



中原大學 雲端計算平台實務

12/30-作業報告

Microsoft Azure AI Fundamentals: Explore
natural language processing

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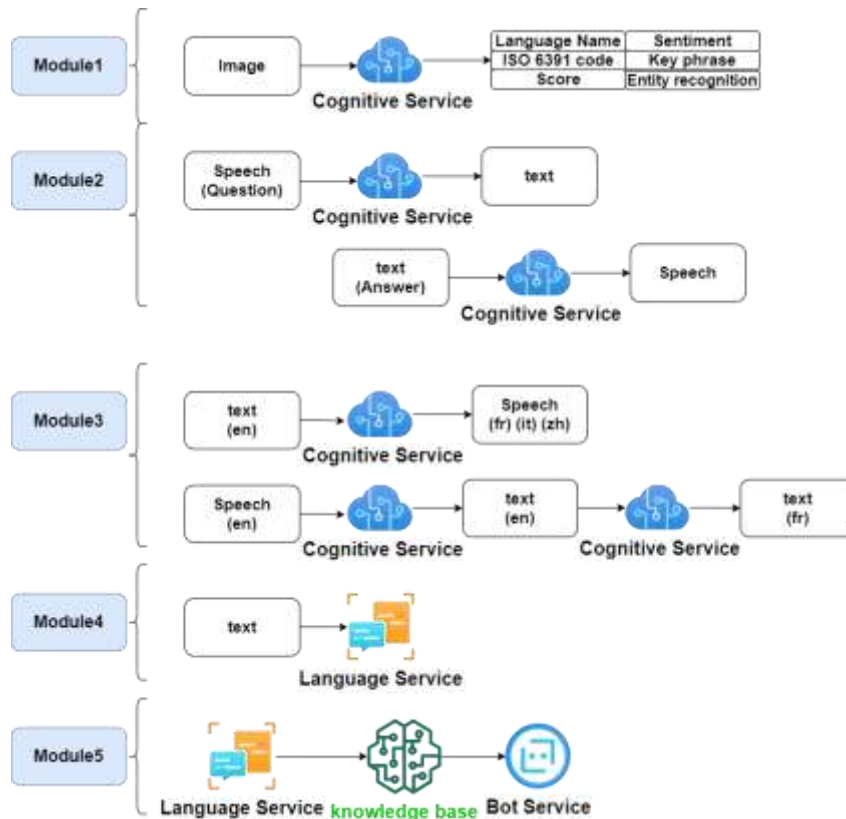
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中華民國一一一年十二月

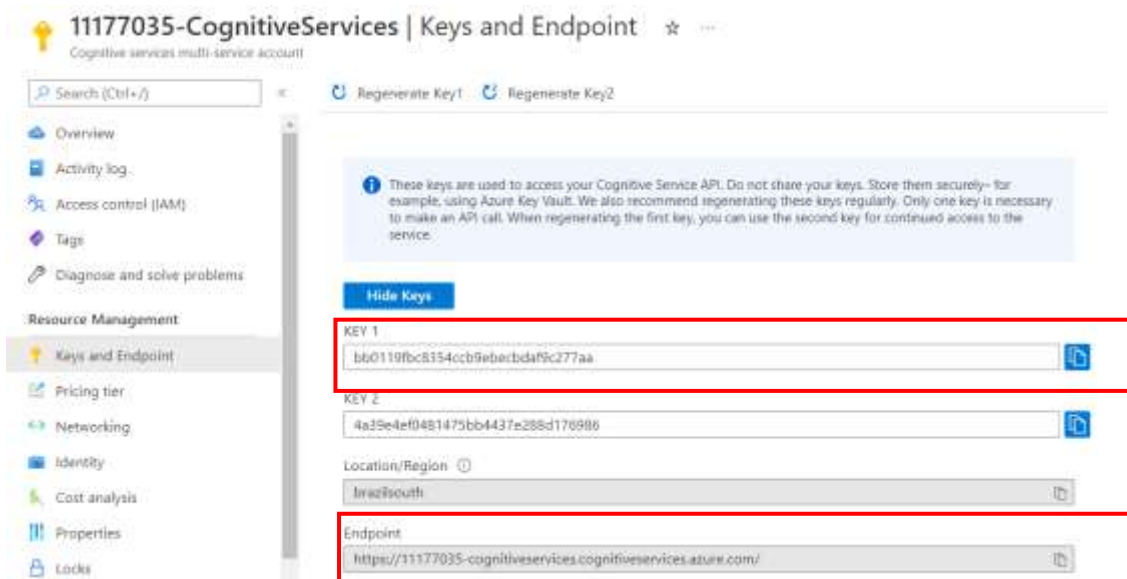
1. Learning Path Intro

Microsoft Azure AI Fundamentals: Explore natural language processing
<https://docs.microsoft.com/en-us/learn/paths/explore-natural-language-processing/>


2. Summary Homework Assignment



1. Prepare: Create a Cognitive Service in Azure & Get Keys and Endpoints



<https://github.com/MicrosoftLearning/AI-900-AIFundamentals>



The screenshot shows the Azure Cloud Shell interface. At the top, there's a search bar and navigation icons. Below that, the 'PowerShell' tab is active, and the terminal shows the following output:

```
Cloud Shell.Succeeded.
Terminal....

Welcome to Azure Cloud Shell

Type "az" to use Azure CLI
Type "help" to learn about Cloud Shell

NOTE: Switch to Bash from PowerShell: bash

VERBOSE: Authenticating to Azure ...
VERBOSE: Building your Azure drive ...
PS /home/sh1896318> git clone https://github.com/MicrosoftLearning/AI-900-AIFundamentals ai-900
Cloning into 'ai-900'...
remote: Enumerating objects: 564, done.
remote: Counting objects: 100% (15/15), done.
remote: Compressing objects: 100% (13/13), done.
remote: Total 564 (delta 6), reused 10 (delta 3), pack-reused 548
Receiving objects: 100% (564/564), 78.48 MiB | 15.27 MiB/s, done.
Resolving deltas: 100% (267/267), done.
PS /home/sh1896318>
```

修改範例程式 `analyze-text.ps1` 的程式碼，分析文本內容。修改 `key` 與 `endpoint` 的變數，使 API 能套用變數使用 Azure Cognitive Service 服務。

```

1 curl -XPOST https://api.openai.com/v1/chat/completions \
2 -H "Content-Type: application/json" \
3 -d '{
4   "model": "gpt-4o",
5   "messages": [
6     { "role": "user", "content": "Analyze the sentiment of the following text: 'I love this product, it's amazing!'." }
7   ],
8   "stream": false
9 }' \
10 https://api.openai.com/v1/chat/completions
11
12 # Parse the JSON response
13 jq -r '.choices[0].message.content'
14
15 # Expected output: "The sentiment of the text is positive."

```

Tired hotel with poor service The Royal Hotel, London, United Kingdom 5/6/2018 This is a old hotel (has been around since 1950's) and the room furnishings are average - becoming a bit old now and require changing. The internet didn't work and had to come to one of their office rooms to check in for my flight home. The website says it's close to the British Museum, but it's too far to walk.

調用 API 偵測文本語言：返回 English 的結果。

```
30 $result = Invoke-RestMethod -Method Post `
31     -Uri "$endpoint/text/analytics/v3.1/languages" `
32     -Headers $headers `
33     -Body $data | ConvertTo-Json -Depth 6
34
```

```
***Detecting Language***
- Language: English
- Code: en
- Score: 1
```

調用 API 偵測關鍵詞。

```
53 write-host "`n`n***Finding Key Phrases***"
54 $result = Invoke-RestMethod -Method Post `
55     -Uri "$endpoint/text/analytics/v3.1/keyPhrases" `
56     -Headers $headers `
57     -Body $data | ConvertTo-Json -Depth 6
```

```
***Finding Key Phrases***
- Key Phrases:
  The Royal Hotel
  Tired hotel
  old hotel
  poor service
  United Kingdom
  room furnishings
  office rooms
  flight home
  British Museum
  London
  changing
  internet
  website
  1950
```

調用 API 偵測文本情感，結果回傳正面/中性/反面的信心程度。

```
79 write-host "`n`n***Analyzing Sentiment***"
80 $result = Invoke-RestMethod -Method Post `
81     -Uri "$endpoint/text/analytics/v3.1/sentiment" `
82     -Headers $headers `
83     -Body $data | ConvertTo-Json -Depth 6
```

```
***Analyzing Sentiment***
- A negative sentiment based on these scores:
- Positive: 0.01
- Neutral: 0.07
- Negative: 0.92
```

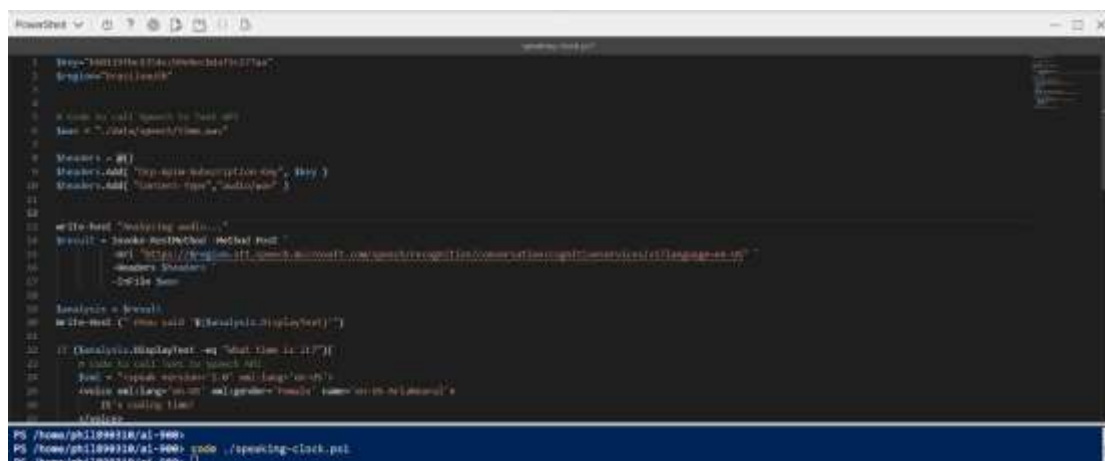
調用 API 偵測詞句文意（借助 Wikipedia 網站）。

```
105 write-host "`n`n***Identifying known entities***"
106 $result = Invoke-RestMethod -Method Post `
107     -Uri "$endpoint/text/analytics/v3.1/entities/linking" `
108     -Headers $headers `
109     -Body $data | ConvertTo-Json -Depth 6
```

```
***Identifying known entities***
- The Royal Hotel : https://en.wikipedia.org/wiki/The_Royal_Hotel
- London : https://en.wikipedia.org/wiki/London
- British Museum : https://en.wikipedia.org/wiki/British_Museum
```

Module2: Recognize and synthesize speech

修改範例程式 speaking-clock.ps1 的程式碼，分析語音內容，並回覆已經準備好的回答。修改 key 與 Region 的變數，使 API 能套用變數使用 Azure Cognitive Service 服務。



```
1 $key="34011214e5f4a370e0bda1f0c271a2"
2 $region="westus2"
3
4 # Code to call Speech to Text API
5 $url = "https://speech.azure.com/"
6
7 Headers = @{}
8 Headers.Add("Ocp-Apim-Subscription-Key", $key)
9 Headers.Add("Content-Type", "audio/wav")
10
11 write-host "Speaking audio..."
12 $result = Invoke-RestMethod -Method Post `
13     -Uri "$url/text/analytics/v3.1/entities/linking" `
14     -Headers $headers `
15     -Body $data | ConvertTo-Json -Depth 6
16
17 $result | ConvertFrom-Json
18
19 $result | ForEach-Object {
20     $entity = $_
21     $url = "https://en.wikipedia.org/wiki/$($entity.name)"
22     $result += "The $($entity.name) is located at $($entity.location).`n"
23 }
24
25 $result | Out-Null
26
27 $result | Out-Null
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29 $result | Out-Null
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31 $result | Out-Null
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95 $result | Out-Null
96
97 $result | Out-Null
98
99 $result | Out-Null
100
```

使用範例程式的音檔 time.wav，內容為”What time is it?”，並使用 RestfulAPI 進行語音分析，並回傳文字內容。

```
5 # Code to call Speech to Text API
6 $wav = "./data/speech/time.wav"
7
8 $headers = @{}
9 $headers.Add( "Ocp-Apim-Subscription-Key", $key )
10 $headers.Add( "Content-Type", "audio/wav" )
11
12
13 write-host "Analyzing audio..."
14 $result = Invoke-RestMethod -Method Post `
15     -Uri "https://$region.stt.speech.microsoft.com/speech/recognition/conversation/cognitiveservices/v1?language=en-US" `
16     -Headers $headers `
17     -InFile $wav
```

接續程式判斷內容是否為”What time is it?”，並使用 SSML(Speech Synthesis Markup Language，語音合成標記語言)透過 API 合成出”It’s Coding time!”的語音。

```
22 if ($analysis.DisplayText -eq "What time is it?"){
23     # Code to call Text to Speech API
24     $sml = "<speak version='1.0' xml:lang='en-US'>
25     <voice xml:lang='en-US' xml:gender='Female' name='en-US-AriaNeural'>
26         It's coding time!
27     </voice>
28     </speak>"
29
30     $headers = @{}
31     $headers.Add( "Ocp-Apim-Subscription-Key", $key )
32     $headers.Add( "Content-Type", "application/ssml+xml" )
33     $headers.Add( "X-Microsoft-OutputFormat", "audio-16khz-128kbitrate-mono-mp3" )
34
35     $outputFile = "output.wav"
36
37     write-host "Synthesizing speech..."
38     $result = Invoke-RestMethod -Method Post `
39         -Uri "https://$region.tts.speech.microsoft.com/cognitiveservices/v1" `
40         -Headers $headers `
41         -Body $sml `
42         -OutFile $outputFile
43
44     write-host $result
45     write-host "Response saved in $outputFile `n"
46 }
47 }
```

程式表示輸入的 time.wav 內容為’What time is it?’，而輸出語音為一個 'output.wav'，內容是"It's coding time!"。

```
PS /home/phil890110/ai-900> ./speaking-clock.ps1
Analyzing audio...

You said 'What time is it?'
Synthesizing speech...

Response saved in output.wav

PS /home/phil890110/ai-900> ls
analyze-image.ps1  classify-image.ps1  detect-anomalies.ps1  form-recognizer.ps1  LICENSE  output.wav  translator.ps1
analyze-text.ps1  _config.yml        detect-objects.ps1   index.md             mapping.md  readme.md   understand.ps1
_build.yml        data               find-faces.ps1      instructions         ocr.ps1   speaking-clock.ps1  upload-content-for-search.sh
```


Module3: Translate text and speech

修改範例程式 translator.ps1 的程式碼，分析文本語言，並使其文本轉換成其他語言的語音。修改 key 與 Region 的變數，使 API 能套用變數使用 Azure Cognitive Service 服務。

```
PowerShell |> translator.ps1

1  add your key here
2  $key="bb0119fbc8934ccb9ebecbda79c277aa"
3
4  #you need to add your resource location if you use a Cognitive Services resource
5  $location="brazilsouth"
6
7  #the endpoint is global for the Translator service, DO NOT change it
8  $endpoint="https://api.cognitive.microsofttranslator.com/"
9
10 #text to be translated
11 $text="hello"
12
13 # Code to call Text Analytics service to analyze sentiment in text
14 $headers = @{}
15 $headers.Add("Ocp-Apim-Subscription-Key", $key )
16 $headers.Add("Ocp-Apim-Subscription-Region", $location )
17 $headers.Add("Content-Type","application/json" )
18
19 $body = "[{"text": '$text'}]"
20
21 write-host "Translating text..."
22 $result = Invoke-WebRequest -Method Post -
23     -Uri "$endpoint/translate?api-version=3.0&from=es&to=fr&to-it&to-zh-Hans" -
24     -Headers $headers -
25     -Body $body
26
27 $analysis = $result.content | ConvertFrom-Json
28 $french = $analysis.translations[0]
```

```
PS /home/phil890310/ai-900> code ./translator.ps1
PS /home/phil890310/ai-900> |
```

首先，透過 API 分析一個內容為”Hello”的文本，並在 23 行指定文本翻譯的語言（French、Italian、Chinese），並印出結果。

```
10 #text to be translated
11 $text="hello"
12
13 # Code to call Text Analytics service to analyze sentiment in text
14 $headers = @{}
15 $headers.Add("Ocp-Apim-Subscription-Key", $key )
16 $headers.Add("Ocp-Apim-Subscription-Region", $location )
17 $headers.Add("Content-Type","application/json" )
18
19 $body = "[{"text": '$text'}]"
20
21 write-host "Translating text..."
22 $result = Invoke-WebRequest -Method Post -
23     -Uri "$endpoint/translate?api-version=3.0&from=en&to=fr&to-it&to-zh-Hans" -
24     -Headers $headers -
25     -Body $body
26
27 $analysis = $result.content | ConvertFrom-Json
28 $french = $analysis.translations[0]
29 $italian = $analysis.translations[1]
30 $chinese = $analysis.translations[2]
31 Write-Host ("Original Text: $text; French Translation: $($french.text); Italian Translation: $($italian.text); Chinese Translation: $($chinese.text) ")
```

```
PS /home/phil890310/ai-900> ./translator.ps1
Translating text...
Original Text: Hello
French Translation: Bonjour
Italian Translation: Ciao
Chinese Translation: 你好
```

接著透過 API 分析一個內容為”Hello”的語音，並回傳語音文字內容，並將其內容透過 39 行轉換為法語的文本。

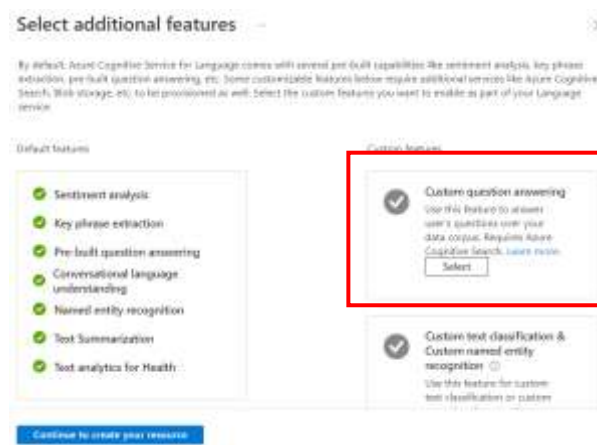
```
33 # Code to translate audio to text in another language
34 $wav = "./data/translation/english.wav"
35
36 $headers = @{}
37 $headers.Add( "Ocp-Apim-Subscription-Key", $key )
38 $headers.Add( "Content-Type","audio/wav" )
39
40 write-host "Translating audio..."
41 $audio_result = Invoke-RestMethod -Method Post `
42     -Uri "https://$location.stt.speech.microsoft.com/speech/recognition/conversation/cognitiveservices/v1?language=en-US" `
43     -Headers $headers `
44     -InFile $wav
45
46 $original_audio_text = $audio_result.DisplayText
47 write-Host ("The audio said '$($original_audio_text)'")
48
49 # Code to call translate audio text to different language
50 $headers = @{}
51 $headers.Add( "Ocp-Apim-Subscription-Key", $key )
52 $headers.Add( "Ocp-Apim-Subscription-Region", $location )
53 $headers.Add( "Content-Type","application/json" )
54
55 $body = "[{'text': '$original_audio_text'}]"
56
57 write-host "Translating text from audio to French..."
58 $result = Invoke-WebRequest -Method Post `
59     -Uri "$endpoint/translate?api-version=3.0&from=en&to=fr" `
60     -Headers $headers `
61     -Body $body
```

```
Translating audio...
The audio said 'Hello.'
Translating text from audio to French...
Translated text: 'Bonjour.'
```

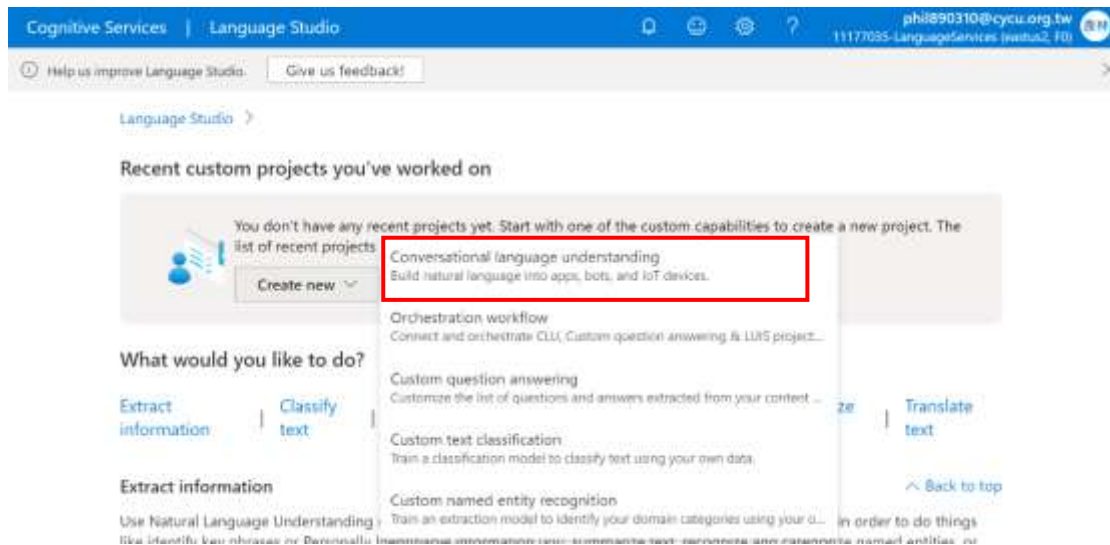
Module4: Create a language model with Conversational Language Understanding

此章節重點示範 Language Service 的 Conversational Language Understanding 如何理解人類的話語並進行分析。

創立一個 Language Service（並選擇 Feature，為了下一個 Module 的 Bot Service）。



新增一個 Project。



新增 intents, utterances, and entities。

Utterances（話語）：即正常人類可能會說出的一段話。

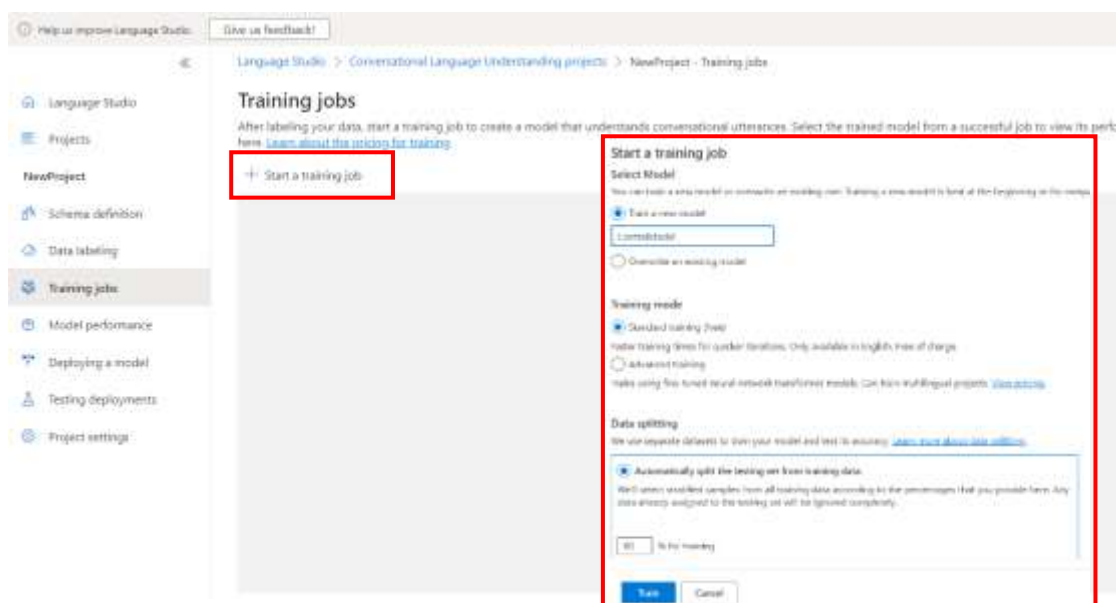
Intents（意圖）：一段話中表達的目的或是目標。

Entities（實體）：一段話中指定的一個物品。

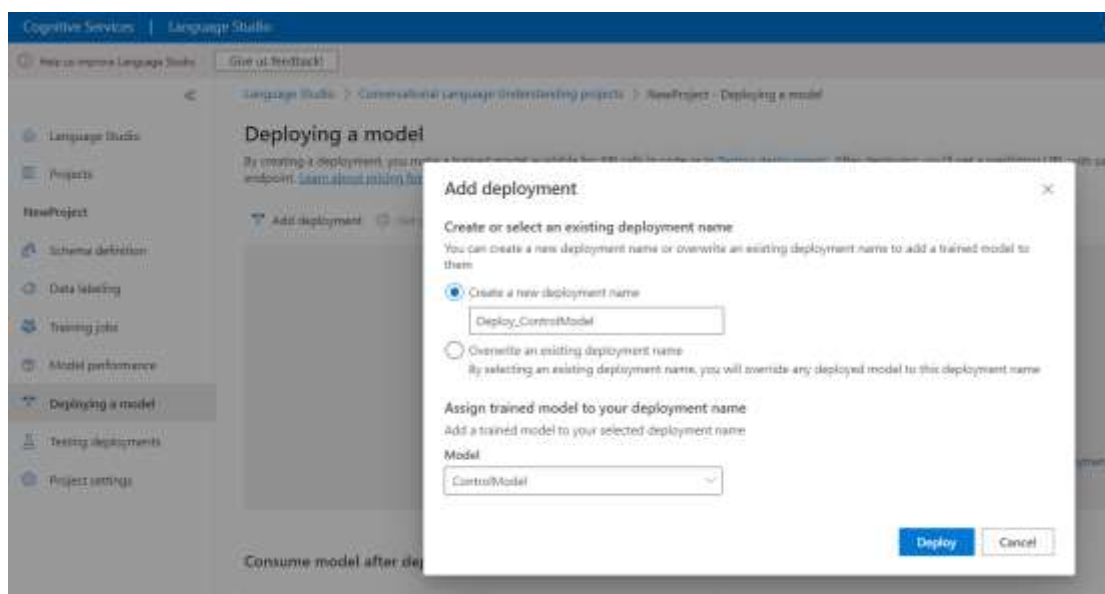
Intents	Utterances	Entities
switch_on	turn the light on	light
switch_on	turn the fan on	fan
switch_on	switch on the fan	fan
switch_on	put the light on	light
switch_on	put the fan on	fan
switch_off	switch the fan off	fan
switch_off	turn off the light	light
switch_off	put the light off	light
switch_off	put the fan off	fan
switch_off	switch off the fan	fan



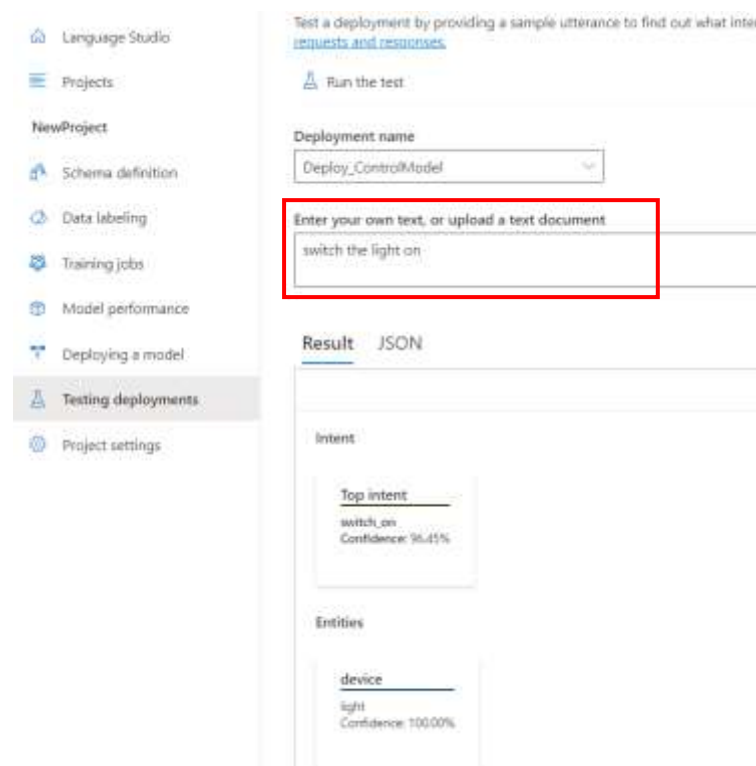
接著訓練模型，設定 Training/Test Data 比例為 8:2。



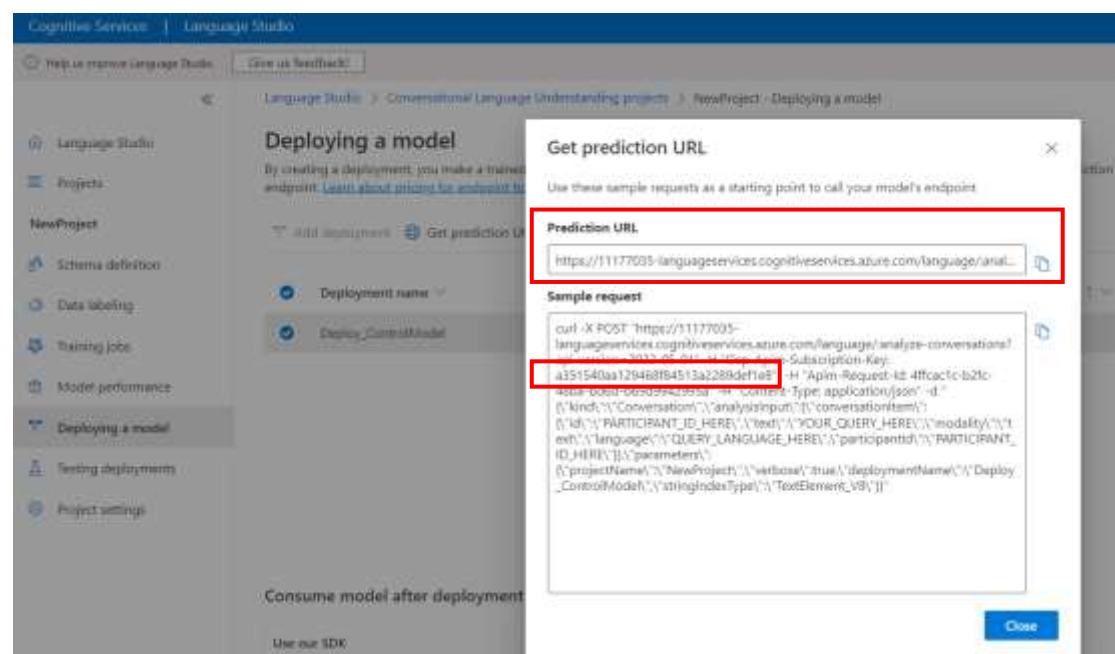
訓練完畢，接著部署模型。



測試模型，使用”switch the light on”的句子進行測試。結果顯示該句子的 Entities、Intent



取得 Prediction URL 以及 Key。



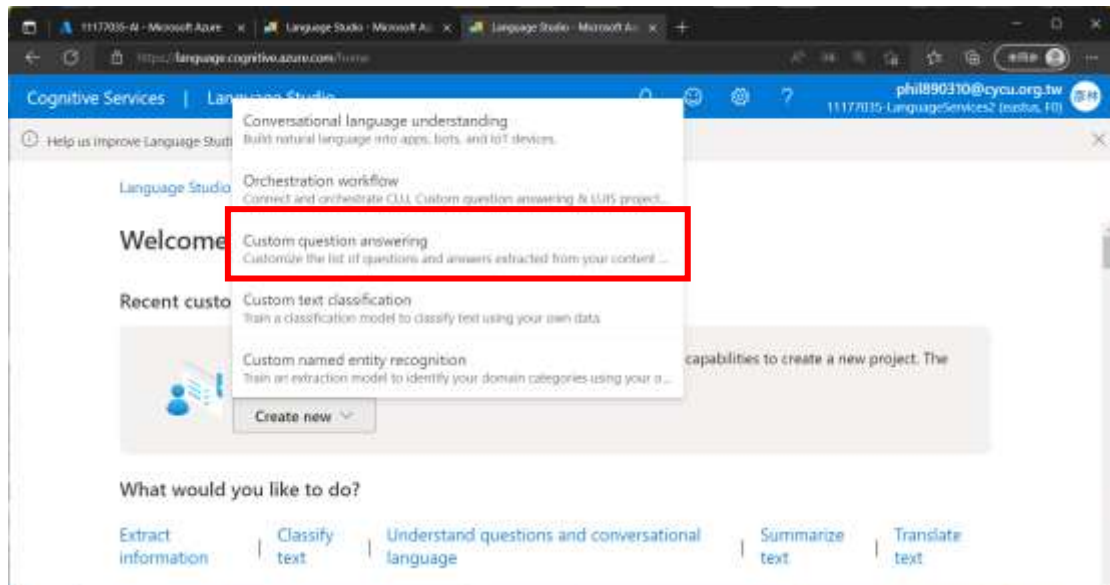
回到 AI-900 的 Github Sample Code，在 understand.ps1 的程式碼中替換前四行 Endpoint 資訊。

```
PowerShell
understand.ps1
1 $endpointurl="https://111770b5-1anguagewservices.cognitiveservices.azure.com/language/analy/s-conversations7api-version=2022-05-01"
2 $key = "a51540a129468f84313a2280def1e8"
3 $projectName = "HomeProject"
4 $deploymentName = "Deploy_ControlModel"
5
6
7 if ($args.count -gt 0){
8     # Get The user input
9     $utterance = $args[0].ToString()
10
11     # Code to call language service for intent prediction
12
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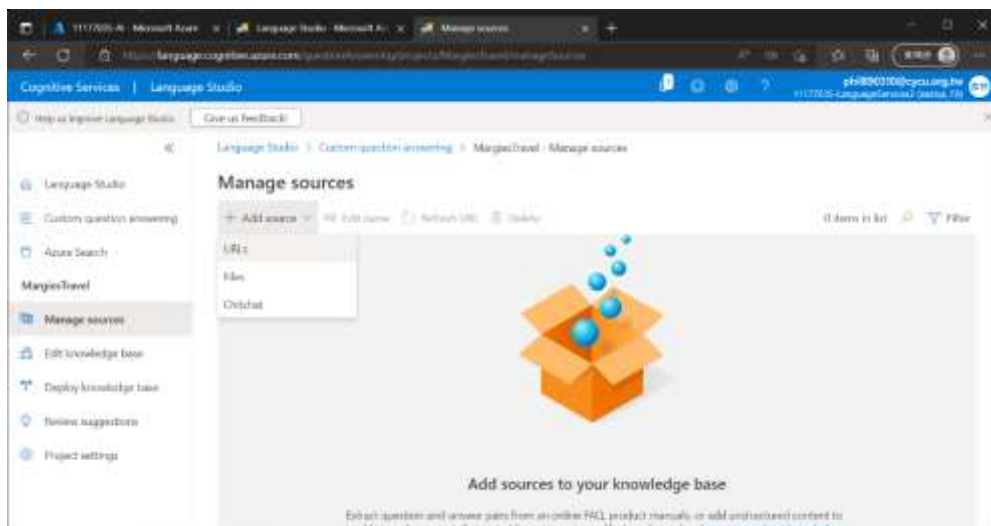
Module5: Build a bot with the Language Service and Azure

Bot Service

此章節重點示範 Language Service 的 Custom question answering 如何創建一個 Bot Service，並擁有回答問題的功能。



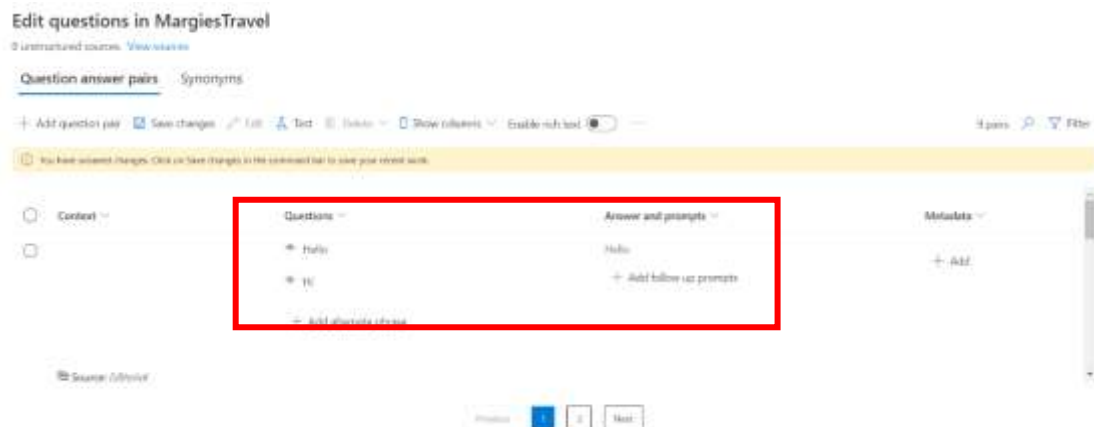
透過 Github 範例檔案，新增一個 Knowledge Base。



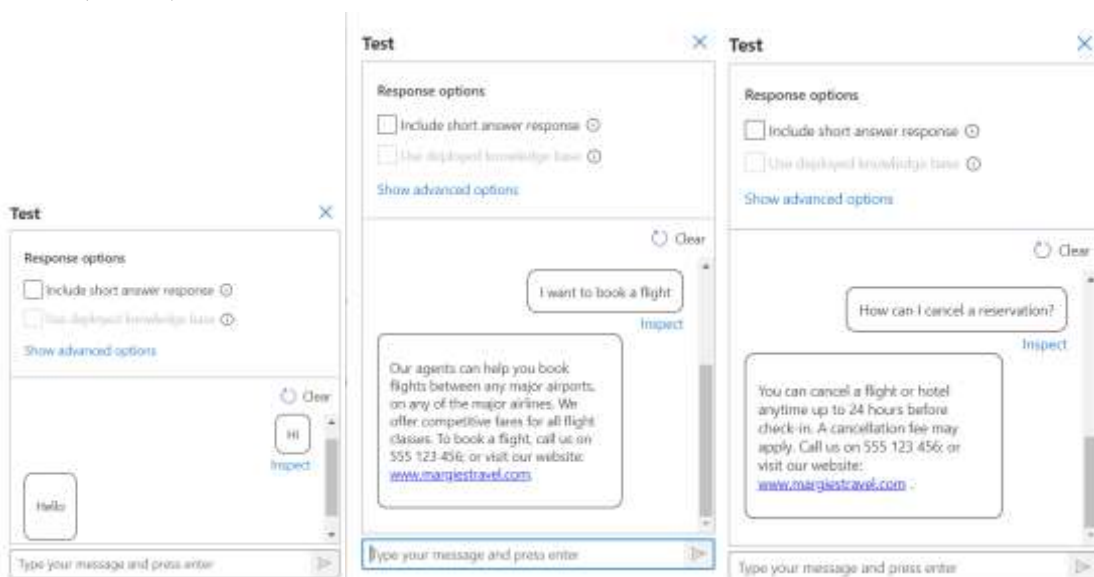
Knowledge Base 內容如下：

- Why Margie's Travel?^{4,1}
Margie's Travel is a full-service travel agent, with years of experience in the worldwide tourism industry.^{4,1}
- What services do you provide?^{4,1}
Margie's Travel can help arrange flights, accommodation, airport transfers, excursions, visas, travel insurance, and currency exchange.^{4,1}
- What destinations do you offer?^{4,1}
We can arrange travel anywhere in the world, but we specialize in trips to Dubai, Las Vegas, London, New York, and San Francisco.^{4,1}
- How can I book a flight?^{4,1}
Our agents can help you book flights between any major airports, on any of the major airlines. We offer competitive fares for all flight classes. To book a flight, call us on 555 123 456; or visit our website: www.margiestravel.com.^{4,1}
- How can I reserve a hotel?^{4,1}
We partner with the best independent hotels all across the world and can arrange accommodation that suits your needs and budget. From small boutique five-star luxury resorts, we've got the right hotel for you. To reserve a hotel, call us on 555 123 456; or visit our website: www.margiestravel.com.^{4,1}
- How do I cancel a flight or hotel?^{4,1}
You can cancel a flight or hotel anytime up to 24 hours before check-in. A cancellation fee may apply. Call us on 555 123 456; or visit our website: www.margiestravel.com.^{4,1}

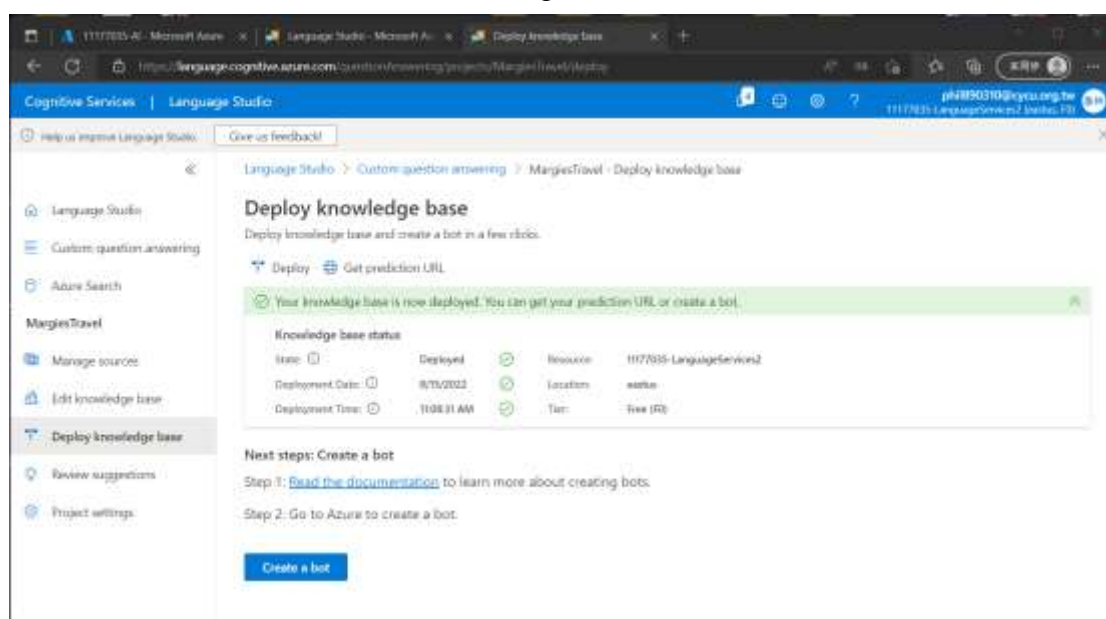
嘗試新增其中一個 Knowledge Base，設定 Q/A 內容。



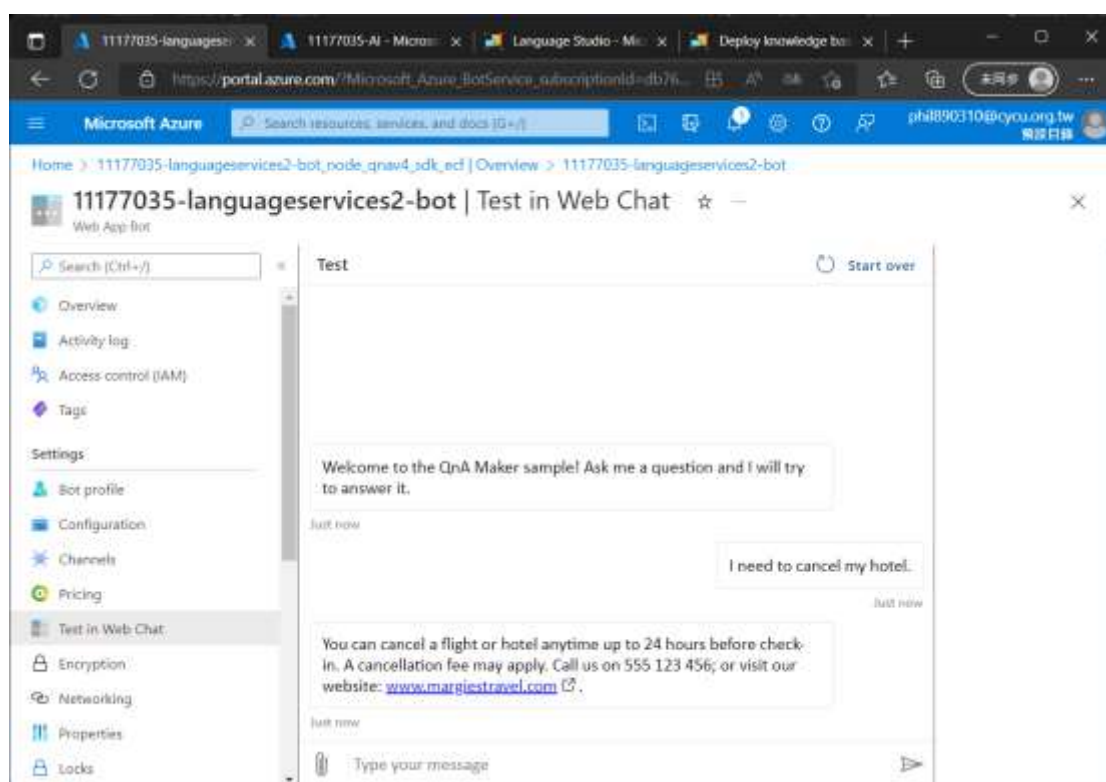
測試結果。



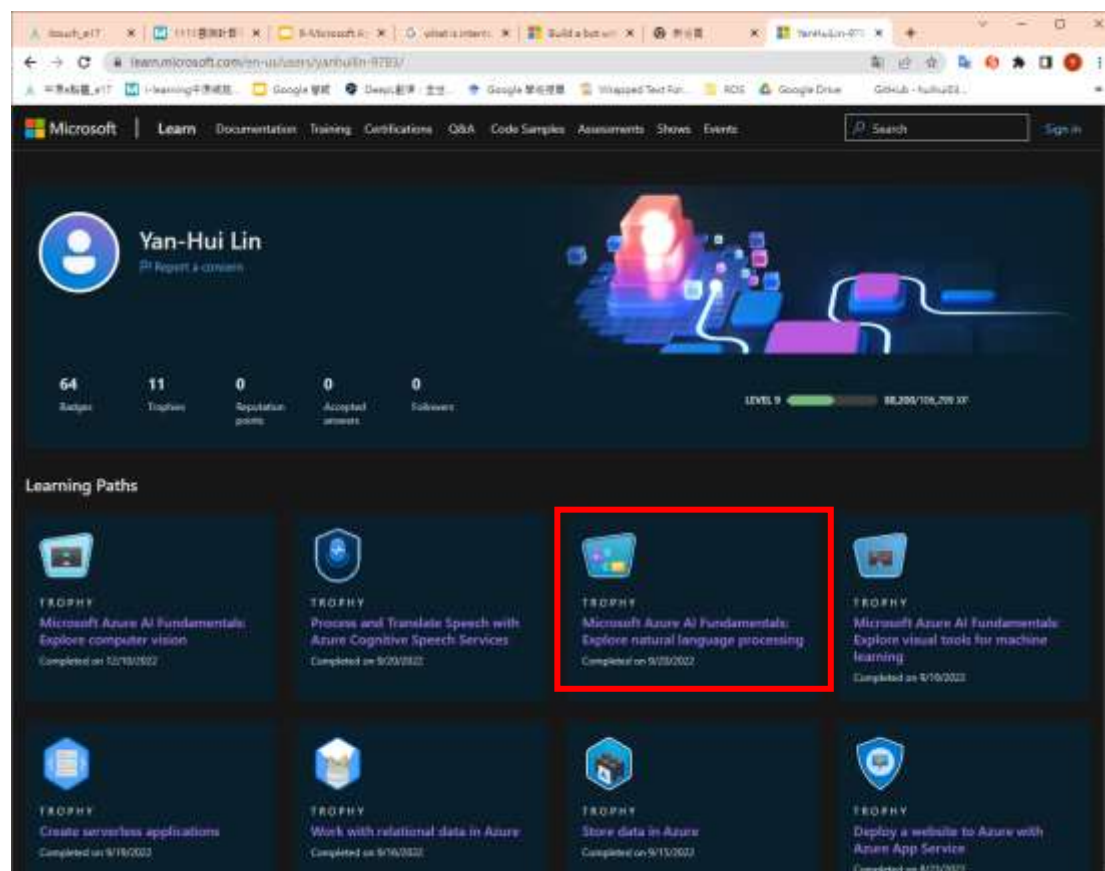
創立 Bot Resource，部署 Knowledge Base 至 Bot 中。



測試結果。



Take screenshots of Badges and Trophies



Learned from the Learning Path

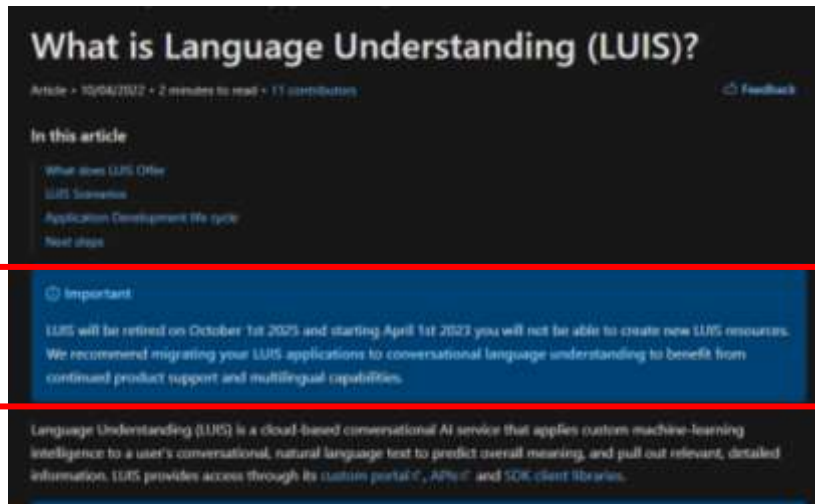
在前三個章節中重點了解到 Cognitive Service 的 Language 部分，Language Service 除了能 call library 進行使用，還能透過 Restful API 的方式進行使用。在最後兩個章節是最重要的重點，最重要了解到 Bot Service 的基本概念：Utterances、Intents、Entities，這些是機器解析 Language 的關鍵物件，Azure 也在最後一個章節展示 Bot Service。恰巧可以當成是期中講員演講的延伸閱讀。

Problems

Lab 無太大的問題，唯獨 Microsoft Learn 中的 Module5，Bot Service 創建 Custom Feature 資源處標示不明顯，容易誤判是 Bug。

FeedBack

今年的 Lab 少了 LUIS 的資源，後來發現 LUIS 即將在 2025 年 10 月 1 日 Retire [1]，LUIS 的功能漸漸融入 Cognitive Service 以及 Language Service，整體上相比起去年的內容沒有太大的更動。另外，在 Module 設計上，可以建議官方將 Module 5 與 Module4 對調，如此一來遊玩流程可以更加順暢。



Reference

[1] <https://learn.microsoft.com/en-us/azure/cognitive-services/luis/what-is-luis>