

# Chrome Extension: Youtube Translator & Summarizer

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## ABSTRACT

This is a project report in Development Track for CS510 Advanced Information Retrieval. It serves two purposes: (1) we will provide a description of the software tool developed, including its motivation, intended users, major functions, some implementation details (e.g., system architecture, pseudo code of key algorithms, etc), and any evaluation results (e.g., benchmark results or screenshots), and (2) we will provide details about how to use the software with screenshots to show sample use scenarios.

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## 1 INTRODUCTION

We plan to develop a chrome extension for YouTube, which can translate subtitles according to timeline and generate accurate summary of the video. It is a new extension using the existing ChatGPT API. There are two major functionalities: to translate the audio of Youtube video to another language, and to summarize the content of the video. Anyone who watches YouTube may be our potential user.

Our extension addresses two common needs: (1) Most of the YouTube videos only have automatically generated English subtitles, currently there is no convenient extension that can generate corresponding subtitles in other languages for users. (2) It's a waste of time to sift through a long video to just find some key points, a quick and accurate summarizer for long videos is needed. It's important to address these needs because most people would prefer not to watch a video with automatically generated English subtitles, which is not in their native language. Also, people may spend a long time watching a video and later find that this is not what they want. Our extension makes it convenient and efficient for those people to watch a video in a different language, and to have a glimpse of the main idea of the video to determine whether it is something they need to spend time watching.

The main technologies we plan to leverage include (1) ChatGPT API: connect OpenAI GPT3.5 model, change hyperparameter of the base model, use model to do translation and summary. (2) YouTube Transcript API: extract existing subtitle/transcript of given video (3) DOM API: frontend interface to build out the chrome extension. The potential barrier is how to know the timestamp of the video at a particular time to determine which subtitle that we would like to translate.

It's difficult to evaluate the correctness of the translation and summarization, as they are purely based on a pre-trained large

language model. For this project, we mostly will focus on improving the usefulness of our extension: ie. trying to show translated subtitles dynamically according to the progress bar of the video.

All the codes for our extension are available at <https://github.com/xingyuqiu2/youtube-translator-summarizer-extension>

## 2 TASK DIVISION

- Fan Zang: Implementation of translation and summary functions using ChatGPT API, proper prompting generation with ChatGPT, and front-end development with DOM
- Jerry Qiu: Implementation of general architecture, implementation of transcript and timestamp functions using YoutubeAPI, and front-end development with DOM

## 3 MOTIVATION

Most YouTube videos only offer auto-generated subtitles in English, which is not helpful for users who speak other languages. There is no easy way to get subtitles in different languages with an extension. For example, a user who speaks Spanish may want to watch a video about cooking, but the video only has subtitles in English. The user may not understand the instructions or the ingredients, and may lose interest in the video. An extension that can generate subtitles in Spanish or other languages would be very useful for such users.

Watching a long video to find the key points is time-consuming and inefficient. A summarizer that can quickly and accurately capture the main idea of a long video is needed. These needs are important because many people don't want to watch a video with auto-generated subtitles in English, which is not their native language. Also, people may waste a lot of time watching a video that is not relevant to their interests. For example, a user who wants to learn about a topic may watch a video that is an hour long, but only has a few minutes of useful information. The user may get bored or frustrated by the video, and may miss the key points. An extension that can summarize the video in a few sentences or bullet points would be very helpful for such users.

Our extension makes it convenient and efficient for those people to watch a video in a different language, and to get a summary of the video to decide if it is worth watching. Our extension uses advanced natural language processing techniques to show high-quality subtitles with translations and to summarize the content of the YouTube videos. It also allows users to customize the language. Our extension is easy to install and use, and it enhances the user experience of watching YouTube videos.

## 4 INTENDED USERS

We generally categorize three kinds of intended users for our extension.

- Users who speak a different language than the one used in the YouTube video. They may want to watch a video in their

native language or learn a new language by watching videos with subtitles in that language.

- Users who want to save time and get the main idea of a long video. They may not have enough time or patience to watch the whole video, or they may want to preview the video before watching it in full.
- Users who are interested in a variety of topics and genres on YouTube. They may want to watch videos about education, entertainment, news, sports, music, etc. with subtitles and summaries that suit their needs.

## 5 MAJOR FUNCTIONS

This extension allows users to chat with a powerful natural language generation model and get summaries of their conversations in different languages and styles with their own preferences.

### 5.1 Customization

To use the extension, users need to provide two keys: a RapidAPI key and a ChatGPT key. These keys are used to access the APIs that power the translation and summary features. Users can obtain these keys from the respective websites of rapidapi and chatgpt.

Users can also customize their experience by choosing the translated language and the summary mode according to their preferences. The extension supports multiple languages, such as Chinese, Spanish, and French. Users can select the language they want the transcript to be translated to.

The summary mode determines the style and tone of the summary. Users can choose from three modes: creative, balanced, and precise. The creative mode generates a summary that is more expressive and imaginative, using metaphors, analogies, and humor. The balanced mode generates a summary that is more neutral and factual, using clear and concise language. The precise mode generates a summary that is more accurate and detailed, using specific and technical terms. Users can switch between these modes from the popup page of the extension.

Once the above setup information is provided, users can click the "save & submit" button so that all the information will be saved locally, and then they can begin to experience the main functionalities of our extension.

### 5.2 Translator

This extension enables users to watch YouTube videos with subtitles in different languages. The extension uses two APIs to achieve this functionality: "Subtitles for YouTube" from RapidAPI and ChatGPT. "Subtitles for YouTube" is an API that allows to fetch subtitles for any YouTube video that has them. ChatGPT is an API that is used here to translate text.

The extension works as follows: when users open a YouTube video, the extension will automatically detect it and display a panel with all the functionalities in the video page. The extension will then use the "Subtitles for YouTube" API to get the subtitles for the video in the original language. Next, the extension will use the ChatGPT API to translate each subtitle into the chosen language with a high quality. The extension will then display both the original and translated subtitles on the screen in two different tabs.

The extension also provides a convenient way for users to navigate the video using the subtitles. Each subtitle and its translation has a clickable timestamp that can take users to the corresponding time in the video. Users can click on any subtitle to jump to that part of the video. This feature is useful for users who want to review or replay a specific segment of the video.

The translator function for the extension is designed to enhance users' YouTube experience by providing them with subtitles in different languages. Users can watch videos in languages they don't understand and still follow along with the subtitles. Users can also learn new words and phrases from the subtitles and improve their language skills. The extension is a great tool for anyone who loves watching YouTube videos but don't know the English.

### 5.3 Summarizer

This extension allows users to get a summary of any YouTube video that has subtitles. The extension uses ChatGPT API to generate the summary based on the subtitles of the video. The extension also lets users choose one of the summary modes: creative, balanced, or precise. The summary mode determines the style and tone of the summary.

The extension works as follows: when users open a YouTube video that has subtitles, the extension will then use the ChatGPT API to generate a summary for the video under the chosen mode. The summary will be written in a clear and concise way with bullet points. Each bullet point will summarize a main idea or highlight from the video. The extension will also automatically choose a relevant figure for each bullet point from the video. The figure is an image that illustrates the bullet point. The extension will then display the summary on the summary tab.

The summary function in the extension is designed to provide users with a quick and easy way to get an overview of any YouTube video. Users can use the summary to decide if they want to watch the whole video or not. Users can also use the summary to review or recall what they learned from the video. The extension is a great tool for anyone who wants to save time and learn more from YouTube videos.

## 6 IMPLEMENTATION DETAILS

Our extension is based on Manifest V3, the latest API of Chrome extension that governs how extension interact with the browser. The extension consists of three parts: background, popup, and ContentScript.

The background process is separate from the browser and monitors the tab updating event, which sends a message to ContentScript process whenever user switch to a new video.

The popup process starts whenever user click the extension icon button and is mainly responsible for the configuration. We utilize the storage system of Chrome and store user's API key and preference to the cloud. Thus the API key will be bounded to the Google account. Even if user switch to a new device, the extension is able to load the previously stored API key to work properly.

The ContentScript process fetch the content(transcript, translation, summary) and then modifies the YouTube page html to provide the content for users. We use the default parameters for RapidAPI: the transcript is the default language of videos. For most videos,

the default language is the auto generated English. For ChatGPT API, we use the text-davinci-003 model with max response token equal to 2048. Frequency penalty and presence penalty are both set to 0. For translation task, we use the simple prompt: "[Transcript] translate the above text to [Language]." For summary task, we use the temperature parameter to control the mode of our summary. For language model like ChatGPT, higher temperature make the model more creative and lower temperature make the model more confident about its response. Thus for precise mode, temperature is 0.3, for balanced mode, temperature is 0.6, for creative mode, temperature is 0.9. We also craft our summary prompt to ensure ChatGPT could generate a pleasing result. Our summary prompt is: "Your task is to summarize the text I have given you in up to five concise bullet points, starting with a short highlight. Choose an appropriate emoji for each bullet point. Your output should use the following template:#### Summary #### Highlights- [Emoji] Bulletpoint." An example response is shown in Figure 8.

## 7 USAGE DETAILS

This section provides details about how to use our extension.

### 7.1 Installation

The extension can be downloaded from this [git repository](#). You can download zip if git is not installed. To install the extension, click "Manage extensions" of google chrome to open the extensions page. Then click the "Developer mode" button in the upper right corner and you should see a "Load unpacked" button appear. Click the "Load unpacked" button and choose the unzipped extension folder(which contains manifest.json). The extension should be installed now and you can close the "Developer mode".

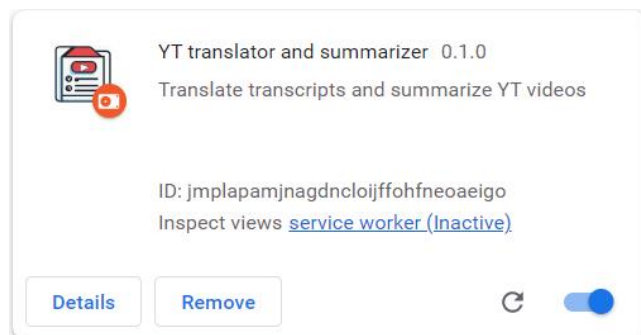


Figure 1: Installed Extension

### 7.2 Configuration

To use our extension, you need to create two API keys. The first one is the RapidAPI key(Figure 2) used for video transcript extraction. You can sign up a RapidAPI account through [this link](#). Then subscribe the [Subtitles for YouTube API](#), and then in the endpoints tab you should see a X-RapidAPI-Key. Copy the generated key and save in a safe spot.

The second one is the ChatGPT API key(Figure 3) used for video translation and summarization. Go to [OpenAI official website](#) and sign up an account. Then you can create your API key in your

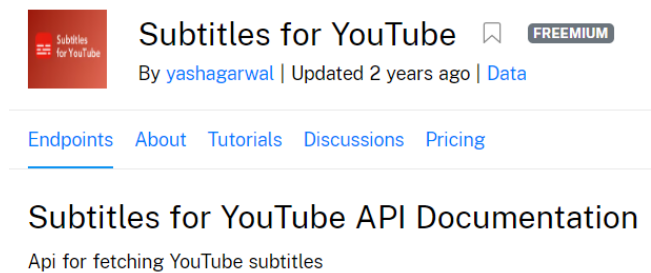


Figure 2: RapidAPI

[account page](#). Make sure default organization is set to personal and then click the "create new secret key" button. Copy the generated key and save in a safe spot.

#### API keys

Your secret API keys are listed below. Please note that we do not display your secret API keys again after you generate them.

Do not share your API key with others, or expose it in the browser or other client-side code. In order to protect the security of your account, OpenAI may also automatically rotate any API key that we've found has leaked publicly.

NAME	KEY	CREATED	LAST USED	
Secret key	sk-...28c4	Apr 22, 2023	Never	✎ ⌵

[+ Create new secret key](#)

#### Default organization

If you belong to multiple organizations, this setting controls which organization is used by default when making requests with the API keys above.

Personal

Note: You can also specify which organization to use for each API request. See [Authentication](#) to learn more.

Figure 3: ChatGPT API

The final step is to save these two API keys to the extension. Open a YouTube video page and then open the extension. The browser will pop up several alerts messages(Figure 4) reminding you to configure the extension. Click the extension button again and you will see a configuration page(Figure 5) appear. Input corresponding two API keys and select translation language and summary mode you need. Then click the save & restart button, if no alert pops up again, you are done.

www.youtube.com says

Please set correct rapid api key in configuration.

OK

Figure 4: API Error Ex

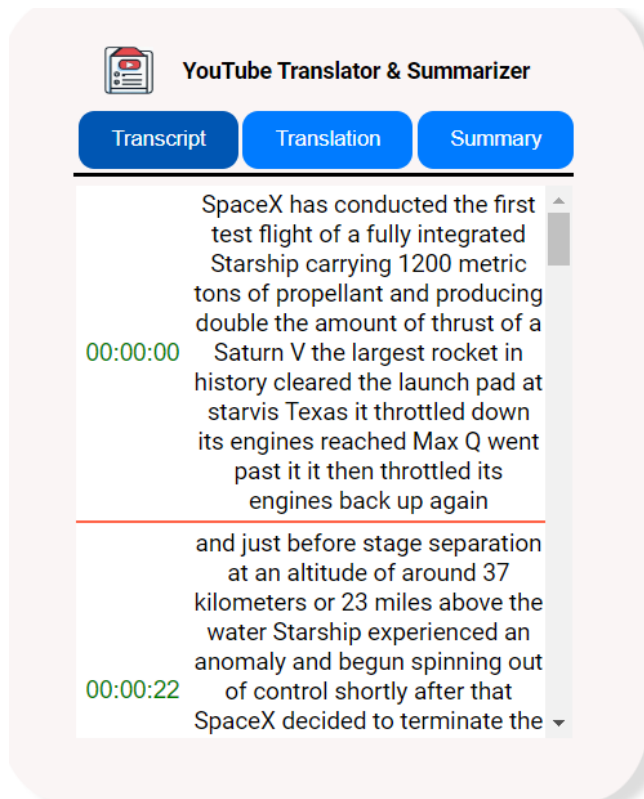


Figure 6: Transcript Example

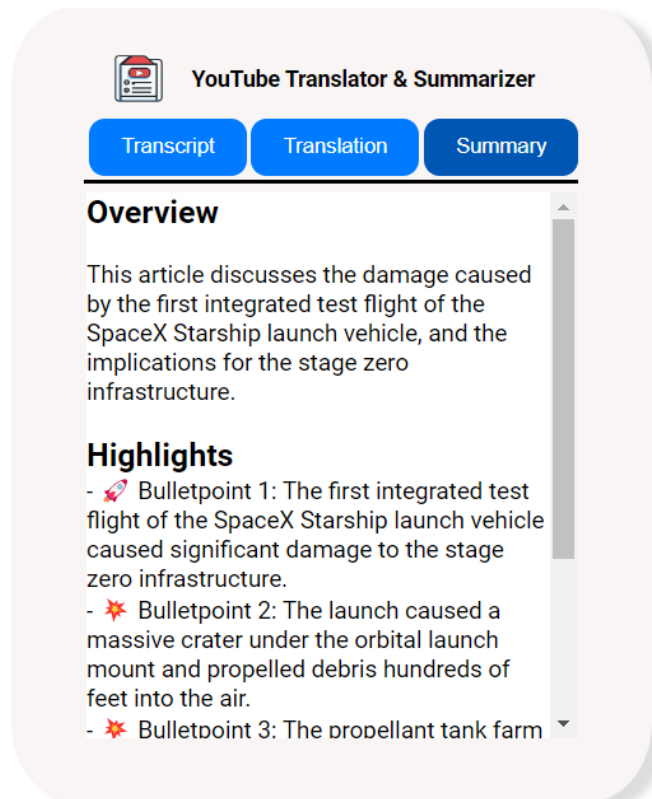


Figure 8: Summary example



Figure 7: Translation Example

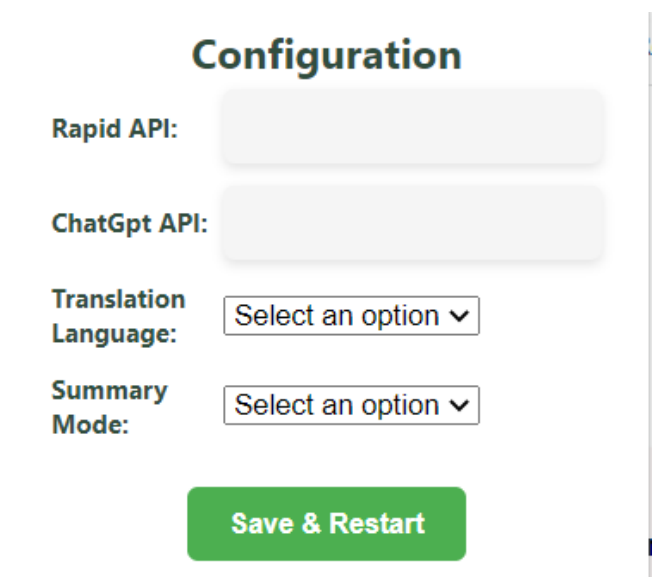


Figure 5: Extension Configuration

### 7.3 Functions

After initial configuration, contents of all three tabs(transcript, translation, summary) will appear whenever you click the restart button in configuration or switch to a new video. An example about this [YouTube video](#) is provided(Figure 6,7,8).

For transcript and translation, you can also click the timestamp to switch to the corresponding part of the video. If you want to regenerate the summary or change the mode of summary, simply change mode in configuration and click restart button.