**AI 900**

**Services**:

**Computer vision service**: it can take an image and detect the various objects in the image (taking an image and process that image and give you information about that image).

**Microsoft guiding principles for responsible AI**:

1)**Accountability**:

When we are developing or making use of AI services to build an AI enabled solution but, in the end, remember that you are accountable (responsible) as a human being for that solution.

2)**Reliability and Safety**:

When we are building an AI solution it must need to be reliable and safe.

3)**Privacy and Security**:

In ML and AI, it works with a lot of data, so we collect a lot of data, and that data might contain sensitive information, so we must enable the privacy and security to the data.

4)**Transparency**:

When we are developing an AI solution the developer must need to understand what the models are, we used to develop the solution.

5)**Inclusiveness**:

While building the ai enabled solution for a particular problem we must include all the aspects and we must include all people. For AI enabled solution there should not have any bias against certain type of people. We need to make sure that solution for everyone.

6)**Fairness**:

Including everyone like we need to be fair and include everyone we need to treat everyone fairly when it comes to Ai enabled solution.

**Note**: we will give some information or data to the machine learning process and machine learning process will take that data and it will use the machine learning algorithm and it will try to create the machine learning model/function

**Note**: So, when want to create your machine learning model, we must need to feed in two things to the machine learning process: **data** and your **machine learning algorithm**

**Algorithm** will tell machine learning how to go ahead and process the data and then develop an efficient machine learning model to go ahead and develop that function.

**y=f(x)**

**x**: input or **feature**- input (the input data we are feeding)

**y**: output or **label** – value of y what we are trying to predict.

**f**: function- machine learning model that we create based on machine learning algorithm and dataset(x).

The algorithm already have a define set of instructions that can be used for finding patterns in our dataset to determine and output the value.

The dataset has lot of input values(x) and that would train the model(f) using machine learning algorithms So that model can determine and send back us some output data(y).

**Machine Learning Techniques**:

**Supervised learning**: Here we will feed the input data including the features and the labels (output data that the machine learning model going to predict), here we will feed the output data also based on this inputs and outputs ml algorithms will predict the output label.

**Unsupervised learning**: Here we only pass the dataset which only consists of features (inputs) not the labels here algorithm will try to organize the data and decide how the outcome would look like. Here we will use different type of algorithms.

**Reinforcement learning:** Here the algorithms try to learn the outcomes and decides what to do next.

**Machine learning with Azure:**

We need to create Azure machine learning workspace because it will give us the machine learning studio and we will use this ML studio to create our Machine Learning models.

If we create the machine learning workspace it will create three resources for us along with the machine learning workspace

1. **Storage account:** This will store the data assets that are required by the learning workspace.
2. **Key vault:** This is used to store the sensitive information in our machine learning process that needs to be stored and it can be stored inside this key vault.
3. **Application Insights:** This is used for monitoring the machine learning work space**.**
4. **Container Registry:** After this we need to do the container registry for the workspace because we are going to deal with lot of images and videos etc, so this data will store under this Container.

**Azure ML Studio:**

**Components in it:**

1. **Designer:** In designer we can build the flow (building or training) for our machine learning model (Pipeline process).
2. **Automated ML:** we can automate the entire machine learning process.
3. **Notebooks**: Here we can interact with our data.
4. **Datasets:** we can create here our datasets that help to train and test your machine learning model**. Azure machine learning will provide the inbuilt data sets to us.**

**Note**: We can create a new machine learning model by creating new pipeline, pipelines will be used for training our machine learning model.

When you want to go ahead and train your machine learning model, we need to split your data to training data (70%) and testing data (30%) to train and test the machine learning model in terms of accuracy.

To the canvas designer we can drag two things

1. **Data set** (data we are using to feed to train machine learning model), we can find this at Dataset component.
2. **Split data** component to split or data set to 70, 30%.

**Compute Target**: All the operations for this machine learning process needs to run somewhere. So,

**Compute target** will create an Azure virtual machine for running the underlying machine learning process. In this virtual machine python is used to split the data.

**Compute** will create a virtual machine resource that can be used by our pipeline when I want to train my machine learning model.

**Note**: When you run the pipeline it will create a job, that job is called compute. We know that we created the vm in compute in that vm it will download our dataset which we dragged into our pipeline canvas and then it will perform the compute activity of splitting our data into two batches.

**Pipeline process**: We have our dataset and we will splitting our data(using split data component) into our training and test data and we will use machine learning algorithm to train our model(we will take the train **model** component) based on the training data(data we are feeding to the model), we will scoring the model (using the score model component) based on the training and based on the test data and finally we will evaluate (using the evaluate model component) the results to make sure that the model is the best model.

SPLIT ->TRAIN-> SCORE-> EVALUATE.

**ROC Curve**: Receiver operating characteristic curve- relationship between true positive rate and false positive rate.

**Azure Kubernetes**: Once the training for the model is completed so for test this model, we need to deploy our model so for this we need compute infrastructure, you need to expose an endpoint that can call that particular model and get the required output. Simply if we call an endpoint it will invoke the corresponding model.

In Azure we can use Kubernetes to deploy our model, Kubernetes is a tool that can used for deploying our container-based applications.

**Note:** We can clean the missing data in our dataset by using clean missing data component, this component will replace the missing value with the zero by default and we can customize this value if we want.

**Automated Machine Learning service**: It will take our data and then it will train the model by using different algorithms.

It will create different pipelines for us for using the different algorithms.

**Feature Engineering**: When we use our raw data to create additional features to power our machine learning algorithm. Simply here we will create new features based on raw data.

**Feature Selection**: This is the process of only using those features that are important to the training process.

**Features of Computer vision service on Azure:**

**1)Azure Ai Vision service:** Allows you to process images and get the information from the images.

**2)Optical character recognition**: Used to extract text from the images, this can be handwritten, or printed text includes documents, invoices, and receipts etc.

**3)Image Analysis**: Extract visual features from images, like it will tell us what is there inside the image.

**4)Face**: Used to detect human faces in an image, it can also analyse human faces. When it comes to identifying the faces, we can verify the faces as well.

**Example**: if you have an image and in it there are particular face so we can use the api to get a face ID and we can compare with other images as well to make sure that the face belongs to same person or not.

**Find similar**: Do a matching between a target face and a set of candidate faces.

**5)AI Document Intelligence:** It is used to analyse our documents; we can extract printed and handwritten text; it has the power of optical character recognition service.

**Example**: We have lot of pre-built models for this, we can upload an invoice onto this service and extract all the details of the invoice using the prebuilt model (Invoice).

**NOTE**: Whenever we want to submit images to azure ai service we actually make a api call from our application. So, with azure we can make a api call with our application. We will submit the image and then the api will give a response back.

In order to make that api call we need to have a vision resource on the azure platform and then we will use the endpoint and key (ocp-apim-subscription-key) when making a call like this we can call our azure ai service.

**Features of Natural language processing service on Azure:**

1)**Key phrase extraction**: It has an ability to pick out the key words from a particular sentence.

2**)Entity recognition**: It has an ability to read the textual information and then it will take the key phrases out from the sentence and then it will categorize those key phrases into respective categories.

Example: The hotel we stayed on last week in Dubai is so good

It will do this: Hotel-location category, Dubai-location category, last week- date time category.

3)**Sentiment analysis**: It has an ability to read the textual information and then understand whether the text content is positive, negative, or neutral.

4)**Translation**: It has an ability to take a text and translate from one language to another.

**5)Speech recognition**: it will take the speech and it will listen to that speech and based on that speech it will generate the text content.

6)**Speech synthesis**: Here we can generate the speech by ourselves.

**Algorithms**:

**1)Binary classification algorithm**: Here the model will tell yes or no, used to classify, or divide data it can only have 2 possible values.

**Example**: if we feed the input data and we want to predict the model whether the salary of a person is greater than or equal to 50 thousand, So at that time this algorithm will perfect because it will take the input data and it just tell us salary is greater than or equal to 50000 or not.

**Metrics used to evaluate this classification model**: Recall, AUC.

**2)Linear Regression algorithm**: Machine learning model trying to find the relationship between the output and the input using a function.

It will predict the new data point in the graph based on the historical data(input).

**Example**: predicting the sale of houses in the area for the next year.

**Metrics used to evaluate this classification model**: Mean absolute error, Root mean Squared error

**3)Two class (binary) classification algorithms**: It divides the data into two categories. They are useful for questions that have only two possible answers that are mutually exclusive (Yes or No).

**4)Clustering**: Used to divide data into different groups.

**Example**: Divide students into different groups based on their course preference.

**5)Regression**: it predicts the value of a new data point based on historical data.

**Note**: If we want to clean our training data if the data contains null or missing values then we can use the clean missing data module in canvas to get the accurate data so then we can train our model with this accurate data to get accurate machine learning model.

**Note**: if we want to use computer vision services available in azure, we can find those in Azure cognitive services.

**Why Cognitive services**? A developer does not need to have any knowledge in machine learning. They don’t need to train and test a model; we just need to invoke the cognitive service.

Here we can found documentation for every ai enabled service like what is the url and what is the we need to use.

**LUIS**: Language Understanding Intelligence Service

**Intents**: we need to train LUIS application on what are the different intents of the user.

Example: we are building this app for a site which is used for booking of flights there we need to add what are the different intents of the user like

1)Does user want to search for a particular flight?

2) Does user want to book for a particular flight?

**Entities**: this will help us to divide the keywords into separate entities this is based on user’s intent

--------------------------------------------------------------------------------------------------------------------------------------

QNA:

Do these two faces belong to the same person – Verification.

Do a matching between a target face and a set of candidate faces – Find Similar.

Match a face to set of faces - Identification

One system needs to have an automated chat facility which can answer user’s questions. Which of the following type of workload does this come under? – Conversational AI.

Your development is planning on setting up a bot instance with the use of the Azure Bot service. Can the team communicate with the bot via Microsoft teams? – Yes.

Your development is planning on setting up a bot instance with the use of the Azure Bot service. Can the team communicate with the bot via Slack? – Yes.

a module will be developed which would provide an interactive interface for automatically answering questions asked by the user. Which of the following type of module is being developed here as part of the application? – Conversational AI.

Your team is planning on making use of the QnA Maker service. They want to populate the knowledge base. Can they use the chit-chat feature to add questions and answers to the knowledge-base? – Yes.

Your team is planning on making use of the Azure Cognitive Speech service. Can you use the Speech service to convert text to a human-like synthesized speech? – Yes.

Your company has just launched a new ecommerce website where users can buy various products. Users are allowed to leave a review for each purchase. Your team needs to have an automated system to understand whether the user has a left a positive or negative review.

You also need to monitor the reviews for any sort of profanity. Would this analysis of the reviews come under the context of natural language processing?- Yes.

Since you need to monitor the language of the reviews , it does come under the purview of natural language processing.

Your company needs to process large amounts of documents. From the document text, key elements such as people names , locations and dates need to be extracted.

Which of the following feature of the Text Analytics service can you use for the requirement?- Named entity recognition.

Your team is planning on using the Face API. Can you use the Face API to group faces together based on similarity?- Yes.

Your team is planning on using the Face API. Can the Face API also detect a person even if they are wearing glasses?- Yes.

Your team is planning on using the Custom Vision service. They are going to build an object detector. Do you need to specify a domain when building the object detector?- Yes.

Your team is planning on using the Computer Vision service. Can you use the service to detect faces from images?- Yes

Your team is planning on using the Machine Learning Designer. Is the Machine Learning Designer a drag-and-drop interface that can be used to train and deploy models in Azure Machine Learning? – Yes.

Your team is planning on working with the Azure Machine Learning service. They need to set up the required compute target environments. Which of the following is the Azure Kubernetes Service target environment used for?- real time inference.

Your team is planning on working with the Azure Machine Learning service. They need to set up the required compute target environments. Which of the following is the Azure Machine Learning compute clusters used for?- batch inference.

Your team is planning on using Automated Machine Learning in Azure Machine Learning. Does Automated Machine Learning create a number of pipelines in parallel during model training?- Yes.

Multiple pipelines are created whilst training a model. Each pipeline is used to train a different algorithm.

Your team needs to train a model. Here the requirement is to find out whether an email is a spam. Which of the following type of Machine Learning algorithm needs to be used here?-Classification.

Your team is designing an AI system. Here they want to ensure that they provide customers with the required information and controls on what data is collected and how the data is stored. Which of the following Microsoft principle of AI does this come under?- Privacy and security.

Your team is designing an AI system. Here they want to ensure that the AI system is tested thoroughly before it can be used. Which of the following Microsoft principle of AI does this come under?- Reliability and safety.