

# Hwa Chong Virtual Assistant

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# 1. Introduction

We wanted to make use of A.I. to create a virtual assistant that is specialised to Hwa Chong. The idea came about because researching about the school would take up quite a lot of time. For example, if you wanted to find out why Tan Kah Kee decided to set up the school, you would have to read through long paragraphs before sieving out the relevant information. Even then, you would have to cross check this information with other sources to find out if it is accurate. If you use this Virtual assistant, however, you would get reliable, straight-to-the-point information that may not even be found in other sources. Furthermore, the A.I. speech recognition and output provides an interactive and interesting experience. All these would benefit various groups of people, like primary 6 pupils, who are thinking of joining the school and want to find out more. The significance of this project is brought about by the application of A.I. as we need to take advantage of this technology especially in these modern times. This project would include the designing of the user interface, the creation of several databases and the use of speech recognition technology, although it is not included in the beta version of the project.

## 2. Literature Review/Theoretical Framework/Reference Models

Some of our inspirations are google assistant and siri. This is how they function. [Google](#) first records your speech before sending it to Google's servers to be analyzed more efficiently. Google breaks down what you said into individual sounds before consulting a database containing various words' pronunciations to find which words most closely correspond to the combination of individual sounds.

It then identifies key words to make sense of the tasks and carry out corresponding functions. For example, if [Google Assistant](#) notices words like "*weather*" or "*temperature*", it would open the weather app. Google's servers send the information back to your device and Google Assistant may speak. If Google Assistant needs to say anything back to us, it would do everything mentioned in reverse.

Now, this is how Siri works. After receiving the user's request, Siri would record the frequencies and sound waves and translate them into a code. The code is broken down and Siri takes note of particular patterns and keywords. The data would then be input into an algorithm that would go through millions of files to find out what the request means.

This intelligent programme can work around certain literary expressions. Once Siri determines the request, Siri would check what resources it has to fulfill it and create a relevant response to the user.

Some shortcomings we found is that they may not understand people with heavy accents and might misinterpret what the user said due to the limitations of vocabulary. Sometimes, it turns on by itself and corrupts data on apps.

### 3. The study and methodology

As mentioned earlier, this idea came about because we wanted to apply A.I. to make something useful, and because we found that researching would take up too much time. To achieve this, we researched on how some virtual assistants work and some common problems users face. We also researched on how speech recognition technology could be used. Unfortunately, we were unable to implement this technology in the beta version of the Hwa Chong Virtual Assistant.

Eventually, we decided that we would use Python and its various libraries for the backend. The libraries used include spacy, nltk, pandas, CGI, etc. As for the user interface, we decided to use HTML and connect it to the backend through Django. Lastly, we would use Microsoft Excel to create various databases for various synonyms and their answers. Basically, the code would read the user's input, pick out certain keywords and go to the databases to see what word's synonyms they are of and what are the responses to be given. We experimented with a few libraries for the reading of user's input. Eventually, we decided to go with spacy as it was the most efficient.

Everyone in the group had a part to play in the project. Vincent, who was the main programmer, programmed the backend. Joshua, the assistant coder, was in charge of designing the user interface. Song Yang and Wang Chen conducted the user acceptance test, research case studies on other virtual assistants, like Google Assistant and speech recognition in other countries.

From February to April, we researched the suitable programs used to make the program, designed the user interface, and tested various Python libraries, before finalising the libraries used and the design of the user interface. After that, we started out programming the user interface.

From May to June, we completed the beta version of the user interface, started programming the backend, linked the two together and started testing the beta version. Since the program worked but with a few hiccups, we were able to expand the database by adding more acronyms to it. This took place while some changes were made to the backend and eventually finalising the beta version of the program.

At the end of July, we made huge updates to the user interface as we felt that it could be better. After that, we finalised the user interface and the base program without speech recognition.

# 4. Outcomes, analysis and discussions

At the end of this project, we were able to create a Hwa Chong Virtual Assistant minus the speech recognition function.

Using Html for the front end, we were able to publish the web page on the web on Vincent's computer. The user interface is as shown below:

Welcome to Hwa Chong Virtual Assistant  
03 : 47 : 32 PM

Enter your question: e.g. How old is Hwa Chong?

Created by: Vincent Coyadi  
Designed by: Joshua Liew

Submit

1st page

This screenshot shows the main landing page of the Hwa Chong Virtual Assistant. It features the Hwa Chong Institution logo at the top left. The title "Welcome to Hwa Chong Virtual Assistant" is centered above a digital clock displaying "03 : 47 : 32 PM". Below the clock is a large input field with placeholder text "e.g. How old is Hwa Chong?". To the right of the input field is a "Submit" button. At the bottom left, there is copyright information: "Created by: Vincent Coyadi" and "Designed by: Joshua Liew". A callout box points to the digital clock with the text "There is a clock for easy reference of the time". Another callout box points to the input field with the text "Users can input their questions here". A third callout box points to the "Submit" button with the text "Users can press submit to process the answer".

Hello! How can I help you?

To return to the previous page: Click here

2nd page

The answers will be output here, along with the voice.

Users can replay the voice output if they missed it the first time, as well as change its volume.

Users can click the button to go back to the previous page if they have any more questions.

This screenshot shows the second page of the virtual assistant. It includes the Hwa Chong logo and a text input field containing "Hello! How can I help you?". Below the input field is a link "To return to the previous page: Click here". A slider control is present, likely for audio volume. A callout box points to the slider with the text "The answers will be output here, along with the voice.". Another callout box points to the "Click here" link with the text "Users can replay the voice output if they missed it the first time, as well as change its volume.". A third callout box points to the "Click here" link with the text "Users can click the button to go back to the previous page if they have any more questions.".

The relevant answer would then be retrieved from the excel database and be shown on the screen in the box, coupled with being spoken out loud.

A	B
1 establish	HCI is established in 1919
2 teachers	HCI has total 100 teachers and professional
3 timings	HCI start from 07.00 to 13.30
4 fallback	I dont quite understand. Could you repeat that?
5 hello	Hello! How can I help you?
6 anthem	Our school anthem is ..... HCI

For the back end, Spacy, pandas, re and xlrd would be imported to get Python to read the file. The code would first compare the words from the question keyed in by the user in the front end between the words in the excel database. Every letter would be converted into small letters and every word to its root form to make it easier for the code to understand. The variables would then be declared. The question asking user for queries would be printed. Then, code would identify whether each word is a stop word or not and all the words would subsequently be converted into a string. The code would afterwards go to sheet 1 in the excel database to look for matching synonyms and also go to sheet 2 to give the user an appropriate response before printing it out the answer to them.

## 5. Implications and recommendations

Overall, Hwa Chong Virtual Assistant turned out well. However, we have found some of its shortcomings.

The main problem of this virtual assistant is actually about its speed. It takes slightly less than 10 seconds for the system to generate one response. This is a big problem because it defeats the whole purpose of speeding up the researching process. One way we can solve this is by changing the libraries used to read the input, read the excel sheet etc.

Next, because the database has to be updated manually, a lot of time has to be spent making it up to date. Another problem is the system's inability to read Chinese and give it as feedback. This is a problem, especially as Hwa Chong is a SAP school, and certain things like its school song is all in Chinese. However, this problem is not as big because users are still able to read the text output.

A minor shortcoming of the system is that it can only answer one question at a time. If users try to enter two questions at the same time, the system will truncate one of them and only reply to the other. This can be solved by changing the backend to include 2 or more keywords. Lastly, the voice output only works on chromium browsers. If you use the system on firefox, the voice output will not be present.

To achieve the full Hwa Chong Virtual Assistant, we have to replace the text typing to speech with frame database. Furthermore, we need to enhance the natural language processing before integrating the virtual assistant into Hwa Chong's website (<http://www.hwachong.edu.sg/>) for easy access. After all these, then can we be done with our prototype.

## 6. Conclusion

During the project, we learnt more about coding and voice recognition and how programs like Siri and Google Assistant functions. We learnt to be resilient and not give up when the code failed to work and continued to fix and improve the code. We learnt to have teamwork and be efficient when doing the slides and other things. We got to converse more with each other during our holidays and had fun doing the project. Mainly, we learnt to be thankful for the programmers out there who have spent a lot of time to develop apps and websites like Google or Youtube to make our life easier and more enjoyable.

## 7. Bibliography

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