识别结果: 한번 해봤습니다

```
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
```

```
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
```

Whisper 识别结果: Passing military checkpoint

```
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
```

```
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
```

Whisper 识别结果:

```
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
```

```
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
```

Whisper 识别结果: That was a truck and it was a tablet on the truck.

```
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
Whisper 识别结果: covering it. It's got like model. Yeah.
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
Whisper 识别结果: Yeah
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
Whisper 识别结果:
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
Whisper 识别结果: Jack, do you feel like this is getting...
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
Whisper 识别结果: you enough to understand or do you want to continue? Yeah, I think.
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
Whisper 识别结果: I think it's, how about you comment it? I think it's enough.
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
Whisper 识别结果: I mean I'm having fun but we can stop if you want to.
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
Whisper 识别结果: Yeah, we kill it. So, um, all dry.
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
Whisper 识别结果: peppers or the pepper for the breaks. Okay. Come here.
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
```

Whisper 识别结果: of braking now?

```
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
Whisper 识别结果: Please don't run through me. No!
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
Whisper 识别结果: We've been we're ended
/Library/Frameworks/Python.framework/Versions/3.12/lib/python3.12/site-packages/whisper/transcribe.py:126: UserWarning: FP16 is not supported on CPU; using FP32 instead
    warnings.warn("FP16 is not supported on CPU; using FP32 instead")
Whisper 识别结果: in park now.
```

```
In [ ]: # 创建 DataFrame
df = pd.DataFrame(transcripts, columns=["Timestamp", "Transcription"]

# 先显示前几行，确保数据正确
print(df.head())

# 保存为 CSV，命名格式: video_1731617801_transcripts.csv
csv_filename = "whisper_video_1731617801_transcripts.csv"
df.to_csv(csv_filename, index=False, encoding="utf-8") # 将转录数据保存

print(f"Whisper 转录数据已保存到 {csv_filename}")
```

	Timestamp	Transcription
0	0	
1	5	Okay, so the
2	10	you're going to complete and use the key auto...
3	15	upgrade vehicle, and keep your needs off the ...
4	20	Okay, so when you see that some driver indica...

Whisper 转录数据已保存到 whisper_video_1731617801_transcripts.csv

情感分析: TextBlob

```
In [ ]: nltk.download("punkt") # 需要分词
```

```
[nltk_data] Downloading package punkt to
[nltk_data]     /Users/bocongzhao/nltk_data...
[nltk_data]     Package punkt is already up-to-date!
```

Out[]: True

```
In [ ]: # 定义情感分析函数
# TextBlob 是一个用于文本处理的 Python 库，进行情感分析、翻译等任务
# TextBlob 提供的情感极性值。极性值的范围从 -1 到 1：
# -1 代表强烈的负面情绪
# 0 代表中性情绪
# 1 代表强烈的正面情绪
# TextBlob 的情感分析是基于词汇和语法规则的，可能不适用于复杂的上下文
```

```

def get_sentiment(text):
    if not text.strip(): # 如果文本为空, 返回 'Neutral'
        return "Neutral"

    analysis = TextBlob(text) # 创建TextBlob 对象, 其中 text 是要进行分析的文本
    polarity = analysis.sentiment.polarity # 情绪极性 (-1 负面, 0 中性, 1 正面)

    if polarity > 0:
        return "Positive"
    elif polarity < 0:
        return "Negative"
    else:
        return "Neutral"

```

```

In [ ]: # 在 DataFrame 里添加情感分析结果
# df["Transcription"]: DataFrame 中存储转录文本的列
# .apply(get_sentiment): 对每一行的文本应用 get_sentiment 函数, 将每个文本的情感极性存储在 Sentiment 列中
# df["Sentiment"]: 将情感分析的结果存储在 DataFrame 的 Sentiment 列中
df["Sentiment"] = df["Transcription"].apply(get_sentiment)

# 显示前几行, 检查结果
print(df.head())

# 重新保存 CSV
csv_filename = "video_1731617801_sentiments.csv"
df.to_csv(csv_filename, index=False, encoding="utf-8") # 将 DataFrame 保存为 CSV 文件

print(f" 情感分析已完成, 数据已保存到 {csv_filename}")

```

	Timestamp	Transcription	Sentiment
0	0		Neutral
1	5	Okay, so the	Positive
2	10	you're going to complete and use the key auto...	Positive
3	15	upgrade vehicle, and keep your needs off the ...	Positive
4	20	Okay, so when you see that some driver indica...	Positive

情感分析已完成, 数据已保存到 video_1731617801_sentiments.csv

数据可视化

```

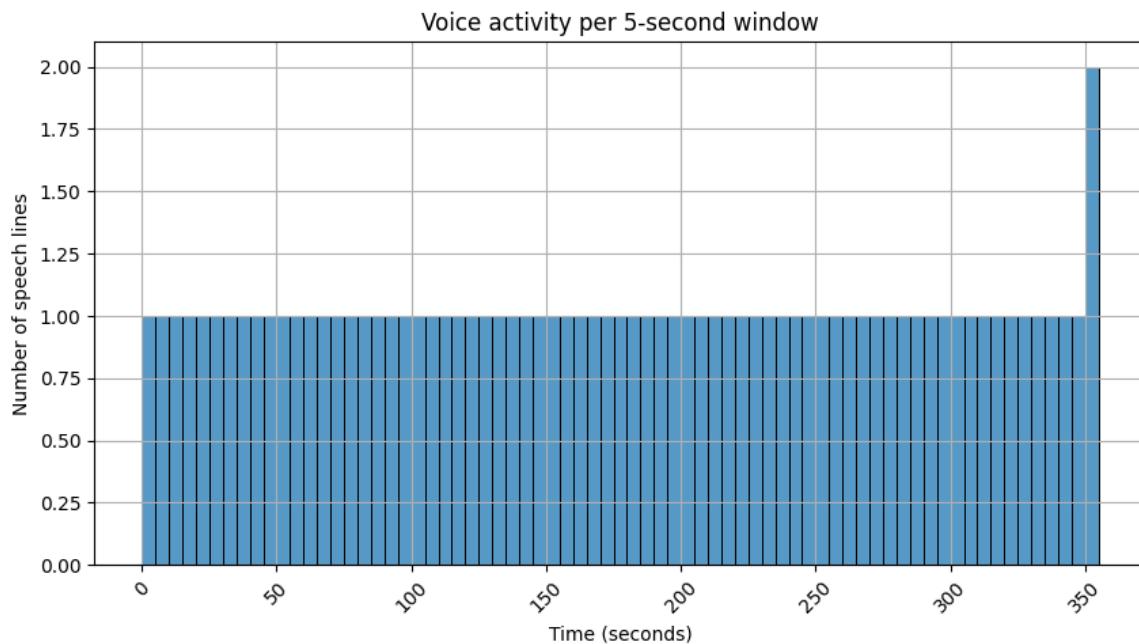
In [ ]: # 读取 CSV 数据
df = pd.read_csv("video_1731617801_sentiments.csv")

# 1 **直方图 - 每个 5 秒窗口的语音活动**
plt.figure(figsize=(10, 5))
sns.histplot(df["Timestamp"], bins=range(0, int(df["Timestamp"].max)+1), kde=True)
plt.xlabel("Time (seconds)")
plt.ylabel("Number of speech lines")
plt.title("Voice activity per 5-second window")
plt.xticks(rotation=45)

```

```
plt.grid(True)
plt.show()

# 2 **情感分类图 - 统计 Positive / Neutral / Negative 的比例**
plt.figure(figsize=(7, 5))
sns.countplot(x="Sentiment", data=df, palette={"Positive": "green",
plt.xlabel("Emotional classification")
plt.ylabel("Qty")
plt.title("Distribution of Emotional Analysis")
plt.grid(axis="y")
plt.show()
```



```
/var/folders/ny/3djxxhdx4kz2zxhn2yx5jgqr0000gn/T/ipykernel_41850/708
763567.py:16: FutureWarning:
```

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `x` variable to `hue` and set `legend=False` for the same effect.

```
sns.countplot(x="Sentiment", data=df, palette={"Positive": "green",
"Neutral": "gray", "Negative": "red"})
```

