



SIG788

Engineering AI solutions

Credit & Distinction Task 6

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S223919051

SIG788 – Engineering AI Solutions

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Target = Distinction

Drug Tariff Advisor Bot

Introduction

The **healthcare** sector **domain** continuously seeks enhancements in the delivery of information and services to both providers and patients. Access to accurate and timely information about drug tariffs and healthcare products is crucial for efficient healthcare management. The Drug Tariff Advisor Bot aims to streamline the information by leveraging advanced natural language processing technologies to provide instant, reliable answers to inquiries about drug tariffs and healthcare products.

Objective:

The primary objective of the Drug Tariff Advisor Bot is to provide healthcare professionals and patients with immediate access to critical information for drug tariffs and healthcare product pricing in England.

Key uses include:

- Quickly answering common questions regarding drug prices and availability, which can enhance decision-making and planning for healthcare providers.
- Assisting pharmacy staff and healthcare providers in managing inventory and cost predictions based on the latest tariff information.
- Reducing the time spent by healthcare professionals in searching for product-specific information, thus improving operational efficiency.

Approach:

The project involves several steps:

- **Data Collection:** Utilize NHS England's Drug Tariff information from the provided link.
Link:
<https://faq.nhsbsa.nhs.uk/knowledgebase/category/?articlecategory=Drug%20Tariff&id=CAT-01087&parentid=>
- **Bot Development:** Use **Azure Cognitive Services Language Studio** to build a Custom Question Answering Bot.
- **Integration:** Deploy the bot on Azure and integrate it with a channel such as Facebook, Team for easy access by users.
- **Testing & Feedback:** Conduct testing with bot's responses & compare against the website.

Azure Cognitive Language Studio:

Azure Cognitive Services Language Studio:

A platform offering machine learning and AI algorithms for natural language processing.

Custom Language Models: Tools provided by the platform to create tailored language models without needing deep data science expertise.

Custom Question Answering Feature: A feature that enables the development of sophisticated bots that can understand and respond to user queries conversationally.

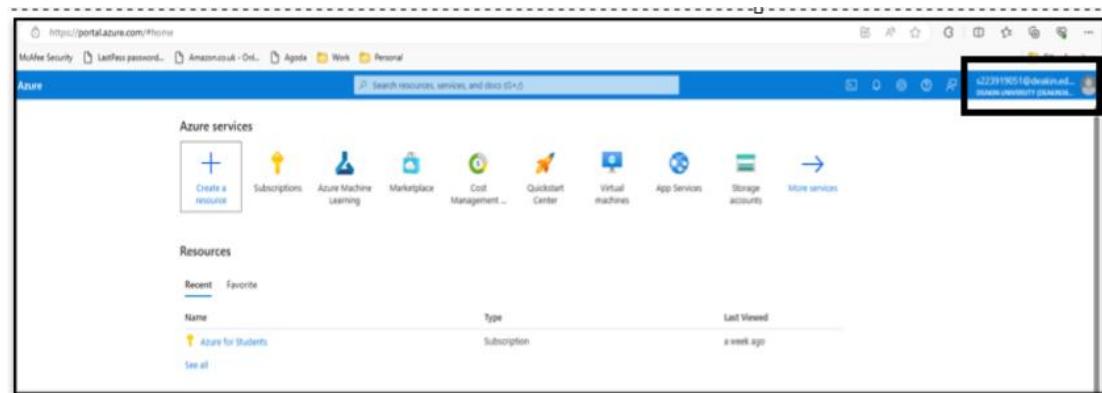
Drug Tariff Advisor Bot: A bot that will leverage this service to accurately interpret and answer complex questions related to **NHS England's** Drug Tariff and healthcare product prices.

Creating Azure Cognitive Language Studio:

- **Sign in to Azure Portal:** Azure Portal and sign in with Microsoft account Deakin credentials.

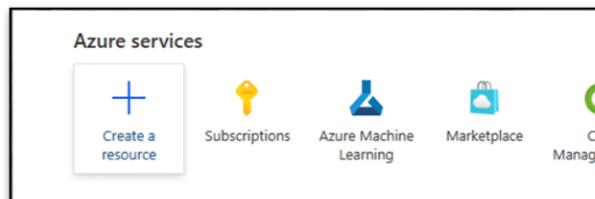
Link: <https://portal.azure.com/>

Landing Page:

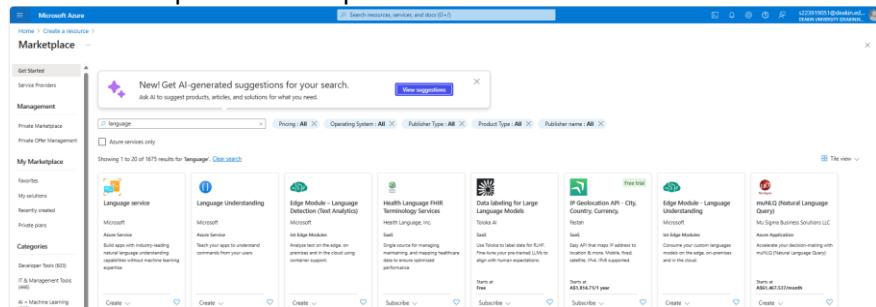


- **Create a New Workspace:**

- Click on **Create a resource** at the top-left corner.



- Search for **Language Service** & select **Create** from Azure Machine Learning to initiate the workspace creation process.



➤ Select **Custom question answering** and **Custom text classification, Custom named entity recognition, Custom summarization, Custom sentiment analysis & Custom Text Analytics for health** and then click **continue to create resource** as we our bot domain is **healthcare**

Home > Create a resource > Marketplace > Language service > Select additional features ...

By default, Azure AI service for Language comes with several pre-built capabilities like sentiment analysis, key phrase extraction, pre-built question answering, etc. Some customizable features below require additional Language service.

Default features

- ✓ Sentiment analysis
- ✓ Key phrase extraction
- ✓ Pre-built question answering
- ✓ Conversational language understanding
- ✓ Named entity recognition
- ✓ Text Summarization
- ✓ Text analytics for Health

Custom features

- ✓ **Custom question answering**
Use this feature to answer user's questions over your data corpus. Requires Azure AI Search. [Learn more](#).
[Unselect]
- ✓ **Custom text classification, Custom named entity recognition, Custom summarization, Custom sentiment analysis & Custom Text Analytics for health** ⓘ
Use these customization features to tailor our products for your specific requirements. Requires Azure Storage. [Learn more](#).
[Unselect]

➤ Configure the Project workspace:

Subscription

Azure Student: Limited access to Azure resources without charge.

Resource Group

RG-S223919051-Task6: A collection of resources managed as a single unit.

Instance Details

Region: Central India

Name: ID-S223919051-Task

Pricing Tier: Free F0

Custom Question Answering

Azure Search Region: Central India

Azure Search Pricing Tier: Free F0

Storage Account Details

Storage Account: New

Storage Account Name: sts223919051task

Storage Account Type: Standard LRS

Responsible AI Notice

Acknowledged and agreed to Microsoft's Responsible AI Notice.

Microsoft Azure

Home > Create a resource > Marketplace > Select additional features > Create Language ...

Search resources, services, and

Create Language ...

Basics Network Identity Tags Review + create

Unlock insights from unstructured text using advanced natural language processing. Use sentiment analysis to find out what customers think of your brand. Find topic-relevant phrases using key phrase extraction and identify the language of the text with language detection. Detect and categorize entities in your text with named entity recognition.

[Learn more](#)

Project Details

Subscription * Resource group * [Create new](#)

Instance Details

Region Name * Pricing tier *

[View full pricing details](#)

Custom question answering

Custom question answering lets you answer user's questions over your data corpus. You can extract questions and answers from your data, customize them and create a knowledge base. The knowledge base is stored in an Azure AI Search index in your own subscription.

[Learn more](#)

Azure search region Azure search pricing tier *

[View full Azure search pricing details](#)

Custom text classification, Custom named entity recognition, Custom summarization, Custom sentiment analysis & Custom Text Analytics for health

You need to create your own storage when using these customization features to host and upload all your training and labeled data and have it saved in your own Azure subscription. You get to associate only one storage account with one language resource that cannot be changed moving forward.

[Learn more](#)

New/Existing storage account * New storage account Existing storage account

Storage account name * Storage account type *

[Learn more about storage account types](#)

Responsible AI Notice

Microsoft provides technical documentation regarding the appropriate operation applicable to this Azure AI service that is made available by Microsoft. Customer acknowledges and agrees that they have reviewed this documentation and will use this service in accordance with it.

[Responsible Use of AI documentation for Text Analytics for Health](#)

[Responsible Use of AI documentation for PII](#)

[Responsible Use of AI documentation for Language](#)

By checking this box I certify that I have reviewed and acknowledge the terms in the Responsible AI Notice. *

[Previous](#) [Next](#) [Review + create](#)

Summary

Using an Azure Student subscription.

Resources are under the "RG-S223919051-Task6" resource group.

Language resource ("ID-S223919051-Task") is in Central India on a free tier.

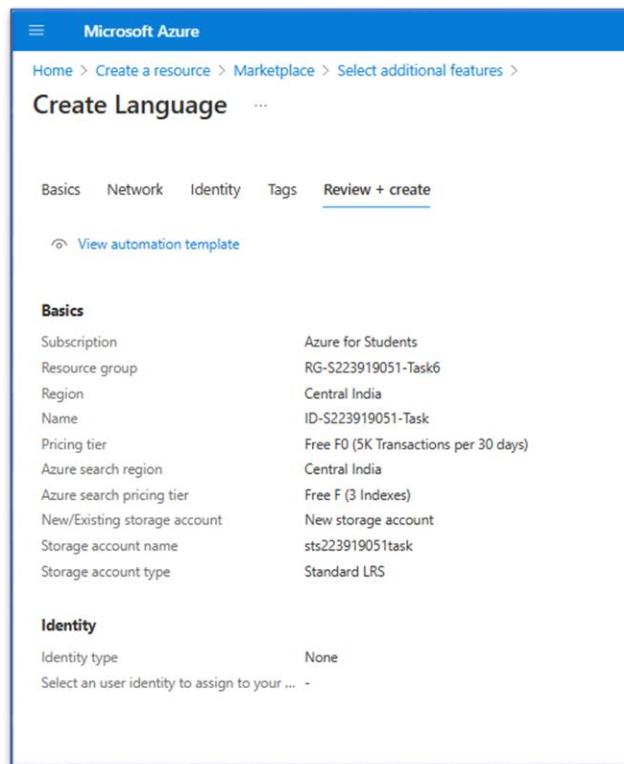
Azure Search is also in Central India on a free tier.

Using an existing standard LRS storage account named "sts223919051task".

Certified review and agreement with the Responsible AI Notice by Microsoft.

➤ **Review and Create:** After configuring the details click on **Review + create** button. Once Azure validates configuration. Click on **Create** button to deploy workspace.

Review:



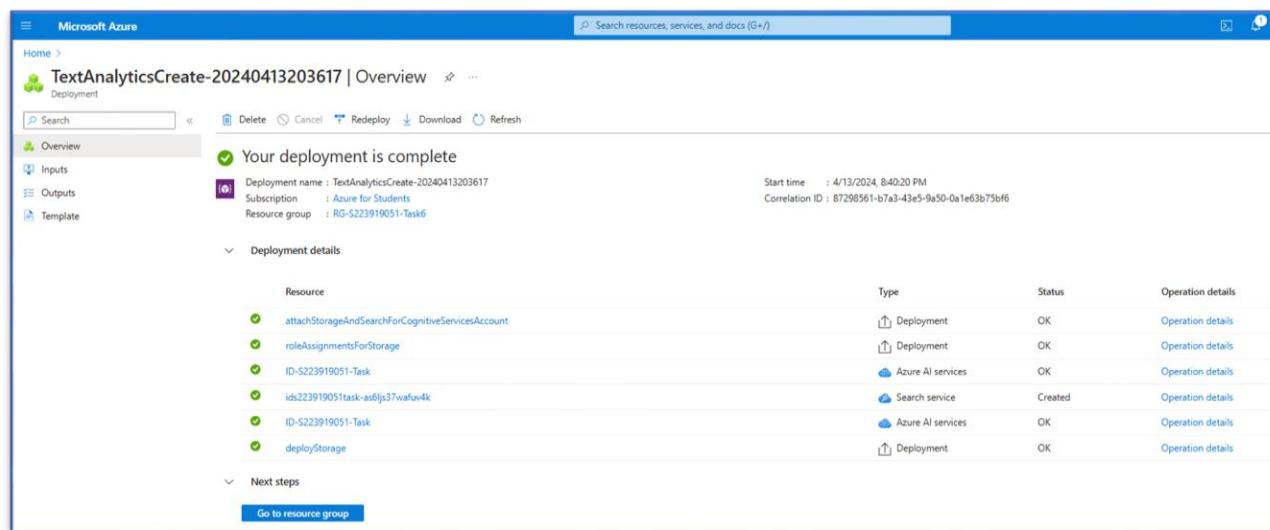
The screenshot shows the 'Create Language' wizard in the Microsoft Azure portal. The 'Review + create' tab is selected. The configuration details are as follows:

- Subscription:** Azure for Students
- Resource group:** RG-S223919051-Task6
- Region:** Central India
- Name:** ID-S223919051-Task
- Pricing tier:** Free F0 (5K Transactions per 30 days)
- Azure search region:** Central India
- Azure search pricing tier:** Free F (3 Indexes)
- New/Existing storage account:** New storage account
- Storage account name:** sts223919051task
- Storage account type:** Standard LRS

Identity

- Identity type:** None
- Select an user identity to assign to your ...** (dropdown menu)

Bot workspace deployed:



The screenshot shows the 'TextAnalyticsCreate-20240413203617 | Overview' page in the Microsoft Azure portal. The deployment is marked as complete. Deployment details are as follows:

- Deployment name:** TextAnalyticsCreate-20240413203617
- Subscription:** Azure for Students
- Resource group:** RG-S223919051-Task6

Deployment details:

Resource	Type	Status	Operation details
attachStorageAndSearchForCognitiveServicesAccount	Deployment	OK	Operation details
roleAssignmentsForStorage	Deployment	OK	Operation details
ID-S223919051-Task	Azure AI services	OK	Operation details
ids223919051task-as6ljs37wafuv4k	Search service	Created	Operation details
ID-S223919051-Task	Azure AI services	OK	Operation details
deployStorage	Deployment	OK	Operation details

Let's move forward with the Python SDK to develop the **Drug Tariff Advisor Bot**.

Pre-requisites:

Install pre-requisites for **Azure Cognitive Language Studio** in Anaconda prompt.

- pip install azure-ai-language-questionanswering
- pip install python-dotenv
- pip install azure-storage-blob

❖ **azure-ai-language-questionanswering:** This Python package is used to install the Azure AI Language Question Answering library in Python. This library provides tools to interact with the Azure Cognitive Services Language Studio's Question Answering service. It allows developers to build, test, and refine bots that can understand and respond to user queries in a conversational manner

❖ **python-dotenv:** This package reads key-value pairs from a .env file and sets them as environment variables, enhancing the security and flexibility of application's configuration management.

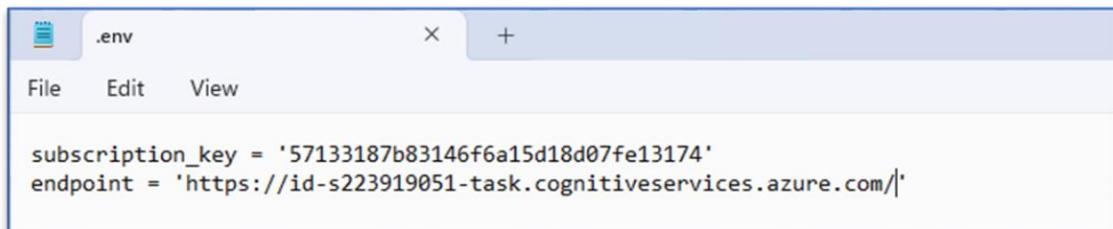
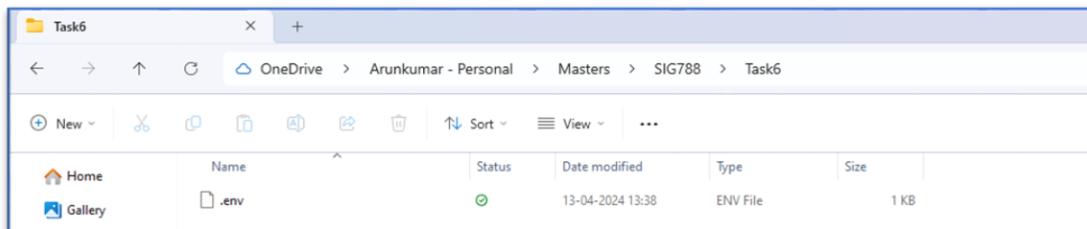
❖ **azure-storage-blob:** This package is used for Azure's Blob Storage Service to store the files.

Configure .env file:

For Azure Computer Vision services, follow these steps to enhance security:

- ❖ After deployment, copy **Key1 (subscription_Key)** and the **endpoint**.
- ❖ Paste these into a **.env** file in working directory.
- ❖ These will be assigned as environment variables and can be read directly in Python code.

This method ensures **subscription_key** and **endpoint** are not displayed to users, enhancing the security of application. Please refer to the snapshot of the **.env** file.



FAQ & Dataset selection for Bot:

I've curated the **PART VIIA** dataset from the **Drug Tariff** and merged it with the **FAQs** to create a custom **Q&A** for the **Drug Tariff Advisor bot**. This bot will provide timely and accurate information about drug tariffs and healthcare products, which is vital for efficient healthcare management.

The **Drug Tariff** in NHS England is a comprehensive guide that details the reimbursement prices for medications and appliances dispensed under NHS prescriptions. It plays a key role in the financial and operational management of NHS prescription services.

PART VIIA of the Drug Tariff is a specific section that lists generic and certain branded medicines that are not available as generics. These items are reimbursed based on fixed prices determined by the **NHS Business Services Authority**. This section is crucial for pharmacies as it ensures consistent reimbursement for these products.

The **Drug Tariff** is a monthly publication produced by NHS Prescription Services. It's available in both **electronic** and **PDF formats** and can be accessed online a few days before the start of each month. This allows for the inclusion of any necessary updates or changes in drug pricing. It is regularly communicated to contractors through the **NHS's digital platforms**.

Dataset:

A screenshot of the NHS Business Services Authority website. The top navigation bar includes 'NHS Business Services Authority' and a search bar. The main content area is titled 'Drug Tariff Part VIIA' and contains a sidebar with links for 'Pharmacies, GP practices and appliance contractors', 'SICBMs, ICBs and other providers', 'Manufacturers and suppliers', and 'Contact NHS Prescription Services'. The main content area includes a table of contents for 'Category A', 'Category M prices', and 'Part VIIA'. A note at the bottom states: 'The Department of Health and Social Care has announced the Part VIIA prices which will apply to prescriptions from 1 April 2024.' A footer at the bottom left indicates the document is 'April 2024 (Excel 2016|XLS)'. A sidebar on the right lists 'Drug Tariff', 'Drug Tariff updates', 'Drug Tariff Part VIIA', and 'Drug Tariff Part IX'.

FAQs

The **FAQs**, which are in hyperlink format, have been selected. Their questions and answers have been integrated with the dataset questions mentioned below.

The screenshot shows a blue header with the NHS Business Services Authority logo. Below the header, a navigation bar includes 'Knowledge Base' and 'Sign in'. A 'BETA' message states: 'This is a new service – your [feedback](#) will help us to improve it.' The main content area is titled 'Drug Tariff'. It contains a list of four questions, each with a blue link:

- [What is the Drug Tariff?](#)
- [What are the categories of drugs in the Drug Tariff?](#)
- [What is Part XVIIIA of the Drug Tariff?](#)
- [What is the price change mechanism?](#)

Data Preparations:

For the creation of the **Drug Tariff Advisor bot** services using **Azure Language Service**, I've performed the following steps:

- Loaded the **Part VIIIA dataset** directly from the NHS digital site using Python. This dataset includes alternative question options, allowing Azure AI Language to detect them as such when the answers are the same. Here's the Python code used:

```
# Read NHS Dataset (Part VIIIA)
df = pd.read_csv('https://www.nhsbsa.nhs.uk/sites/default/files/2024-03/Part%20VIIIA%20Apr%202024.xls.csv',skiprows=2)
df.head()
```

- Applied **data preprocessing** to format the dataset into a QnA structure suitable for loading into Azure Cognitive Language Studio.
- Copied each question from the **NHS FAQs section** into a notepad and prepared the corresponding questions and answers. These were then appended to the above dataset. The specific codes for this process will be detailed in the code section.

- Included **greetings** (like 'hi', 'hello', 'greetings') and **end notes** ('bye', 'good bye', etc.) in the dataset to facilitate a more conversational interaction with the bot.

Python SDK:

File Processing:

Import the necessary libraries in Python SDK:

```
# To read the secret keys for Authentication
import os
from dotenv import load_dotenv
from azure.core.credentials import AzureKeyCredential

# To create new project
from azure.ai.language.questionanswering.authoring import AuthoringClient

# to create a question-answering client, and to ask questions using the knowledge base
from azure.ai.language.questionanswering import QuestionAnsweringClient
from azure.ai.language.questionanswering import models as qna

# dataframe
import pandas as pd

# Blob Storage
from azure.storage.blob import BlobServiceClient, BlobClient, ContainerClient
```

Setting up Working directory

```
# Setting Working Directory
os.chdir(r'C:\Users\arunk\OneDrive\Masters\SIG788\Task6')
print(os.getcwd())
```

Read NHS PART VIIIA drug tariff file

```
# Read NHS Dataset (Part VIIIA)
df = pd.read_csv('https://www.nhsbsa.nhs.uk/sites/default/files/2024-03/Part%20VIIIA%20Apr%202024.xls.csv',skiprows=2)
df.head()
```

	Medicine	Pack size	Unnamed: 2	VMP Snomed Code	VMPP Snomed Code	Drug Tariff Category	Basic Price
0	Abacavir 600mg / Lamivudine 300mg tablets	30.0	tablet	39724011000001106	8991611000001104	Part VIIIA Category C	19000
1	Abatacept 125mg/1ml solution for injection pre...	4.0	pre-filled disposable injection	29767011000001106	29747011000001102	Part VIIIA Category C	120960
2	Abatacept 125mg/1ml solution for injection pre...	4.0	pre-filled disposable injection	21704711000001107	21699511000001107	Part VIIIA Category C	120960
3	Acamprosate 333mg gastro-resistant tablets	168.0	tablet	42267511000001104	994511000001109	Part VIIIA Category M	2319
4	Acarbose 100mg tablets	90.0	tablet	42080211000001108	1315211000001104	Part VIIIA Category A	4893

Pre-process the loaded file and restrict the data to only 1000 rows along with preparing QnA pair for **BOT** services

```
# drop any NA from dataframe
df.dropna(inplace=True)
```

```

# 'Basic Price' is a float & it need to divide by 100 for price
df['Basic Price'] = df['Basic Price'].astype(float) / 100

# Group by 'Medicine'
grouped = df.groupby('Medicine').agg({
    'Pack size': 'unique',
    'Drug Tariff Category': 'first',
    'Basic Price': lambda prices: ['{:2f}'.format(price) for price in prices]
}).reset_index()

# Creating a descriptive answer
grouped['Answer'] = grouped.apply(lambda row: f"We have {len(row['Pack size'])} pack sizes for {row['Medicine']} with the pack sizes of {', '.join(map(str, row['Pack size']))} and the category {row['Drug Tariff Category']} with the prices {', '.join(row['Basic Price'])} respectively.", axis=1)

# Creating alternate questions for each medicine
grouped['Alternate Questions'] = grouped.apply(lambda row: [
    f"What is the price of {row['Medicine']}?",
    f"Detail on product {row['Medicine']}",
    f"What do you know about {row['Medicine']}"
], axis=1)

# Expand the DataFrame to have one row per question (original and alternate)
qna_pairs_expanded = grouped.explode('Alternate Questions')
qna_pairs_expanded.rename(columns={'Alternate Questions': 'Question'}, inplace=True)

# QnA pairs & restrict for 1000 rows
qna_pairs = qna_pairs_expanded[['Question', 'Answer']].head(1000)

# head
qna_pairs.head()

```

	Question	Answer
0	What is the price of Abacavir 600mg / Lamivudi...	We have 1 pack sizes for Abacavir 600mg / Lami...
0	Detail on product Abacavir 600mg / Lamivudine ...	We have 1 pack sizes for Abacavir 600mg / Lami...
0	What do you know about Abacavir 600mg / Lamivu...	We have 1 pack sizes for Abacavir 600mg / Lami...
1	What is the price of Abatacept 125mg/1ml solut...	We have 1 pack sizes for Abatacept 125mg/1ml s...
1	Detail on product Abatacept 125mg/1ml solution...	We have 1 pack sizes for Abatacept 125mg/1ml s...

Manually picked up QnA from the NHS site

```

nhs_qna_content = [
{
    "Question": "What is the Drug Tariff?",
    "Answer": (

```

"NHS Prescription Services produces the Drug Tariff on a monthly basis on behalf of the "
"Department of Health and Social Care (DHSC).\\n\\n"
"The Drug Tariff outlines:\\n\\n"
"- What will be paid to pharmacy contractors for NHS services provided either for reimbursement "
"or for remuneration\\n"
"- Rules to follow when dispensing\\n"
"- Value of the fees and allowances you will be paid\\n"
"- Drug and appliance prices you will be paid\\n\\n"
"The Preface of the Drug Tariff contains additions, deletions, and any other alterations to the Drug Tariff.\\n\\n"
"Definitions:\\n"
"This section outlines the meaning of common terms used in the Tariff.\\n\\n"
"Where to access the Drug Tariff:\\n"
"The Drug Tariff is available in two versions on our website, a PDF version and the electronic Drug Tariff (eDT).\\n"
"The PDF version is a duplicate of the paper tariff. This can be downloaded and used offline.\\n"
"The electronic tariff requires a continuous connection to the internet. There are no page numbers, "
"and the format is different to the paper Tariff."
)
},
{
"Question": "What are the categories of drugs in the Drug Tariff?",
"Answer": (
"There are 3 categories of drugs in the Drug Tariff, categories A, C, and M.\\n\\n"
"Category A:\\n"
"This category lists the drugs that are readily available.\\n"
"The reimbursement price for each of these drugs is calculated from a basket list of suppliers.\\n\\n"
"Category C:\\n"
"This category lists drugs that are not readily available as a generic and their price is based on a particular brand or supplier.\\n\\n"
"Category M:\\n"
"This category lists drugs which are readily available.\\n"
"The reimbursement price is calculated by the Department of Health and Social Care (DHSC) based on information submitted by manufacturers."
)
},
{
"Question": "What is Part XVIIIA of the Drug Tariff?",
"Answer": (
"Part XVIIIA of the Drug Tariff contains a list of drugs, medicines, and other substances that cannot be ordered under the NHS.\\n\\n"
"The list is made up of specific products and not generic drugs. Only those items specified would be disallowed if prescribed.\\n\\n"
"Items in Part XVIIIA are also referred to as Schedule 1 drugs.\\n\\n"

"The decision to add a product to Part XVIIIA is made by the Department of Health and Social Care and published in Schedule 1 of the National Health Service (General Medical Services Contracts)(Prescription of Drugs etc.) Regulations 2004.\n\n"

"This is reproduced in Part XVIIIA of the Drug Tariff.\n\n"

"Access Drug Tariff from link <https://www.nhsbsa.nhs.uk/pharmacies-gp-practices-and-appliance-contractors/drug-tariff>"

)
,
{

"Question": "What is the price change mechanism?",

"Answer": (

"The Price Change Mechanism is an agreed system that changes the reimbursement price of drugs due to changing market prices.\n\n"

"If the drug is:\n"

"- Propriety and the indicative price changed on or before the eighth of the month, the reimbursement price will change for prescriptions dispensed in the following month\n"

"- Propriety and the indicative price changed after the eighth of the month, the reimbursement price will be changed for prescriptions dispensed the month after the following month\n"

"- Generic and the indicative price changed on or before the eighth of the month, the reimbursement price will change for prescriptions dispensed in the same month\n"

"- Generic and the indicative price changed after the eighth of the month, the reimbursement price will be changed for prescriptions dispensed in the following month\n\n"

"This is intended to consider pharmacies having stock of certain products already on their shelves when a price change is first introduced.\n\n"

"Community Pharmacy England keeps the proprietary and non-proprietary price change mechanisms under close review."

)
,
{

"Question": "Can I apply for a drug to be added, deleted or amended in Part VIII of the Drug Tariff?",

"Answer": (

"Specified procedures are carried out monthly to identify items which meet the criteria for addition, deletion, or amendment within Part VIIIA and Part VIIIB. \n\n"

"These items and their prices are determined by the Secretary of State for Health and Social Care. This process at no time requires application from a manufacturer.\n\n"

"Inclusion, amendment, or deletion of a drug in Part VIIIA or VIIIB cannot be requested."

)
,
{

"Question": "Can I apply for an appliance or device to be included in the Drug Tariff?",

"Answer": (

"You can apply for an appliance or device to be included in the Drug Tariff by completing the application form DT1 Form A. You must also complete the relevant Form B. \n\n"

"Read more information on the application process and view the application forms from link [<https://www.nhsbsa.nhs.uk/manufacturers-and-suppliers/drug-tariff-part-ix>]

```

information](https://www.nhsbsa.nhs.uk/manufacturers-and-suppliers/drug-tariff-part-ix-information)\n\n"
    "The completed form should be returned to:\n"
    "Email: pixie@nhsbsa.nhs.uk"
}
{
    "Question": "How do I amend or delete my appliances in the Drug Tariff?", 
    "Answer": (
        "To notify us of any changes or deletions, you'll need to complete a DT3 change of
product listing form.\n\n"
        "Read more information on the process and view the DT3 change form from link
[https://www.nhsbsa.nhs.uk/manufacturers-and-suppliers/drug-tariff-part-ix-
information](https://www.nhsbsa.nhs.uk/manufacturers-and-suppliers/drug-tariff-part-ix-
information)\n\n"
        "The completed form should be returned to:\n"
        "Email: pixie@nhsbsa.nhs.uk\n\n"
        "Price increase\n"
        "To notify of us of a price increase, you'll need to complete a Part IX price increase
request template.\n\n"
        "Read more information on the price increase mechanism and view the request
template from link [https://www.nhsbsa.nhs.uk/pharmacies-gp-practices-and-appliance-
contractors/drug-tariff/drug-tariff-part-ix](https://www.nhsbsa.nhs.uk/pharmacies-gp-
practices-and-appliance-contractors/drug-tariff/drug-tariff-part-ix)\n\n"
        "The completed form should be emailed to:\n"
        "Email: pixie@nhsbsa.nhs.uk"
    )
}
]

```

Conversion and merge:

```

# create dataframe from dictionary
nhs_qna_df = pd.DataFrame(nhs_qna_content)

# merge dataframe with dataset QnA
final_qna_df = pd.concat([qna_pairs, nhs_qna_df], ignore_index=True)

```

Greetings and Farewell pair:

```

qna_greetings_and_farewells = [
{
    "Question": "Hi",
    "Answer": "Hello! How can I assist you today?"
},
{
    "Question": "Hello",
    "Answer": "Hi there! What can I help you with?"
},
{
    "Question": "Greetings",

```

```

        "Answer": "Greetings! How may I be of service to you?"
    },
    {
        "Question": "Good morning",
        "Answer": "Good morning! How can I help you today?"
    },
    {
        "Question": "Good afternoon",
        "Answer": "Good afternoon! What do you need assistance with?"
    },
    {
        "Question": "Good evening",
        "Answer": "Good evening! What can I do for you?"
    },
    {
        "Question": "Hey",
        "Answer": "Hey there! How's it going?"
    },
    {
        "Question": "Bye",
        "Answer": "Goodbye! Have a great day!"
    },
    {
        "Question": "Goodbye",
        "Answer": "Farewell! Contact us again if you need more help."
    },
    {
        "Question": "See you",
        "Answer": "See you next time! Take care!"
    },
    {
        "Question": "Good night",
        "Answer": "Good night! Sleep well."
    }
]

# create dataframe from dictionary
greetingsdf = pd.DataFrame(qna_greetings_and_farewells)

# merge dataframe with dataset QnA
final_qna_df = pd.concat([final_qna_df, greetingsdf], ignore_index=True)

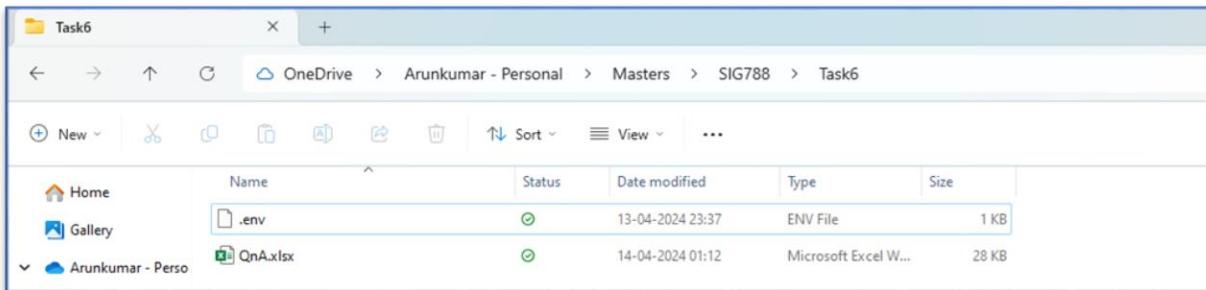
```

QnA file to working Directory:

```

# Create the final QnA pair to working directory
final_qna_df.to_excel('QnA.xlsx', index=False)

```



Authentication:

Load environment variables and create clients

```
# get service secrets
load_dotenv()
endpoint = os.environ.get("endpoint")
key = os.environ.get("subscription_key")

# Please note, we will create two clients, one for creating the project (Authoring) and one
# for querying it (Question Answering)

authoring_client = AuthoringClient(endpoint, AzureKeyCredential(key))
qna_client = QuestionAnsweringClient(endpoint, AzureKeyCredential(key))
```

```
# get service secrets
load_dotenv()
endpoint = os.environ.get("endpoint")
key = os.environ.get("subscription_key")

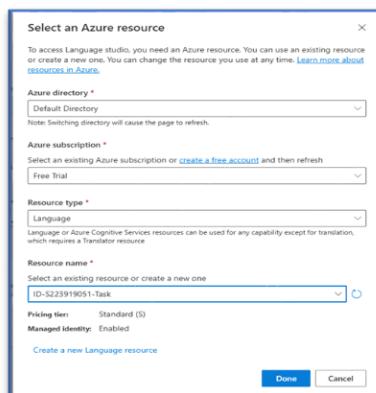
# Please note, we will create two clients, one for creating the project (Authoring) and one for querying it (Question Answering)

authoring_client = AuthoringClient(endpoint, AzureKeyCredential(key))
qna_client = QuestionAnsweringClient(endpoint, AzureKeyCredential(key))

authoring_client, qna_client
(<azure.ai.language.questionanswering.authoring._patch.AuthoringClient at 0x17dcb6d03d0>,
 <azure.ai.language.questionanswering._patch.QuestionAnsweringClient at 0x17dcb7b7390>)
```

Language service portal:

1. Sign in to the portal
2. Select Azure resource



3. Create the project in Python SDK and validate the same in Python SDK and Language portal.

```
# Create new project, add knowledge base and deploy it.
authoring_client = AuthoringClient(endpoint, AzureKeyCredential(key))

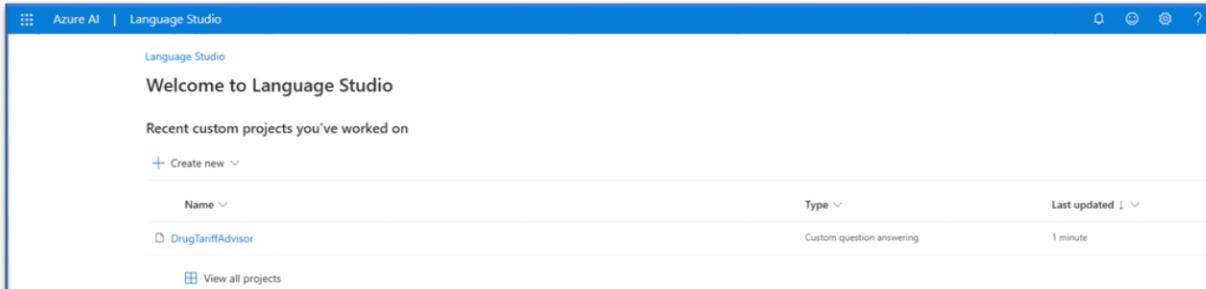
with authoring_client:

    # Step 1: create project
    print("\n***** Creating a new project *****")
    project_name = "DrugTariffAdvisor"
    project = authoring_client.create_project(
        project_name=project_name,
        options={
            "description": "FAQs & Pricing information of Drug Tariff in England",
            "language": "en",
            "multilingualResource": True,
            "settings": {
                "defaultAnswer": "no answer, please contact arunkumarbalaraman@outlook.com"
            }
        }
    )

    # Output 1: View the project details

    print("view created project info:")
    print("\tname: {}".format(project["projectName"]))
    print("\tlanguage: {}".format(project["language"]))
    print("\tdescription: {}".format(project["description"]))
```

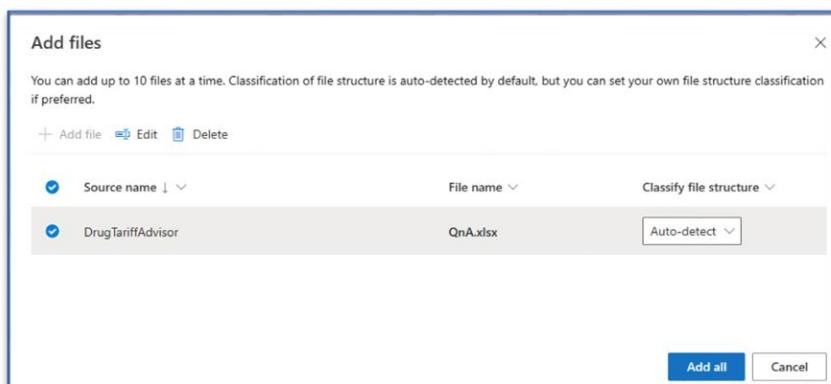
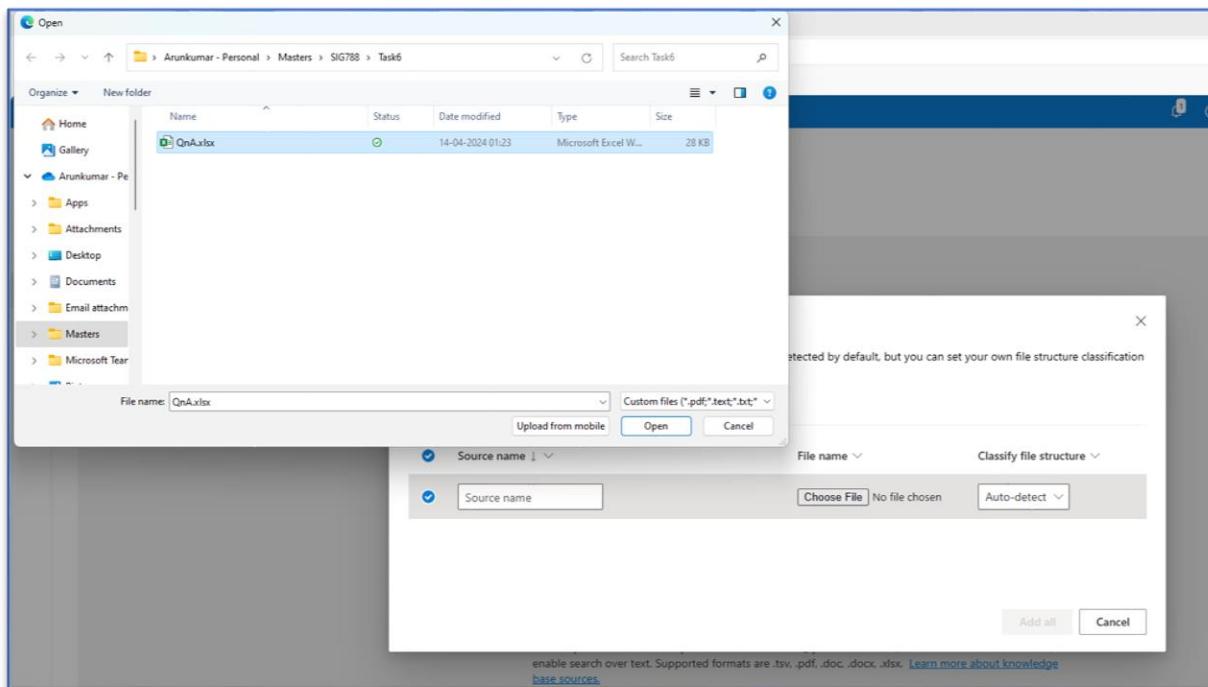
```
***** Creating a new project *****
view created project info:
    name: DrugTariffAdvisor
    language: en
    description: FAQs & Pricing information of Drug Tariff in England
```



4. The project is loaded and the source Excel file, created in the previous steps, is added. This is then verified in the portal and confirmed in the 'Edit Knowledge Base'.

In the Knowledge Base, it's evident that all the questions from the Excel file have been added. This includes dataset questions, FAQs, and greetings.

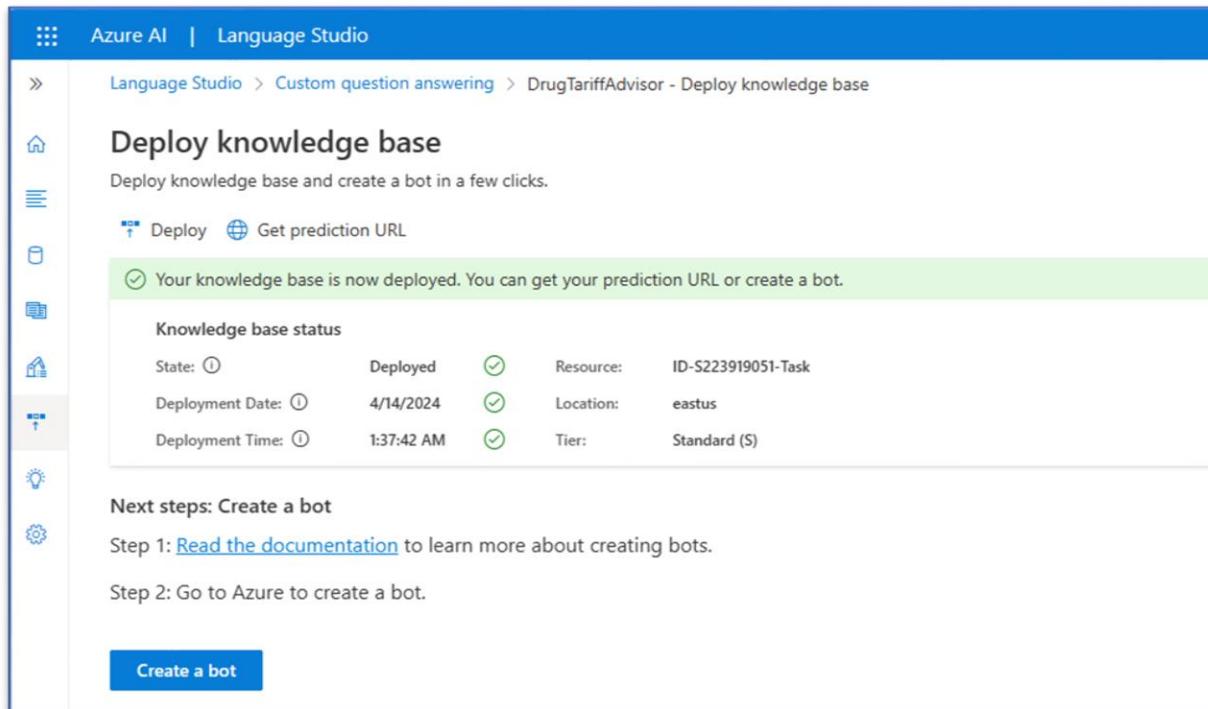
The screenshots below clearly show that all the QnAs from the Excel file, along with the alternate questions, FAQs, and greetings, have been successfully loaded



Deploy the project:

```
with authoring_client:  
    # Step 3: deploy the project  
  
    print("\n***** Deploying the project *****")  
  
    deployment_poller = authoring_client.begin_deploy_project(  
        project_name=project_name,  
        deployment_name="production"  
    )  
    deployment_poller.result()  
  
    # list all deployments  
    deployments = authoring_client.list_deployments(  
        project_name=project_name  
    )  
  
    print("view project deployments")  
    for d in deployments:  
        print(d)
```

```
***** Deploying the project *****  
view project deployments  
{'deploymentName': 'production', 'lastDeployedDateTime': '2024-04-13T20:07:42Z'}
```



Deploy knowledge base

Deploy knowledge base and create a bot in a few clicks.

Deploy Get prediction URL

Your knowledge base is now deployed. You can get your prediction URL or create a bot.

Knowledge base status	
State:	① Deployed
Deployment Date:	① 4/14/2024
Deployment Time:	① 1:37:42 AM
Resource:	ID-S223919051-Task
Location:	eastus
Tier:	Standard (S)

Next steps: Create a bot

Step 1: [Read the documentation](#) to learn more about creating bots.

Step 2: Go to Azure to create a bot.

[Create a bot](#)

Test the project:

Testing the project with 1 question to ensure the model is working

```
# 1. Test by asking a question
qna_client = QuestionAnsweringClient(endpoint, AzureKeyCredential(key))

with qna_client:
    question= "Detail on product Abatacept 125mg/1ml solution for injection pre-filled disposable devices?"
    output = qna_client.get_answers(
        question=question,
        top=3,
        confidence_threshold=0.5,
        include_unstructured_sources=True,
        short_answer_options=qna.ShortAnswerOptions(
            confidence_threshold=0.5,
            top=1
        ),
        project_name=project_name,
        deployment_name="test"
    )
    if output.answers:
        best_candidate = [a for a in output.answers if a.confidence and a.confidence > 0.5][0]
        print("Q: {}".format(question))
        print("A: {}".format(best_candidate.answer))
    else:
        print(f"No answers returned from question '{question}'")

Q: Detail on product Abatacept 125mg/1ml solution for injection pre-filled disposable devices?
A: We have 1 pack sizes for Abatacept 125mg/1ml solution for injection pre-filled disposable devices with the pack sizes of 4.0 and the category Part VIIIA Category C with the prices £1209.60 respectively.
```

Testing with Chit-Chat:

```
# 2. Testing by initiating a chit-chat.

qna_client = QuestionAnsweringClient(endpoint, AzureKeyCredential(key))
with qna_client:
    first_question= "Hello"

    output = qna_client.get_answers(
        question=first_question,
        top=3,
        confidence_threshold=0.5,
        include_unstructured_sources=True,
        short_answer_options=qna.ShortAnswerOptions(
            confidence_threshold=0.5,
            top=1
        ),
        project_name=project_name,
        deployment_name="test"
    )
    if output.answers:
        best_candidate = [a for a in output.answers if a.confidence and a.confidence > 0.2][0]
        print(u"Q: {}".format(first_question))
        print(u"A: {}".format(best_candidate.answer))

        print("\n*****\n*****\n")
    else:
        print(f"No answers returned from question '{first_question}'")
```

```

if best_candidate.qna_id:
    followup_question = "What is the Drug Tariff?"

    output = qna_client.get_answers(
        question=followup_question,
        top=3,
        confidence_threshold=0.5,
        answer_context=qna.KnowledgeBaseAnswerContext(
            previous_question=first_question,
            previous_qna_id=best_candidate.qna_id
        ),
        short_answer_options=qna.ShortAnswerOptions(
            confidence_threshold=0.5,
            top=1
        ),
        include_unstructured_sources=True,
        project_name=project_name,
        deployment_name="test"
    )
    if output.answers:
        print(u"Q: {}".format(followup_question))
        print(u"A: {}".format(output.answers[0].answer))

    print("\n*****\n*****\n")
    else:
        print(f"No answers returned from question '{followup_question}'")

```

```

Q: Hello
A: Hi there! What can I help you with?
*****
Q: What is the Drug Tariff?
A: NHS Prescription Services produces the Drug Tariff on a monthly basis on behalf of the Department of Health and Social Care (DHSC).

The Drug Tariff outlines:
what will be paid to pharmacy contractors for NHS services provided either for reimbursement or for remuneration rules to follow when dispensing value of the fees and allowances you will be paid drug and appliance prices you will be paid

The preface of the Drug Tariff contains additions, deletions and any other alterations to the Drug Tariff.

Definitions:
This section outlines the meaning of common terms used in the Tariff.

Where to access the Drug Tariff
The Drug Tariff is available in two versions on our website, a PDF version and the electronic Drug Tariff (eDT).

The PDF version is a duplicate of the paper tariff. This can be downloaded and used offline.

The electronic tariff requires a continuous connection to the internet. There are no page numbers, and the format is different to the paper Tariff.
*****
```

Create the bot:

As now we have tested in Python SDK with the question, let's create the bot service in Azure portal.

1. Click Create a Bot.

2. Create custom deployment to create a bot

3. Click Next and Provide the following

- App Name
- SDK Language to C#
- Select create new app service plan
- Get & update the Language resource Key from the Language deployed resource
- Then click on review + Create
- Then after validation click **Create**

Home >

Custom deployment

Deploy from a custom template

New! Deployment Stacks let you manage the lifecycle of your deployments. Try it now →

Basics Web App Review + create

App Service

App name * .azurewebsites.net

SDK language selection *

App Service Plan

App Service plan pricing tier determines the location, features, cost and compute resources associated with your app. [Learn more](#)

Creation type Create new app service plan Use existing app service plan

ⓘ The pricing tier currently defaults to 'S1 Standard'. It can be modified by visiting the app service plan resource page once the resource has been created, or you can choose an existing plan in your subscription.

App Settings

In App Service, these app settings are variables passed as environment variables to the bot code.

Language Resource Key *

Language project name

Language service endpoint hostname

Language service details

Subscription Id

Resource Group Name

Custom deployment

Deploy from a custom template

charge or bill my current payment method for the fees associated the offering(s), including applicable taxes, with the same billing frequency as my Azure subscription, until I discontinue use of the offering(s); and (c) agree that, if the deployment involves 3rd party offerings, Microsoft may share my contact information and other details of such deployment with the publisher of that offering.

Microsoft assumes no responsibility for any actions performed by third-party templates and does not provide rights for third-party products or services. See the [Azure Marketplace Terms](#) for additional terms.

Deploying this template will create one or more Azure resources or Marketplace offerings. You acknowledge that you are responsible for reviewing the applicable pricing and legal terms associated with all resources and offerings deployed as part of this template. Prices and associated legal terms for any Marketplace offerings can be found in the [Azure Marketplace](#); both are subject to change at any time prior to deployment.

Neither subscription credits nor monetary commitment funds may be used to purchase non-Microsoft offerings. These purchases are billed separately.

If any Microsoft products are included in a Marketplace offering (e.g. Windows Server or SQL Server), such products are licensed by Microsoft and not by any third party.

Basics

Subscription	Free Trial
Resource group	RG-S223919051-Task6
Resource group location	East US
Bot handle	ID-S223919051-Task-bot
Pricing tier	Standard
Creation type	Create new User-assigned managed identity

Web App

App name	ID-S223919051
SDK language selection	C#
Creation type	Create new app service plan
Language Resource Key	*****
Language project name	DrugTariffAdvisor
Language service endpoint hostname	https://ID-S223919051-Task.cognitiveservices.azure.com
Subscription Id	/subscriptions/8d5ceb22-44c7-4367-bfc6-07378096e055
Resource Group Name	RG-S223919051-Task6
Account Name	ID-S223919051-Task

Currently deployment in progress, the deployment would create the following resources

1. App Service
2. App service plan
3. Managed Identity
4. Microsoft.Web/sites/Extensions
5. Bot Services

Resource	Type	Status	Operation details
ID-S223919051-Task-bot	Bot Service	Created	Operation details
ID-S223919051/MSDeploy	Microsoft.Web/sites/Extensions	OK	Operation details
ID-S223919051	App Service	OK	Operation details
ID-S223919051-Task-serverfarm-2b4db0	App Service plan	OK	Operation details
ID-S223919051-Task-bot	Managed Identity	Created	Operation details

Drug icon has been updated to the model.

Configuration page:

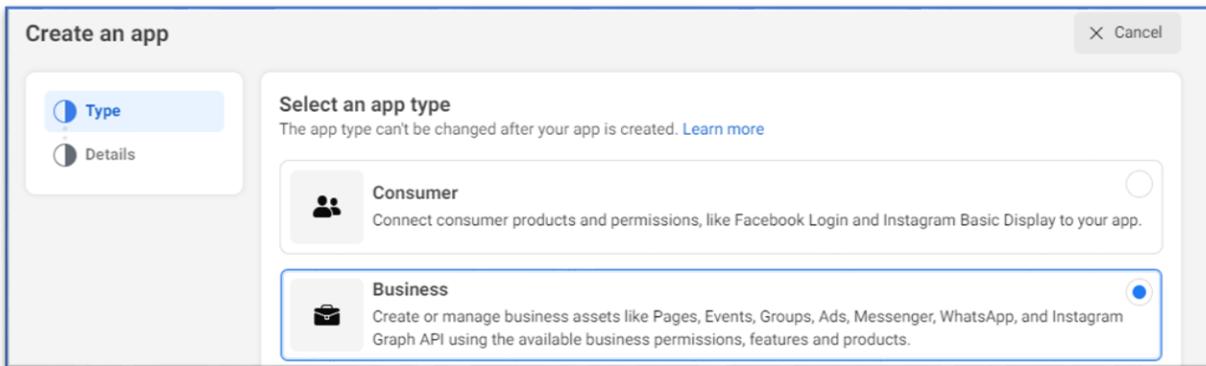
Below is the configuration details of the Bot service which includes messaging endpoint, BotType, AppID, Tenant ID, MSI resource ID, etc..

Channel:

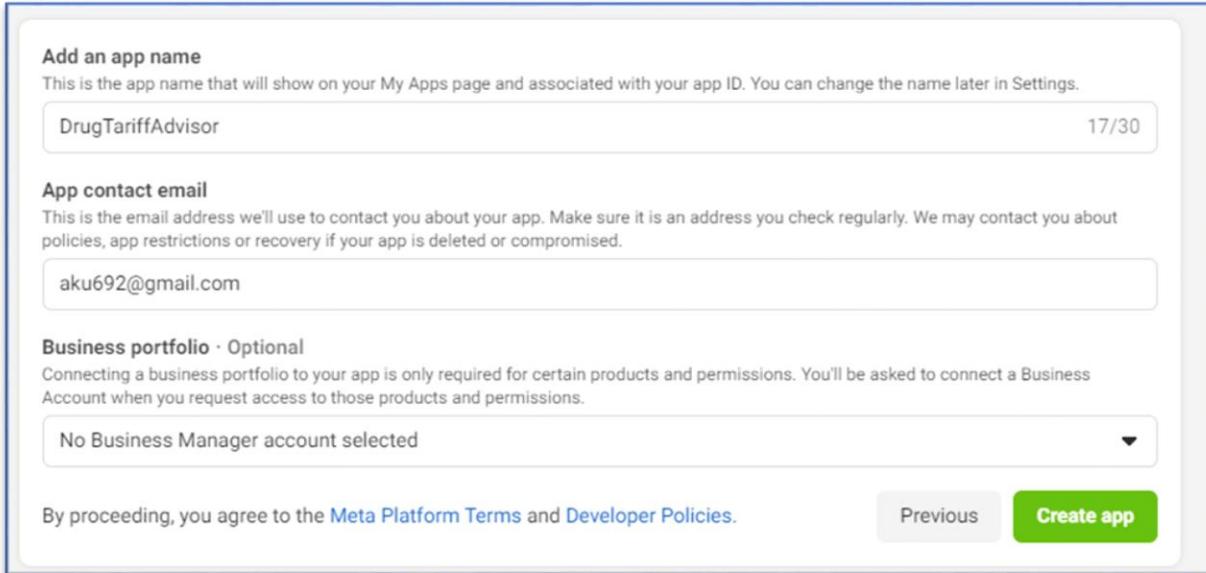
1. Click on Facebook channel & then go to <https://developers.facebook.com/>
2. Login into the facebook developer using the personal username and password.
3. Click on create new app

4. Select Other & next

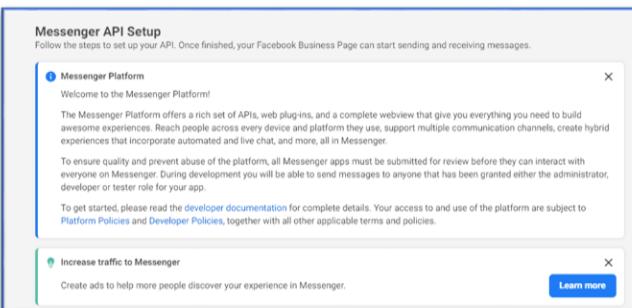
5. Click Consumer and click next



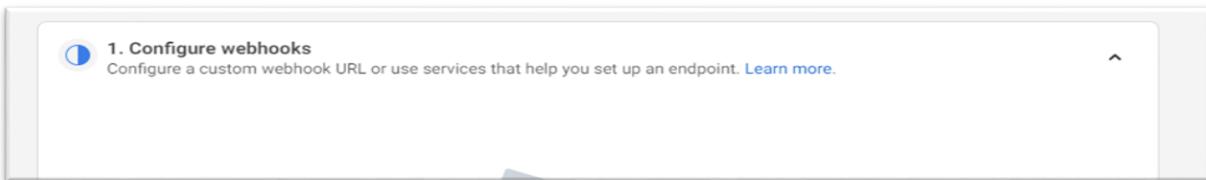
6. Name the App “” and create app



7. Add Product to app set up messenger & Configure the object.



8. Configuration:



Configuring webhooks by getting into the Azure portal to create facebook channel

Get the AppID and Secret from the Facebook developer page in app setting basic.

Updated the same in Azure portal

Then go to Facebook developer & before we need to create the privacy policy URL
 Goto <https://app.freeprivacypolicy.com/>

Click on free privacy policy URL & click generate the URL and update the same in the facebook developer Privacy policy URL & select category and save changes

Now click on generate access token in Messenger API settings to generate the access token for the azure portal

Then create the sign in to the facebook account to authenticate and create the page access token and ID then in **Azure portal** updated the page ID and Access Token and click **Apply**

Configure the page

Page ID * 115912323141537

Access Token * [REDACTED]

Facebook credentials
The Facebook App ID and Secret can be found in your Facebook account settings. The Callback URL and Verify Token are used to provide Facebook with the correct endpoint for your application so that your bot will receive messages. [Learn more](#)

App ID * 25110029651974516
Secret * [REDACTED]
Callback URL <https://facebook.botframework.com/api/v1/bots/ID-S223919051-task-bot>
Verify Token GcYATD7gDzJ8pVWERSAg9OKD2CM7aS11TMWGGf74RB8M

Pages credentials
The Page ID and Access Token can be found in your Facebook account settings.

Filter by page Id + New page

Page ID 115912323141537 Delete Edit

Facebook Workplace
Facebook Workplace is a business-oriented version of Facebook which allows employees to easily connect and collaborate. It contains live videos, news feeds, groups, messenger, reactions, search, and trending posts. To use Facebook Workplace with your bot, you must create a Workplace account and a custom integration to connect the bot. [Learn more](#)

This would create the Facebook channel in the Azure Bot

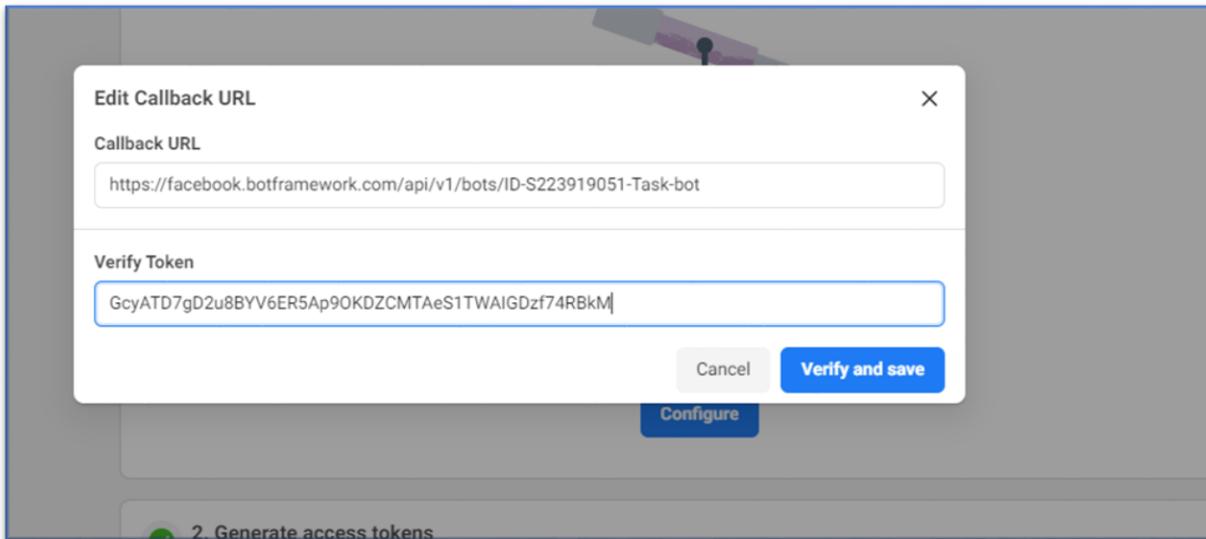
Get bot embed codes Refresh | Feedback

You are using the updated channels page. Let us know what you think by providing feedback [Feedback](#)

This bot is connected with the following channels.

Channel	Health status	Details	Actions
Direct Line	Healthy	REST API for communicating directly with a bot	
Facebook	Healthy	Support for Text Messaging via Facebook	Open in Messenger
Web Chat	Healthy	Embeddable Web Chat control	

Then go back to Facebook developer to configure the Webhooks by providing the Callback URL and token created in the Microsoft azure portal.

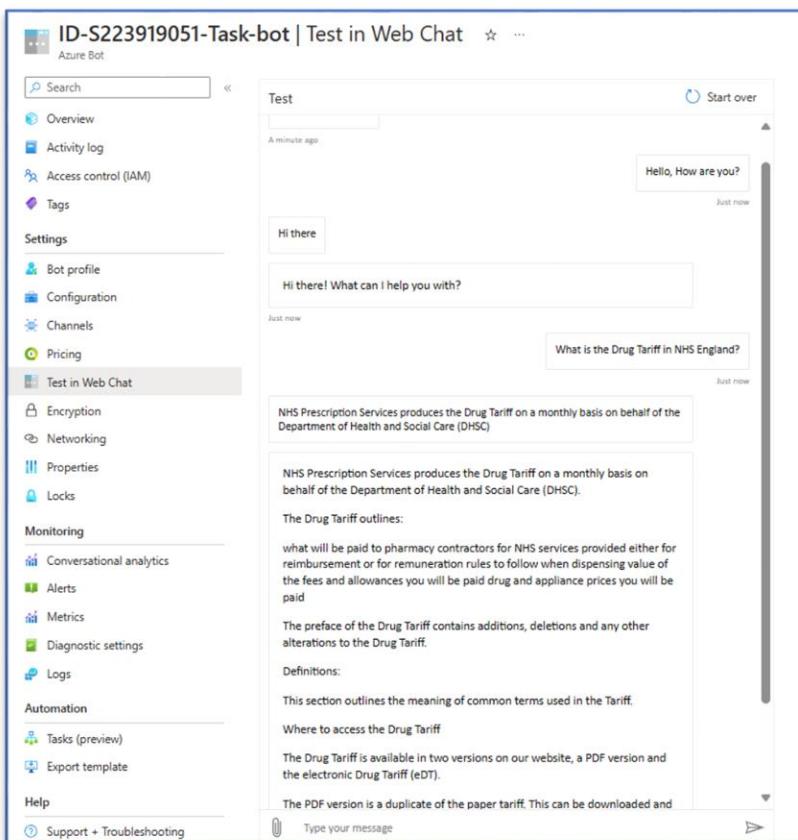


Click verify and save.

We are all set to open the messenger and test the model but we will test the bot in the Webchat and then in the messenger.

Webchat Test

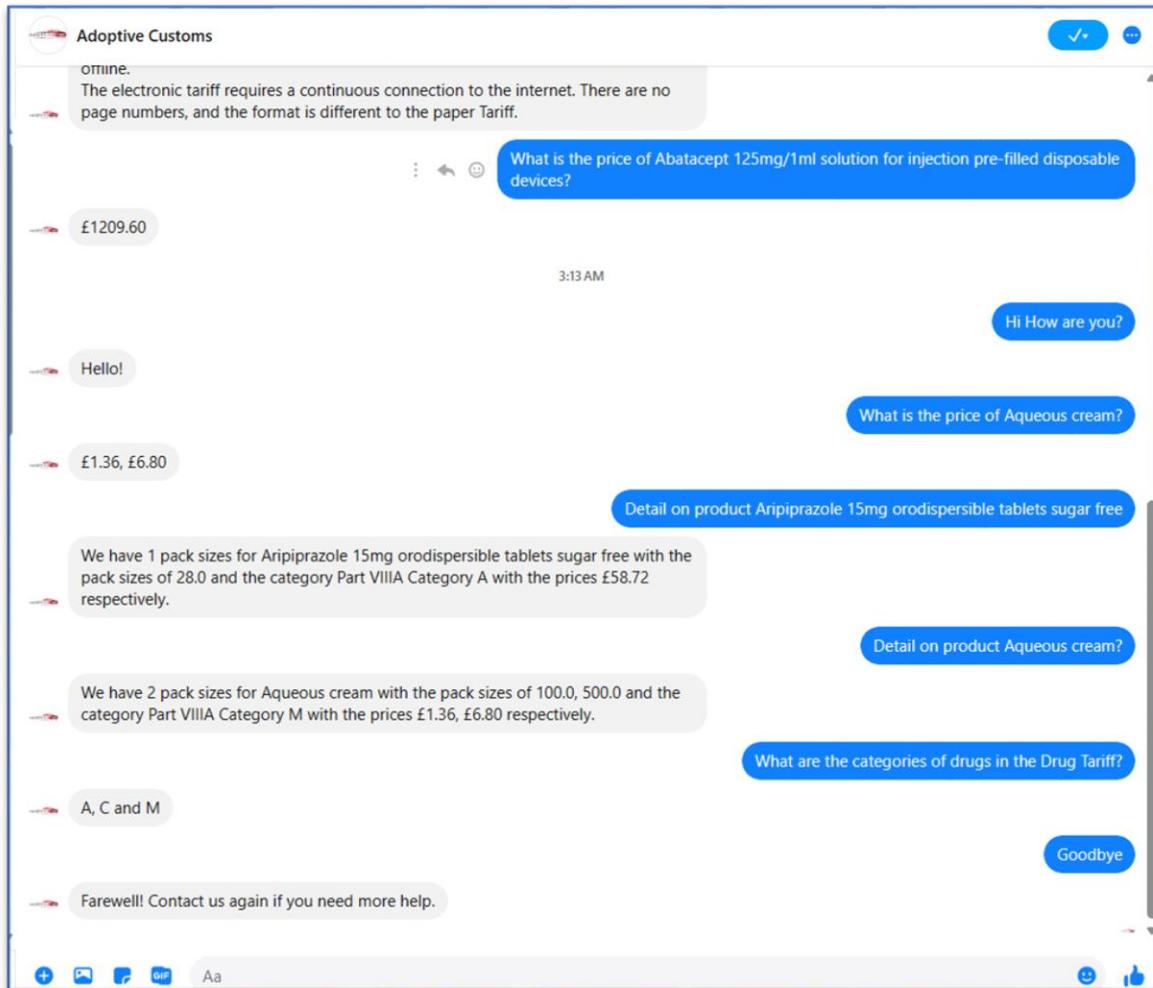
Click test in Webchat:



Facebook Messenger Test:

Go to Channels, and click on open in messenger and fire questions to DrugAdvisorBot services.

Below is the outcome of the service.



As successfully completed the project, now let's delete the resource and resource group to ensure the billing is under control.

Conclusion:

The Drug Tariff Advisor Bot, powered by Azure Cognitive Language Studio, provides healthcare professionals in England with easy access to up-to-date drug tariff information. It enhances decision-making and streamlines inventory management, contributing to healthcare efficiency.

Potential future enhancements include:

- Integrating with other healthcare platforms for a unified user experience.
- Adapting the bot for different languages and regional drug tariffs.
- Implementing a feedback mechanism for continuous improvement.
- Exploring advanced NLP features for enhanced interactivity.

Clean up Activity:

As completed the project, cleaning up the resources and resource group to reduce cost on the Azure Student subscription.

All resources

Default Directory (arunkumarbalaraman@outlook.onmicrosoft.com)

Filter for any field... Subscription equals all Resource group equals all Type equals all Location equals all Add filter

0 recommendations 7 changed resources 0 Unsecure resources

Name	Type	Resource group	Location
ID-5223919051	App Service	RG-5223919051-Task6	East US
ID-5223919051-Task	Language	RG-5223919051-Task6	East US
ID-5223919051-Task-bot	Azure Bot	RG-5223919051-Task6	Global
ID-5223919051-Task-bot	Managed Identity	RG-5223919051-Task6	East US
ID-5223919051-Task-serverfarm-2bd80	App Service plan	RG-5223919051-Task6	East US
ids223919051task-asr5cru5aqdfcue	Search service	RG-5223919051-Task6	East US
sts223919051task	Storage account	RG-5223919051-Task6	East US

< Previous Page 1 of 1 Next > Showing 1 to 7 of 7 records.

Delete Resources

The selected resources along with their related resources and contents will be permanently deleted. If you are unsure of the selected resource dependencies, navigate to the individual resource page to perform the delete operation. More details of the resource dependencies are available in the Manage experience.

Resources to be deleted (7)

Name	Resource type	Remove
ID-5223919051	App Service	Remove
ID-5223919051-Task	Language	Remove
ID-5223919051-Task-bot	Azure Bot	Remove
ID-5223919051-Task-bot	Managed Identity	Remove
ID-5223919051-Task-serverfarm-2bd80	App Service plan	Remove
ids223919051task-asr5cru5aqdfcue	Search service	Remove
sts223919051task	Storage account	Remove

Enter "delete" to confirm deletion
delete

Delete Cancel

Resource group to be deleted

RG-5223919051-Task6

Dependent resources to be deleted (0)

All dependent resources, including hidden types, are shown

Name	Resource type
------	---------------

Enter resource group name to confirm deletion *
RG-5223919051-Task6

Delete Cancel

All the resources are deleted!!

References:

- ⊕ Microsoft Learn (no.date.) **"Azure Cognitive Language Service Question Answering client library for Python - version 1.1.0"** Available at: <https://learn.microsoft.com/en-us/python/api/overview/azure/ai-language-questionanswering-readme?view=azure-python>
- ⊕ Microsoft Learn (no.date.) **"Connect your Azure AI Health Bot to Facebook"** Available at: <https://learn.microsoft.com/en-us/azure/health-bot/channels/facebook>

- Microsoft Learn (no.date.) " **Connect a bot to Facebook**" Available at:
<https://learn.microsoft.com/en-us/azure/bot-service/bot-service-channel-connect-facebook?view=azure-bot-service-4.0&tabs=messenger>
- Great Learning (2024) " **Week 5 - Language Understanding & Azure AI Fundamentals**"
Mentor session Available at:
https://olympus.mygreatlearning.com/mentorship_recordings/2317305
- JD Bots (Apr 30, 2023) " **Integrating Azure Language Studio Custom Question Answering with CLU using Microsoft Bot Framework**" Available at:
<https://www.youtube.com/watch?v=UCA7GUWweVE>
- NHS England (no.date) " **NHS Prescription Services**" Available at:
<https://www.nhsbsa.nhs.uk/pharmacies-gp-practices-and-appliance-contractors/drug-tariff/drug-tariff-part-viii>
- NHS England (no.date) " **NHS Prescription Services Knowledge base**" Available at:
<https://faq.nhsbsa.nhs.uk/knowledgebase/category/?articlecategory=Drug%20Tariff&id=CAT-01087&parentid=>
- Microsoft Learn (no.date.) " **Export-import-refresh in custom question answering**" Available at: <https://learn.microsoft.com/en-us/azure/ai-services/language-service/question-answering/how-to/export-import-refresh>