**Section A: Computer Vision**

1. **What are the required AI services for this image classification. Explain the usage of each of the AI services.**

The AI services required for this image classification are:

1. Azure Machine Learning (AutoML)
   1. AutoML Image Classification in Azure Machine Learning helps create a machine learning model without needing extensive knowledge of machine learning algorithms. We can upload our labeled dataset, and AutoML will automatically train and evaluate multiple models to find the best one. This is particularly useful for handling variations in fruit appearances and ensuring the model performs well under different lighting conditions.
2. Custom Vision Service
   1. Custom Vision Service allows us to build, train, and deploy image classification models. We can upload images of fruits, label them, and then train a model to classify new images. It supports both multiclass and multilabel classification, making it suitable for classifying fruits based on size, shape, and color. Once trained, the model can be integrated into your operational workflow to classify fruits in real-time.
3. Azure Cognitive Services - Computer Vision
   1. Azure Cognitive Services' Computer Vision API can be used for image analysis tasks such as object detection and image classification. You can use it to detect and classify fruits in images, even under varying lighting conditions. It provides pre-trained models that can be fine-tuned with your own data to improve accuracy.
4. Azure Cognitive Services - Custom Vision
   1. Similar to Custom Vision Service, Azure Cognitive Services' Custom Vision allows you to create custom image classification models. You can train the model with your own images and labels, and then use the prediction endpoint to classify new images. This service is ideal for creating a robust classification system that can handle diverse fruit appearances.
5. Azure Cognitive Services - Vision Studio
   1. Vision Studio is a visual interface for creating and managing custom models. You can use it to train custom image classification models by uploading your images and labels. Vision Studio provides tools for fine-tuning your models and testing their performance.
6. **Outline the steps involved in creating and training a custom vision model in Azure Vision Studio.**
7. Create an Azure Account

Sign up for an Azure account to access Azure Vision Studio and other related services.

1. Set Up Your Custom Vision Project

Navigate to Azure Vision Studio, create a new project, and provide the necessary details such as name, description, and resource group. Select the appropriate domain based on your classification needs.

1. Upload and Label Images

Upload images of fruits to the project. Use the interface to label each image according to its category (e.g., apple, banana, etc.). Accurate labelling is crucial for training a reliable model.

1. Train the Model

Initiate the training process by selecting the "Train" option. Azure Vision Studio will utilize the labelled data to train your custom image classification model. Choose between Quick Training or Advanced Training based on data availability and requirements.

1. Evaluate the Model

Upon completion of the training, evaluate the model’s performance using metrics such as precision, recall, and accuracy. Use the test feature to classify new images and assess the model’s effectiveness.

1. Iterate and Improve

If the model’s performance does not meet expectations, iterate by adding more images or refining the labels. Retrain the model with the updated dataset to enhance accuracy and reliability.

1. Deploy the Model

Once satisfied with the model's performance, deploy it to a production environment. Azure Vision Studio provides options to export the model or use it via an API endpoint for real-time classification.

1. Integrate with Your System

Integrate the deployed model into Company ABC’s workflow or application. Utilize the API endpoint to send images to the model and receive classification results.

1. **Outline the steps involved in COCO (Common Objects in Context) file.**

To perform data labeling and generate a COCO file using Azure Machine Learning services, follow these steps:

Step 1: Set Up Your Azure Machine Learning Workspace

1. Sign in to the Azure Portal: Go to https://portal.azure.com and sign in with a Microsoft account.

2. Create a Workspace: Search for "Azure Machine Learning" and select it. Click on "Create" to set up a new workspace. Fill in the required details such as workspace name, subscription, resource group, and location.

Step 2: Create a Data Labeling Project

1. Upload Data: Upload the dataset (ABC\_dataset.zip) to our workspace. we can use the "Datastores" section to manage our data storage.

2. Create a Labeling Project: In our workspace, go to the "Data Labeling" section and create a new labeling project. Name our project and configure it for image labeling.

3. Define Labels: Specify the labels we want to apply to our images (e.g., different types of fruits). we can define multiple labels for each image.

Step 3: Label Our Data

1. Start Labeling: Use the Azure Machine Learning data labeling tool to manually label our images. This tool allows us to draw bounding boxes, polygons, or apply tags to your images.

2. Review and Correct Labels: After labeling, review the labels to ensure accuracy. Correct any incorrect labels before submitting.

Step 4: Export Labeled Data as a COCO File

1. Export Labels: Once our data is labeled, export the labeled data as a COCO file. This can be done through the Azure Machine Learning studio.

2. Verify COCO File: Use a Python script to verify the format of your COCO annotation file. Ensure that the file is correctly formatted for use in model training.

Step 5: Use the COCO File for Model Training

1. Import COCO File: Import the COCO file into our model training project. This will allow us to use the labeled data for training our custom vision model.

2. Train Our Model: Use the labeled data to train our model in Azure Machine Learning. Follow the steps to create a training script, submit a training job, and evaluate our model's performance.

1. **Integrate custom model into app. You are required to show your python code**
2. **Include a screenshot showing the performance of your trained model, along with an explanation of the results. (2 marks)**

A screenshot of a computer

Description automatically generated

The trained model shows a high amount of confidence in its performance due to the easy to identify nature of the training images provided. Each image only has that one fruit against a white background, making it easy to identify features of said fruit

1. **Include a screenshot showing the performance of your testing image, along with an explanation of the results. (2 marks)**

A long eggplant on a white background

Description automatically generated

A close-up of a zucchini

Description automatically generated

A green vegetable with a white background

Description automatically generated

A carrot with a white background

Description automatically generated

When testing images of fruits the model has been trained on, it is highly accurate in its prediction of which fruit it is, however, when shown a fruit with the shape of a cucumber and the colour of a pear, the model has not seen this fruit before and thus begins to compare between the fruits the model has been exposed to, thus having mixed confidence between which of the 3 fruits the test image belongs to.

**Section B**

**Part A**

1. **Write a brief description of what your company is selling here.**

Company ABC is an online-only retailer specializing in a diverse range of food products tailored to the Asian market. Our offerings include fresh produce, packaged snacks, beverages, condiments, and specialty items that cater to the culinary tastes and preferences of various Asian cultures.

1. **List some of the common questions that your chatbot will help to offload from your customer service colleagues. Please include at least 10 questions and answers in an excel**



1. **What are the required AI services for this chatbot. Explain the usage of each of the AI services.**

**Azure AI Language Service**

* Natural Language Understanding (NLU): Helps the chatbot understand the user's input by identifying intent, extracting entities, and interpreting contextual meaning.
* Sentiment Analysis: Evaluates the sentiment expressed in user messages, allowing the chatbot to respond appropriately.
* Named Entity Recognition (NER): Identifies and categorizes entities (like names, dates, or locations) within the text, improving the chatbot's comprehension.

**Azure OpenAI Service**

* Generative Language Models: Leverages advanced language models to generate coherent, relevant, and contextually appropriate responses.
* Conversational AI: Powers the core conversational abilities, enabling the chatbot to maintain meaningful and dynamic dialogues with users.
* Text Summarization: Summarizes lengthy texts or documents, providing concise information to users.

1. **Create a knowledge base in language studio. You are required to import the excel file created in PartA-Q2. Please provide the screenshot for the QnA pairs.**

A screenshot of a computer

Description automatically generated

1. **Test and publish the chatbot. You are required to show the necessary screenshot with at least 5 dialog scenarios.**

A screenshot of a chat

Description automatically generatedA screenshot of a chat

Description automatically generatedA screenshot of a chat

Description automatically generatedTesting before deployment:

Testing to a deployed bot: A screenshot of a computer program

Description automatically generated

**Section B**

**Part B**

* 1. **State and explain what are the two benefits of generating a multilanguage chatbot for your business?**

1. **Expanded Market Reach**

A multilanguage chatbot allows businesses to communicate with customers in their preferred language, thereby expanding their reach to global markets. By catering to different languages, a business can:

* **Engage with a wider audience**: Attract and serve customers from various linguistic backgrounds.
* **Enhance customer satisfaction**: Provide a more personalized and comfortable experience for non-native speakers, fostering loyalty and trust.

1. **Enhanced Brand Image and Global Presence**

Having a multilanguage chatbot demonstrates a commitment to inclusivity and customer-centricity. This can lead to:

* **Positive Brand Perception:** Customers view the business as accessible, considerate, and globally minded, enhancing the company's reputation.
* **Competitive Advantage:** A multilingual chatbot sets your business apart from competitors who may only cater to a single language, giving you an edge in attracting and retaining diverse clientele.\
* **Cultural Adaptability:** Being able to engage with customers in their native languages shows cultural sensitivity and awareness, building stronger relationships and trust across different regions.
  1. **What are the extra AI services required for this Multilanguage chatbot. Assumption: The AI services that generated in Part A are still applicable.**

**Azure AI Translator**

* Language Translation: Enables the chatbot to understand and respond in multiple languages, breaking down language barriers.
* Real-time Translation: Allows for seamless conversation with users who speak different languages by translating messages on-the-fly.
  1. **Explain the procedure on how you could generate the Multilanguage chatbot with minimum cost.**

**Step 1: Choose a Cost-Effective Platform**

Select a chatbot development platform that offers free or affordable plans with multilingual capabilities such as **Microsoft Bot Framework**.

**Step 2: Utilize Pre-built Language Models**

Leverage pre-built language models and AI services that support multilingual conversations to save on development costs.

* **Azure OpenAI Service**: Offers generative language models that can handle multiple languages, reducing the need for custom development.
* **Azure AI Translator**: Provides real-time translation services, allowing the chatbot to communicate in various languages without additional training.

**Step 3: Integrate Multilingual Capabilities**

Incorporate translation services to enable real-time translation of user inputs and chatbot responses.

* **Azure AI Translator API**: Easily integrates with your chatbot to translate messages on-the-fly, ensuring smooth communication in different languages.

**Step 4: Optimize and Train the Chatbot**

Utilize available resources and tools to train your chatbot for multilingual interactions.

* **Language-Specific Templates**: Use pre-designed templates and sample dialogues available on your chosen platform to quickly set up language-specific conversations.
* **Community Resources**: Leverage community forums, documentation, and open-source projects to gather insights and best practices for optimizing multilingual chatbots.

**Step 5: Monitor and Improve**

Continuously monitor your chatbot's performance and make necessary adjustments to enhance user experience.

* **Feedback Mechanism**: Implement a feedback system to collect user inputs and identify areas for improvement.
* **Regular Updates**: Keep the chatbot's language models and translation services up-to-date to maintain accuracy and relevance.
  1. **Test and implemented the above chatbot. Please include the necessary screenshot for the generated cognitive service. You are required to submit the generated code in zip file.**

**A screenshot of a computer

Description automatically generated**