#A) Get Started with AI--

Learning Path

Get Started with AI on Azure

Learn Module

Introduction to AI

- **Machine Learning**: Foundation of AI. Teaches a machine to learn based on data
- **Anomaly Detection**: Automatic error detection based on anomaly
- **Computer Vision**: Interpretation of images and video
- **Natural Language Processing (NLP)**: Interpret written or spoken language
- **Knowledge mining**: Information extraction from unstructured data

Machine Learning

Definition: The foundation for most AI solutions

How does it work:

- Machines (computers) learn from data
- Data Scientists use data to train machine learning models to make predicitons based on data.

Machine Learning on Azure

- **Automated ML (AutoML)**: Create effective ML models with no expertise needed
- **Azure ML Designer**: A GUI for no-code development of ML models
- **Data and Compute**: Cloud-based resources for data scientists tu run experiments
- **Pipelines**: A way to orchestrate tasks like training, validation, and deployment

Anomaly Detection

Definition: Analyzing data over time to identify unusual changes

Anomaly Detector: An Azure service with an API to create anomaly detection solutions

Computer Vision

Definition: Area of AI for visual processing based on interpretation of images and video

Models and capabilities

Task	Description
Image Classification	Classify images based on content. For example *is this a car or a bike?*
Object Detection	Classify individual objects and location within an image using a box
Semantic Segmentation	Similar to object detection that uses an overlay to color-code distinct objects
Image Analysis	Extract information from images including tags for easier cataloging
Face detection, analysis, and recognition	Finds human faces in an image. Can be used with facial geometry to recognize individuals
Optical Character Recognition (OCR)	Detect and extract text in images, like a road sign or building number

Azure Services

- **Computer Vision**: Analyse images and videos to extract descriptions, tags, objects and text
- **Custom Vision**: Customized image classification with your own images
- **Face**: Face detection and facial recognition solutions
- **Form Recognizer**: Information extraction from scanned documents

Natural Language Processing
Definition: Area of AI that understands written and spoken language
Uses:

- Analyze and interpret text in documents
- Interpret spoken language
- Translattion of written and spoken languages
- Interpret commands

Azure Services

- **Language**: Analyze text or spoken language to build smart applications
- **Translator**: Translation service for more than 60 languages
- **Speech**: Recognize and synthesize speech and translate to other languages
- **Azure Bot**: Conversational AI with the ability to connect to channels like email, Teams, and web chat

Knowledge Mining
Definition: Describe solutions about extracting information from unstructured data to create a searchable one
Azure Service: Azure Cognitive Search, and enterprise solution for building searchable indexes from private or public assets including analyzing images.

Challenges and Risks
Challenges or risks:

- **Bias**: Trained data might rely heavily on specific race, or geography
- **Errors**: Mistakes can cause harm (e.g. autonomus vehicles)
- **Exposing data**: Non-compliant solutions that don't remove Personal Identifiable Information (PII)
- **Accessibility**: A solution might not work with individuals with disabilities
- **Complex systems**: Users must trust how solutions are generated (e.g. from what data)
- **Liability**: Who/what is liable for decisions?

Responsible AI
AI development at Microsoft uses 6 principles:

- **Fairness:** AI systems should treat all people fairly
- **Reliability** & Safety: AI systems should work reliably and safely
- **Privacy & Security:** Respect privacy and consider security at all times, even after deployment
- **Inclusiveness**: Empower everyone regardless of ability, gender, and other factors
- **Transparency**: Systems shouold be understandable
- **Accountability**: People should be accountable. Engineers and designers should work with a governance framework

#B) Explore Visual Tools for ML --
Learning Path

Use Automated ML in Azure ML Studio
Learning Module

Definition: A way to predict unknown values with a model using math.
Types:

Supervised Requires a dataset with known labels

- Regression: Predicts a value like price
- Classification: Provides a binary (yes/no, 1/0) value

Unsupervised No known labels in the dataset

- Clustering: Create labels based on grouping items with similar information

Azure ML Studio

Definition: An Azure service that automates common ML tasks like training, deploying. Provides specialized cloud-compute to scale workloads

Offers a portal to interact with its features

Azure ML Workspace

Definition: A requirement to use Azure ML Studio. Allows to manage data, compute resources, code, models.

Azure ML Compute

Definition: Provides different compute resources types to work with ML

Compute types offered:

- **Compute instances**: A workstation-like compute to work with models and data
- **Compute Clusters**: Scalable VM clusters, on-demand workloads
- **Inference Clusters**: For deploying ML models and provide predictions
- **Attached Compute**: Links to existing compute resources in Azure

Azure Automated ML (AutoML)

Definition: Automatically tries different algorithms to train a model allowing you to choose which model is best

- Easier for beginners (no extensive Data Science knowledge needed)
- Operations are called *jobs*

Process:

1. *Prepare data*: Identify features, clean, transform data.
2. *Train model*: Split data (train and validation) and then train the model using the *training* data set
3. *Evaluate performance*: Compare results to known labels
4. *Deploy*: Use the model as an application like a service

Prepare data

Data for model training is called a dataset. You can create datasets in Azure

Train model

AutoML supports supervised ML models. It has to use known labels. Supervised training includes: Classification, Regression, and Time Series Forecasting

Evaluate performance

Happens after the "best" model is generated with the *exit criteria*. Use the **Residual Histogram** to show frequency of residual value ranges, and **Predicted vs. True** for correlatiton of values.

Deploy

Use Azure Container Instance (ACI) or Azure Kubernetes Service (AKS) cluster. AKS is recommended for production.

Create a Regression model with Azure ML Designer
Learning Module

Regression ML scenarios
Definition: Predicts a numeric result or outcome from variables (a.k.a features). E.g. A PC with N GB of RAM and X type of CPU processor can get a price prediction.

Type of ML: Supervised
Training involves both the features and the known values for the label
Examples:

- Predict home prices from house features
- Crop yield in farms from weather and soil quality
- Ad click-through from data from past campaigns

Azure ML Designer
Definiton: A visual UI with drag-and-drop elements to perform common ML actions like train, test, and deploy ML models. ML Designer projects are known as pipelines

Azure ML Pipelines
Definition: Steps to organize, manage, and reuse complex workflows across projects and users. It starts with the dataset. Results are stored in your workspace.

Azure ML Pipeline component
Definition: A single step in an ML pipeline, like a programming function (building bloc)

Azure ML Datasets
Definition: Register data assets in Azure from local files, datastores, web files, or Open Datasets.

Azure ML Jobs
Definition: A task for a compute target with tracking for runs and workflows. All runs are recorded and can be viewed in UI.

Steps for regression

1. Prepare data: Cleaning, pre-processing
2. Train model: Data split in training and validation sets. Training happens with the training dataset. Validation is for testing performance
3. Evaluate: Check predictions against known labels
4. Deploy: Get the model into a server for real-time (live) inference pipeline

Model Training with Azure ML Designer

Step	Dataset
Type of task (Linear Regression)	
Train Model	Split data with training dataset
Score Model	Split data with validation dataset

Performance Evaluation

- Mean Absolute Error (MAE): Average of predicted and true values
- Root Mean Squared Error (RMSE): Square root of the difference of predicted and true values
- Relative Squared Error (RSE): A value between 0 and 1 from square of difference between predicted and true values
- Relative Absolute Error (RAE): Value between 0 and 1 from absolute differences between predicted and true values

- Coefficient of Determination (R2): Variance predicted between predicted and true values. Closer to 1 means better model performance.

Deploy a prediction service

You must convert your training pipeline into a real-time inference pipeline. The process removes training components and adds a web service to handle requests.

After pipeline creation:

- Deploy it as an endpoint, wait for it to get in a healthy state
- Test it after deployment with sample data in JSON format
- Use credentials to consume the endpoint using authentication

Create a classification model with Azure ML Designer

Learning Module

Classification ML scenarios

Definition: Classification can predict a category (or class) for an item. Applies to binary and multi-class scenarios.

Type of ML: Supervised

Training also involves features and known values for the label.

Examples:

- Predict if a patient will become sick given clinical data
- Predict text sentiment (positive, neutral, negative)
-

Steps for classification

1. Prepare data: Cleaning, pre-processing
2. Train model: Data split in training and validation sets. Training happens with the training dataset. Validation is for testing performance
3. Evaluate: Check predictions against known labels
4. Deploy: Get the model into a server for real-time (live) inference pipeline

Confusion Matrix

Helps visualize true positives (both 1's) true negatives (both 0's) and false positives and negatives. Binary classification predicts one of two values.

	ACTUAL 1	ACTUAL 0
PREDICTED 1	869	377
PREDICTED 0	400	2377

Metrics:

- **Accuracy**: Ratio of correct predictions (true positives + true negatives)
- **Precision**: Fraction of cases that are true positives
- **Recall**: True positives divided by the number of true positives plus false negatives
- **F1 Score**: Overall metric from combining precision and recall

ROC curve and AUC Metric

ROC definition: Plotting the True Positive Rate against the False Positive Rate for every threshold value between 0 and 1.

AUC definition: Is the Area Under the Curve. For a ROC plot, the highes the area the better the model.

Create a clustering model with Azure ML Designer

Learning Module

Clustering ML scenarios
Definition: Groups similar items into clusters based on their features.
Type of ML: Unsupervised
Examples:

- Grouping of wines given their flavor characteristics
- Grouping of dishes given their ingredients and preparation type

Training and Steps for clustering

1. Prepare data: Cleaning, pre-processing
2. Train model: Data split in training and validation sets. Training happens with the training dataset. Validation is for testing performance
3. Evaluate: Check predictions against known labels
4. Deploy: Get the model into a server for real-time (live) inference pipeline

STEP	DATASET
TYPE OF TASK (K-MEANS CLUSTERING)	
TRAIN CLUSTERING MODEL	Split data with training dataset
ASSIGN DATA TO CLUSTERS	Split data with validation dataset

Evaluate performance

- Average Distance to Other Center: Average of each point to centroids in all other clusters
- Average Distance to Cluster Center: Average from centroid of the cluster
- Number of Points: Total number of points in the cluster
- Maximal Distance to Cluster Center: Maximum distances between each point and the centroid of that point

#C) Explore Computer Vision –
Learning Path

Analyze Images with the Computer Vision Service
Learning Module

Azure Computer Vision resources
Computer Vision definition: Specific to only Vision and no other service. Useful for tracking utilization and costs separately.
Cognitive Services definition: General cognitive services that includes Computer Vision
Key difference: Cognitive Service includes Computer Vision. Computer Vision is a smaller (specific) service

Two essential pieces of information are provided for these services:

- **key**: For authentication
- **endpoint**: An HTTP address to communicate with the resource (for Cognitive Services, the endpoint is always the same regardless of the service)

Analyze images with Computer Vision Service
These tasks are all part of the Computer Vision Service *specifically*

- **Describing an image**: Generate human readable description of image contents
- **Tagging visual features**: Recognized objects are suggested as tags for metadata to descibe attributes of the image
- **Detecting objects**: Similar to tagging, but creates a box surrounding the object along with the type of object
- **Detecting brands**: Identifies commercial brands

- **Detecting faces**: Detects and analyzses human faces, including age. Note: This is a *subservice* of Face Service (which has more functionality)
- **Categorizing an image**: Uses a parent/child hierarchy of categories from detected objects.
- **Detecting domain specific content**: **Optional Character Recognition (OCR)**: Detects printed and handwritten textt in images.

Other capabilities:

- Detecting image types like line drawings
- Detecting image color schemes like overall and dominant colors
- Thumbnail generation for smaller version of images
- Content moderation like adult content or violoent scenes

Classify images with the Custom Vision Service
Learning Module

Useful examples for this service:

- Product identification, like visual searches
- Disaster investigation, like identifying bridges and roads
- Medical diagnosis, like X-ray evaluation

Classification
Definition: Predict a category (or class) for an item. Uses inputs (features) to find the probability of a class and provide a label for it.

Image Classification: Classify an object from an image. Requires data made of features and labels from categorized images.

Azure Custom Vision Service
Definition: Service that includes common techniques for training image classification models, making it easy to create a software service with minimal knowledge of Convolutional Neural Networks (CNNs) and other deep learning techniques and then deploy them.

Azure Custom Vision resources
Custom Vision definition: A subservice of Cognitive Services for image classification exclusively enabling people with little to no ML experience to create image classification solutions Cognitive Services definition: General cognitive services that includes Custom Vision
Requires a **resource** in your Azure subscription which must be one of:

- **Custom Vision** (dedicated only for Custom Vision)
  - Must choose between training, prediction, or both.
  - Creates a separate endpoint for each
- **Cognitive Services** (Includes Custom Vision as well as other services)
  - Does not require to choose between training or prediction
  - Always has a single HTTP endpoint and key

Model training
Requires uploading images and label them with class labels. This can be done in the portal or with an SDK
Note: As with all ML training, the more images with labels the better the results. Key is to have objects from different angles.

Model evaluation
Custom Vision holds back some of the training data to evaluate using these metrics:

- **Precision**: Percentage of correct predictions
- **Recall**: Percentage of correct identifications
- **Average Precision (AP)**: Overall metric that uses precision and recall

Using the model
Requires the following for client applications to consume the model:

- **Project ID**: Unique ID of Custom Vision project that trained the model
- **Model Name**: The assigned model name
- **Endpoint**: The HTTP address that points to the published model
- **Key**: Used to authenticate

Detect objects in images with the Custom Vision Service
Learning Module

Object Detection Definition: Recognizes individual object in an image
Useful examples for this type of ML:

- Building safety by detecting extinguishers
- Assisted driving by detecting other cars and driving lanes
- Tumor detection from MRI or x-rays

Object classification vs. Object detection: classification classifies **an image** and detection classifies **individual objects within an image**

Azure Custom Vision
Definition: Helps create object detection models with minimal deep learning experience and less training images
Consists of three tasks:

1. Upload an tag images
2. Train the model
3. Publish the model

Two types of resources:

- **Custom Vision** (dedicated only for Custom Vision)
  - Must choose between training, prediction, or both.
  - Creates a separate endpoint for each
- **Cognitive Services** (Includes Custom Vision as well as other services)
  - Does not require to choose between training or prediction
  - Always has a single HTTP endpoint and key

Image Tagging
Training image models requires tagging classes and bounding box coordinates in training images.

- Custom Vision Portal provides a UI for this process to make it easier.
- Ensure you have sufficient images and from different angles

Model evaluation
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Detect and analyze faces with the Face Service
Learning Module

Definition of Face detection and analysis: Locates and analyzises human faces in images or video, returning bounding box coordinates around a face
Facial analysis: Aside from detection, other information including *facial landmarks* can be used as features to train a machine learning model Facial recognition: Identifies individuals given their facial features
Example uses of face detection and analysis:

- Security: For unlocking of devices or areas in a building
- Social media: For tagging of known friends on images
- Missing persons: For finding missing individuals from public camera systems

Services for face analysis on Azure:

- **Computer Vision**
- **Video Indexer**
- **Face**

Azure Face
Definition: Service that returns the rectangle coordinates for human faces in an image
Includes attributes like:

- Blur
- Exposure
- Glasses
- Head pose (orientation)
- Noise (in image)
- Occlusion (objects blocking)

Responsible AI: Azure limits the service unless an intake form is submitted to enable face comparision and ability to identify *named* indivisuals in an image
Two types of resources for Face service:

- **Face**: Dedicated only for Face
- **Cognitive Services**: Includes Azure Face as well as other services

Both resources alwyas provide a key and an endpoint.
Key difference from other services: **Face** does not make you choose between training, prediction or both which generates more than one endpoint Note on facial detection: Best results are obtained with frontal facing faces

Read text with the Computer Vision Service
Learning Module

OCR (Optical Character Recognition) allows AI to read text in images.
Vision intersects with Natural Language Processing.

Uses of OCR:

- Note taking
- Digitizing forms like medical records
- Scanning hand writing

Azure Read API

Definition: Exclusively handled by Computer Vision service which includes image analysis capabilities. Can handle scanned documents with lots of text.

Works asynchronously since it can handle large documents. Process requires:

1. Submitting image(s) which responds with an ID
2. Use the ID to check if processing is complete
3. Retrieve results on completion

Results include:

- **Pages**: Metadata on each page submitted
- **Lines**: Number of lines of text
- **Words**: Words in a line of text with coordinates

Two types of resources for the Read API:

- Computer Vision: Specific to only Vision and no other service. Useful for tracking utilization and costs separately.
- Cognitive Services: General cognitive services that includes Computer Vision

Both resources alwyas provide a key and an endpoint.

Computer Vision provides a single API to read text in images: the **Read** API.

Analyze receipts with the Form Recognizer Service

Learning Module

Definition: Provides text from digitized documents using OCR (Optical Character Recognition) as well as structured data from forms including receipts.

Examples:

- Retrieve address and phone number for a merchant from a receipt
- Create structured data that can tell you quantity and price for each item in a receipt

Two types of automated processing:

- **Pre-built receipt model**: Ready-to-use model for parsing data from receipts
- **Custom models**: Extracts key/value pairs from forms by training models using *your own data*

Two resources to use the Form Recognizer service:

- **Form Recognizer**: Only has access to the Form Recognizer Service
- **Cognitive Services**: Includes the Form Recognizer Service

Both resources always provide a key and an endpoint.

Pre-built model works for English receipts with data common to the US. Can extract information like:

- Taxes
- Items with prices and count
- Merchant information
- Dates and times
- All other extra data

Vision Services chart

Cognitive Services is the parent service for all Vision and Text related services which provides a single interface (API)

SERVICE NAME	PART OF OTHER SERVICE	ENDPOINTS GENERATED
COMPUTER VISION	Cognitive Services	1
CUSTOM VISION	Cognitive Services	1 of training, prediction, or both
AZURE FACE	Cognitive Services	1
COGNITIVE SERVICES		1 for all other included services

#D) Explore Natural Language Processing (NLP)--

Learning Path

Definition of NLP: Process of analysing, evaluating text (from a document or a phrase) to get context, meaning, and insights.

Analyze text with the Language Service

Learning Module

Definition: Part of Azure Cognitive Services that can perform advanced NLP processing on text

The service can:

- Detect text language
- Provide sentiment analysis
- Extract key phrases
- Identify and categorize entities like dates, places, and people

Resources:

- **Language**: Exclusively for that service, does not have access to any other cognitive service
- **Cognitive Services**: Provides other services including Language

Language Detection

Definition: Service that detects the language of the text. Allows for multiple documents at a time for analysis

Provides the following for each doc:

- Language name
- ISO 6391 language code (e.g. "es")
- Score of confidence

Predominant language is always chosen even on mixed language text. Can provide an **unknown** value if it can't detect the language with a **NaN** for score (Not a Number)

Sentiment Analysis

Definition: Ability to provide a positive, neutral, or negative sentiment in text.

Useful for:

- Customer reviews
- Discussion forums
- Social media analysis

Provides a score between 0 and 1, where 1 is positive and 0 is negative. 0.5 is considered neutral or **indeterminate**

Key phrase extraction

Definition: Ability to evaluate text and identify main talking points.

Language Service can parse unstructured text and produce entities like:

TYPE	SUB TYPE	EXAMPLE
QUANTITY	Number	"fifty"
DATETIME	Date	"August 3rd"
DATETIME	DateRange	"Monday to Wednesday"
EMAIL		"admin@example.com"

Recognize and synthesize speech
Learning Module

- **Speech Recognition**: Detect and interpret spoken input
- **Speech synthesis**: Generate spoken output

Speech Recognition
Converts speech (spoken language) into data for processing using multiple models, for example:
- An acoustic model to convert audio signals into phonemes
- A language model to convert phonemes to words or sequence of words

Example usage:
- Closed Captions
- Meeting transcipts
- Note taking (Speech to text)

Speech synthesis
Definition: Opposite of Recognition: it turns text into speech breaking text down to words and assiging phonetic sounds to each word.

Example usage:
- Responding to commands or input
- Voice menus for telephone systems
- Reading websites or email messages

Azure Speech
Definition: A service from the Cognitive Services group which includes two APIs: **Speech-to-Text** and **Text-to-Speech**
Resources possible:
- **Speech**: For speech related tasks exclusively
- **Cognitive Services**: Includes the Speech service in addition to other services. Use this when using other services aside from Speech.

Translate text and speech
Learning Module

Definition: Speech translation translates languages either directly (speech-to-speech) or using text as an intermediate step.
Literal and semantic translation: AI systems should take into account the context for proper translations, not only literal because it might provide insufficient or incorrect meaning.
Text translation is used for documents like emails, PDFs, and websites.
Speech translattion is used for spoken languages, either directly (speech-to-speech) or indirectly with speech-to-text.

Translator Service
Definition: Analyzes *semantic* context of text for text-to-text translations. 60 languages supported.
Requires specifying the source language to one or more destination languages for translations (one-to-many). It is possible to use cultural variants like Spanish from Spain or from Mexico.
Additional configurations:
- Profanity filtering
- Selective translation: Useful when trying to avoid a literal translation of something that doesn't make sense to translate like a name, or brand.

Speech Service
Definition: Analyzes speech or spoken audio to text, and can create spoken audio from text. Both can also get translated.
Provides the following services via APIs:
- **Speech-to-text**
- **Text-to-speech**
- **Speech-translation**

Example usage: real-time closed-captioning of spoken audio (e.g. via video)

Create a language model with Conversational Language Understanding
Learning Module

The main service in Azure is the **Language Service**
Three main concepts:

- **Utterance**: A sentence or phrase a user might say for a system to react, like "turn the lights on"
- **Entity**: A specific item within an utterance. For example in "what is the weather today?", the "weather" is the entity. Sometimes there is no entity.
- **Intent**: The goal or objective in an utterance. "Weather Status" might be the intent for many different utterances

Note: There is a None intent is a *fallback* when no other intents are matched, and is helpful to handle utterances that don't map anything else. It is always created in Conversational Language Understanding app, but left empty. It can't be deleted.

Conversational Language Understanding
Definition: A service to help build application without having much ML experience or knowledge.
Service requires two main tasks:

1. Define entities, intents, and utterances for training the model (a.k.a. authoring a model)
2. Publish the model so that client applications can use it for intent and entity prediction based on input

Resources possible:

- **Language Service**: A resource to build apps, use it if only requiring this service exclusively.
- **Cognitive Services**: Includes the Conversational Language Understanding service along with other cognitive services

Authoring
Use pre-built *domains* that includes pre-defined intents and entities for common uses that you can build on.
Note: order of entities/intents do not matter

Add the intents with the Portal (although you can write code for it). Use the portal for authoring, but SDK for predictions
Intents
There are 4 types:

1. **Machine Learned**: Model learns from sample utterances you provide
2. **List**: Allows a hierarchy of lists/sublists. Like *device* might be a light -> lamp -> night stand
3. **RegEx**: Entities as a regular expression that describes a pattern
4. **Pattern.any**: Entities with patterns to solve complex scenarios that are hard to extract from utterances

Training
After entities and utterances are defined, use the service to train and test the model. Use sample utterances to see if intents and entities are recognized correctly.

Predicting
After verification of training predictions, you publish the application to a *prediction resource for consumption*
Clients can use the prediction to take actions based on predicted intent.

Build a bot with the Language Service and Azure Bot Service
Learning Module

Conversations can happen in different channels including email and text messages. It requires a **knowledge base** and a a **bot service** to provide an interface.
In Azure it requires two core services:

1. **Language Service**: Includes question answering to create a knowledge base for querying later
2. **Azure Bot Service**: The framework for creating, publishing, and managing bots on Azure

Custom Knowledge base
Must create a **Language Service** resource.
Define Q&A. Use the *Language Studio* custom Q&A to create a knowledge base. Enter them manually or with an existing FAQ document or website (or a combination of both).

Test the knowledge base using the Language Studio and reviewing the answers after the model has been processed.
Use the knowledge base: Over an API (REST interface) that requires an ID, the endpoint, and the Authorization key

Azure Bot Service
Build it using the Bot Framework SDK to write code for conversation flow control.
Easier with the *automatic bot creation* functionality using the knowledge base automatically.
Extend and configure

- Extend by adding custom code
- Test the bot in an interactive test
- Configure logging and analytics

Connect channels
Bots can use more than one channel. Including Microsoft Teams, web chat, and email.

#E) Explore Decision Support--
Learning Path

Introduction to Anomaly Detector
Learning Module

Definition: An AI technique to detect if values in a series are within expectations.
Example scenarios:

- Monitoring machine systems like HVAC
- Cloud services usage over time

Anomaly Detector service
Definition: Part of the Decision Services category in Azure Cognitive Services. Exposes a REST API. The service can detect real-time data or historical data.
Requires a *boundary* set with a sensitivity value. By default, *upper* and *lower* boundaries are calculated by including the expected value.

Data Format
The REST API uses JSON that uses *granularity* (in time, e.g. "hourly"), the timestamp and the value for each timestamp.
There is a max of values that can be sent to the API of 8640.
Streaming is possible sending a single value at a time.
Use interpolation to fill in gaps of measurements if there is more than 10% missing.

Use cases

- **Batch detection** Best when the data is almost flat, with some spikes or dips, or a seasonal time series data with some anomalies. Example: Compliance on temperature control for medicine
- **Real-time detection** Best when requiring the latest measurement to be detected as normal or an anomaly. Every new data point is compared to past (seen) data points. Example: Current temperature while bottling carbonated drinks.

Test link (demo)
https://free-braindumps.com/microsoft-braindumps-free.html
https://www.examtopics.com/exams/microsoft/ai-900/
https://tutorialsdojo.com/ai-900-microsoft-azure-ai-fundamentals-sample-exam-questions/
https://kaustubhsharma.com/quiz

Question Answer Session -

Test Prep

Latest Submission Grade 90%

1. **Which description best defines the Azure Machine Learning Designer?** 1 / 1 point

- ○ This is a software development environment for data design.
- ◉ This is a graphic interface enabling no-code development of machine learning solutions.
- ○ This is a programmatic interface that requires code to develop machine learning solutions.

Correct
Azure Machine Learning Designer is a graphical interface that enables no-code development of machine learning solutions.

2. **There are challenges and risks associated with developing AI solutions. Which of the following statements is true?** 1 / 1 point

- ○ An AI algorithm is always correct.
- ◉ Bias can affect results.
- ○ Humans are not responsible for AI-driven decisions.
- ○ AI solutions are always more reliable than humans.

Correct
Feedback. AI systems can inadvertently incorporate bias based on gender, ethnicity, or other factors that can result in an unfair advantage or disadvantage to specific groups of people.

3. **Suppose you're creating a software system that tracks activity in an automated production line and you want it to be able to identify failures. What AI cognitive service should you implement in the development of the system?** 1 / 1 point

- ○ Form Recognizer
- ○ Computer Vision
- ◉ Anomaly Detector

Correct
These types of scenario can be addressed by using anomaly detection - a machine learning based technique that analyzes data over time and identifies unusual changes.

4. **Designers and developers of AI solutions should adhere to a framework of governance and organizational principles and ensure that the solution meets ethical and legal standards. Which principle is that?** 0 / 1 point

- ◉ Transparency
- ○ Privacy and Security
- ○ Accountability

Incorrect
Try going back and reviewing *Considerations for Accountability in AI*.

5. **What is the technique used in AI systems that can identify and read text from images?** 1 / 1 point

- ○ Custom vision
- ◉ Optical Character Recognition
- ○ Natural Language Processing

Correct
OCR can be used to read text in photographs (for example, road signs or store fronts) or to extract information from scanned documents such as letters, invoices, or forms.

6. **Creating software that has the capability to interpret commands and determine appropriate actions is a consideration of which AI area?** 1 / 1 point

- ◉ Natural Language Processing
- ○ Computer Vision
- ○ Conversational AI

Correct
NLP is the area of AI that deals with creating software that understands written and spoken language.

7. **True or False?** 1 / 1 point

AI should bring benefits to some part of society or some specific groups of people.

- ○ True
- ◉ False

Correct
AI should bring benefits to all parts of society, regardless of physical ability, gender, sexual orientation, ethnicity, or other factors.

8. **Which cognitive service enables you to build a knowledge base of questions and answers that can form the basis of a dialog between an AI agent and a human?** 1 / 1 point

- ○ Azure Bot Service
- ◉ QnA Maker
- ○ Form Recognizer

Correct
QnA Maker is a cognitive service that enables you to quickly build a knowledge base of questions and answers that can form the basis of a dialog between a human and an AI agent.

9. **Which three types of AI workloads could be combined to facilitate a human engaging with an AI agent to submit a suitable profile photo?** 1 / 1 point

Select all that apply.

- ☑ Conversational AI

Correct
In this case you could use a combination of Computer Vision, Conversational AI, and Natural Language Processing workloads.

- ☑ Natural Language Processing

Correct
In this case you could use a combination of Computer Vision, Conversational AI, and Natural Language Processing workloads.

- ☑ Computer Vision

Correct
In this case you could use a combination of Computer Vision, Conversational AI, and Natural Language Processing workloads.

- ☐ Anomaly detection

10. **Which of the following human attributes can AI imitate?** 1 / 1 point

Select all that apply.

- ☐ Critical thinking for moral, ethical, and humane behaviour
- ☑ Making decisions based on past experiences

Correct
AI can make prediction and draw conclusions from data, detect errors or unusual activity in a system, and interpret written or spoken language. However, it is not capable of critical thinking for moral, ethical, and humane behavior.

- ☑ Recognizing abnormal events

Correct
AI can make prediction and draw conclusions from data, detect errors or unusual activity in a system, and interpret written or spoken language. However, it is not capable of critical thinking for moral, ethical, and humane behaviour.

- ☑ Understanding written and spoken language

Test prep

Latest Submission Grade 88%

1. **You are planning on creating an AI solution that will use Computer Vision capabilities.To access the APIs, what two pieces of information do you need to use?** 1 / 1 point

Select two options.

- ☑ A key

Correct
To use Computer Vision, you need the endpoint and the key of the service.

- ☐ A connection string
- ☑ An endpoint

Correct
To use Computer Vision, you need the endpoint and the key of the service.

2. **You trained a Custom Vision model, you're satisfied with its evaluated performance and you've also published the model to your Azure resource. To use the model to make predictions, what information do developers need to use?** 0.8 / 1 point

Select all options that apply.

- ☑ Prediction endpoint

Correct
To use the model, client application developers need the following information: Project ID, model name, prediction endpoint, and prediction key.

- ☐ Model name
- ☑ Prediction key

Correct
To use the model, client application developers need the following information: Project ID, model name, prediction endpoint, and prediction key.

- ☐ Recall value
- ☑ Project ID

Correct
To use the model, client application developers need the following information: Project ID, model name, prediction endpoint, and prediction key.

You didn't select all the correct answers

3. **You want to build a solution that needs to detect images that contain adult content or depict violent, gory scenes. Which service would you use to achieve the task?** 0 / 1 point

- ○ A combination of both services
- ◉ Custom Vision
- ○ Computer Vision

Incorrect
Try going back and reviewing *Get started with image analysis on Azure*.

4. **True or False?** 1 / 1 point

To use the image classification capability with Custom Vision, you just have to deploy the service and then start generating predictions.

- ○ True
- ◉ False

Correct
Creating an image classification solution with Custom Vision consists of two main tasks. First, you must use existing images to train the model, and then you must publish the model so that client applications can use it to generate predictions.

5. **You plan on creating a solution that will scan a gallery of photos for images that contain product placement. Which capability of Computer Vision should you use?** 1 / 1 point

- ◉ Detect brands
- ○ Categorize an image
- ○ Detect domain-specific content

Correct
The *detect brands* capability can help in identifying brands, and works well for product placement.

6. **You want to use the Computer Vision service with images where the dominant foreground color is red. Which of the following capabilities should you use?** 1 / 1 point

- ◉ Detect image color schemes
- ○ Optical character recognition
- ○ Detect image types

Correct
Detect image color schemes capability can identify the dominant foreground, background, and overall colors in an image.

7. **True or False?** 1 / 1 point

To train a classification model, you must upload images to your training resource and label them with the appropriate class labels.

- ◉ True
- ○ False

Correct
To train a classification model, you must upload images to your training resource and label them with the appropriate class labels.

8. **You are training your image classification model and you realize that some images are not classified correctly. What should you do to improve the model?** 1 / 1 point

- ○ C. Reduce the number of images used for the training set
- ○ Add new labels to the model
- ◉ Add additional images to the training set

Correct
The more images in the training set, the better the model will understand patterns and the more accurate its predictions will be.

9. **You are creating a solution that needs to identify if celebrities are present in images and also to determine their age. What capabilities should you take into account?** 1 / 1 point

Select all options that apply.

- ☐ Categorize an image
- ☑ Detect faces

Correct
You can detect celebrities with the *detect domain-specific content* feature, while the age can be determined by the *detect faces* feature.

- ☑ Detect domain-specific content

Correct
You can detect celebrities with the *detect domain-specific content* feature, while the age can be determined by the *detect faces* feature.

10. **You are creating a solution that needs to extract handwritten text from several image scans. Which Computer Vision capability should you use?** 1 / 1 point

- ○ Describe an image
- ◉ Optical character recognition
- ○ Detect domain-specific content

Correct

Test prep

Latest Submission Grade 100%

1. **You have built a solution that detects objects in images. You are using the same endpoint and key to predict as you usedwhen you trained the model. What type of service are you using?** 1 / 1 point

- (•) Cognitive Service
- ( ) Computer Vision
- ( ) Custom Vision

Correct
The simplest approach is to use a general Cognitive Services resource for both training and prediction.

2. **You plan on using object detection. After you have trained your model, you want to assess the performance of the model. Which performance metrics are available for you to analyze?** 1 / 1 point

Select all options that apply.

- [x] Precision

Correct
At the end of the training process, the performance for the trained model is indicated by the following evaluation metrics: precision, recall, and mean average precision (mAP).

- [x] Recall

Correct
At the end of the training process, the performance for the trained model is indicated by the following evaluation metrics: precision, recall, and mean average precision (mAP).

- [x] Mean average precision

Correct
At the end of the training process, the performance for the trained model is indicated by the following evaluation metrics: precision, recall, and mean average precision (mAP).

- [ ] Project ID

3. **You created a solution the makes use of object detection. You deployed two separate resources in Azure – one that manages the training of the model, and one that manages the predictions. To which endpoint should you make calls to generate predictions?** 1 / 1 point

- ( ) Training endpoint
- (•) Prediction endpoint
- ( ) Any endpoint (prediction or training), both will work

Correct
To generate predictions, it must be used the HTTP address of the endpoint for the prediction resource to which you published the model.

4. **True or False?** 1 / 1 point

Object detection is a form of machine learning-based computer vision in which a model is trained to recognize individual types of objects in an image, and to identify their location in the image.

- (•) True
- ( ) False

Correct
Object detection is a form of machine learning-based computer vision in which a model is trained to recognize individual types of objects in an image, and to identify their location in the image.

5. **Which of the following application examples are a good fit to use object detection?** 1 / 1 point

Select all options that apply.

- [x] Medical imaging such as an MRI or x-rays that can detect known objects for medical diagnosis

Correct
Object detection can be used in many scenarios, all scenarios listed being a good fit.

- [x] Creating software for self-driving cars or vehicles with lane assist capabilities

Correct
Object detection can be used in many scenarios, all scenarios listed being a good fit.

- [ ] Determining the color of clothes
- [x] Evaluating the safety of a building by looking for fire extinguishers or other emergency equipment

Correct
Object detection can be used in many scenarios, all scenarios listed being a good fit.

6. **You are using the object detection capability toevaluate the performance metrics of the trained model. You observe that the recall metric has a value of 0.7. What does this mean?** 1 / 1 point

- ( ) The model identified the class in 30% of the images
- ( ) The model predicted correctly 70% of the images
- (•) The model identified the class in 70% of the images

Correct
Recall metric specifies what percentage of the class predictions made by the model were correct.

7. **What key considerations should you make when tagging training images for object detection?** 1 / 1 point

- [ ] Repeating the same images in the training set
- [x] Having images of the objects in question for multiple angles

Correct
Key considerations when tagging training images for object detection are ensuring that you have sufficient images of the objects in question, preferably from multiple angles; and making sure that the bounding boxes are defined tightly around each object.

- [x] Ensuring sufficient images of the objects in question

Correct
Key considerations when tagging training images for object detection are ensuring that you have sufficient images of the objects in question, preferably from multiple angles; and making sure that the bounding boxes are defined tightly around each object.

- [x] Making sure the bounding boxes are defined tightly around each object

Correct
Key considerations when tagging training images for object detection are ensuring that you have sufficient

Test prep

Latest Submission Grade 87.5%

1. **You are planning on creating an AI solution that will use a custom model of Form Recognizer. What file extensions does the service support?** 1 / 1 point

Select all options that apply.

- [ ] DOCX
- [x] PDF

Correct
When using a custom model, images must be JPEG, PNG, BMP, PDF, or TIFF formats.

- [ ] TXT
- [x] PNG

Correct
When using a custom model, images must be JPEG, PNG, BMP, PDF, or TIFF formats.

- [x] JPG

Correct
When using a custom model, images must be JPEG, PNG, BMP, PDF, or TIFF formats.

2. **You are planning on creating an AI solution that will use a pre-built receipt model of Form Recognizer. Which of the following key information is the model able to extract.** 1 / 1 point

Select all options that apply.

- [x] Taxes paid

Correct
The model is able to extract key information from the receipt slip, such as time of transaction, taxes paid, or receipt totals.

- [x] Receipt totals

Correct
The model is able to extract key information from the receipt slip, such as time of transaction, taxes paid, or receipt totals.

3. **When using a custom model with Form Recognizer, what is the minimum image size recommended?** 0 / 1 point

- (•) 40x40 pixels
- ( ) 50x50 pixels
- ( ) 30x30 pixels

Incorrect
Try going back and reviewing *Get started with receipt analysis on Azure*.

4. **True or False?** 1 / 1 point

The Read API is a better option for analyzing scanned documents that have a lot of text.

- (•) False
- ( ) True

Correct
Feedback: The Read API is a better option for analyzing scanned documents that have a lot of text.

5. **When you use theRead API to process an image, what hierarchy of information does it return?** 1 / 1 point

- (•) First pages, then lines, then words
- ( ) First words, then lines, then pages
- ( ) First lines, then pages, then words

Correct
The results from the Read API are arranged into the following hierarchy: first pages, then lines, then words.

6. **You are building a solution that needs to detect if people are wearing make-up. What API should you use?** 1 / 1 point

- (•) Face API
- ( ) OCR API

Correct
Face API returns an attribute that points out if people detected in an image wear make-up.

7. **You plan to implement a solution that will compare a photo from an ID card with a selfie taken by an individual to determine if it is the same person in both images. What API should you use to achieve this?** 1 / 1 point

- ( ) C: Form Recognizer API
- ( ) B: OCR API
- (•) A: Face API

Correct
Face offers the ability to compare two images to determine if it is the same person through its face verification capability.

8. **You plan on implementing a solution that will scan ID cards and extract relevant metadata such as name, ID number, address, as well as determining what hair color does the person has. Which APIs should you use to achieve this?** 1 / 1 point

Select all options that apply.

- [x] A: Face API

Correct
Face returns an attribute that points to the hair color of the person identified, while OCR helps on extracting text from the ID.

- [ ] C: Form Recognizer API
- [x] B: OCR API

Correct

Azure AI Fundamentals – [AZ-900T00]

Full Practice Exam

Latest Submission Grade 91.5%

1. Tradewind Traders is planning to migrate some of their data and resources to Azure cloud services. Management has decided to only make use of the Platform as a Service (PaaS) offerings in Azure. You have been asked to design a migration plan. As part of this design, you have included the creation of Azure App Services and Azure virtual machines that will run MySQL databases. 1 / 1 point

Does this design meet the requirements of the Organisation?

- ○ Yes
- ◉ No

Correct
Azure App Service is a PaaS (Platform as a Service) service. However, Azure virtual machines are an IaaS (Infrastructure as a Service) service. Therefore, this design does not meet the requirements.

2. Tradewind Traders has recently migrated some of its data and resources to Azure cloud services. The company has developed an Azure web app. They require that the settings for the app be configurable if needed from an iPhone. What are two Azure management tools that you can use from the iPhone? 1 / 1 point

Select all options that apply.

- ☑ Azure portal

Correct
The Azure portal is a web-based portal for managing Azure. Being web-based, you can use the Azure portal on an iPhone.

- ☐ Windows PowerShell
- ☐ Azure CLI (Command Line Interface)
- ☑ Azure Mobile App

Correct
With Azure Mobile App you can monitor the health and status of your Azure resources. Quickly diagnose and fix issues. Run commands to manage your Azure resources. Data is secure and encrypted.

3. Tradewind Traders has recently migrated to Azure cloud services. The company has just completed a review of its current configuration and has discovered that there is a selection of unused resources currently in existence including multiple AD accounts, multiple groups, multiple public IP addresses, and multiple network interfaces. The company wants to reduce costs to a minimum. You recommend removing the unused Public IP addresses. Will this reduce the monthly costs? 1 / 1 point

- ◉ Yes
- ○ No

Correct
You are charged for public IP addresses. Therefore, deleting unused public IP addresses will reduce the Azure costs.

4. Tradewind Traders' current on-premises datacenter has several hundred servers and available resources in the datacenter are currently very low. Management has asked you to research a solution that will allow for increased resources but will keep expenditure such as capital expenditure and operational expenditure at a minimum. What solution should you recommend? 1 / 1 point

- ◉ Create a hybrid cloud
- ○ Create an additional datacenter
- ○ Create a new Private cloud
- ○ A complete migration to the public cloud

Correct
A hybrid cloud is a combination of a private cloud and a public cloud. With a hybrid cloud, you can continue to use the on-premises servers while adding new servers in the public cloud. Adding new servers in Azure minimizes the capital expenditure costs.

5. Tailwind Traders has recently migrated to Azure cloud services. The development departments are currently working on new IoT applications and require a managed service hosted in the cloud that acts as a central message point for bi-directional communication between their IoT application and the devices it manages. 1 / 1 point

Which of the following will provide this solution?

- ○ Azure Sphere
- ◉ Azure IoT Hub
- ○ Azure IoT Central

Correct
You can use Azure IoT Hub to build IoT solutions with reliable and secure communications between millions of IoT devices and a cloud-hosted solution backend.

6. Tradewind Traders has recently migrated to Azure cloud services. The company is reviewing its support plans. You have been asked to determine which support plan will provide best practice information, health status and notifications, and 24/7 access to billing information at the lowest possible cost. Which support plan should you choose? 0 / 1 point

- ○ Standard support plan
- ○ Basic
- ◉ Developer
- ○ Premier

Incorrect
Developer support is chargeable and also provides support for third-party software with interoperability and configuration guidance and troubleshooting.

7. Tradewind Traders is planning to migrate some of their data and resources to Azure cloud services. Management has asked you to design a deployment plan that will guarantee services running on virtual machines will continue to operate in the event a single datacenter fails. As part of this design, you will deploy virtual machines to two or more availability zones. 1 / 1 point

Does this design meet the requirements of the Organisation?

- ◉ Yes
- ○ No

Correct
Availability zones expand the level of control you have to maintain the availability of the applications and data on your VMs. An Availability Zone is a physically separate zone, within an Azure region. Each Availability Zone has a distinct power source, network, and cooling.

8. Tradewind Traders has recently migrated some of its data and resources to Azure cloud services. The company requires a solution that will allow for automation of the deployment of similar resources across multiple business units. Which of the following solutions should you recommend? 1 / 1 point

- ○ Azure API Management service
- ○ Virtual machine scale sets
- ◉ Azure Resource Manager templates
- ○ Management groups

Correct
You can use Azure Resource Manager templates to automate the creation of the Azure resources. Deploying resources through templates is known as Infrastructure as code.

9. Tradewind Traders has recently migrated to Azure cloud services. The company is reviewing its support plans. You have been asked to identify the lowest-cost support plan that allows 24 x7 access to support engineers by phone. Which of the following support options allow this at a low cost? 1 / 1 point

- ○ Azure Developer support plan
- ○ Azure Professional Direct support plan
- ◉ Azure Standard support plan
- ○ Azure Basic support plan

Correct
The Basic support plan is free so is, therefore, the cheapest. The Developer support plan is the cheapest paid for support plan. The order of support plans in terms of cost ranging from the cheapest to most expensive is Basic, Developer, Standard, Professional Direct, Premier. However, 24/7 access to technical support by email and phone is only available for Standard, Professional Direct, Premier plans.

10. Tradewind Traders is planning to migrate to Azure cloud services. Management has asked you to research some of the main features of cloud services. Based on your research, which of the following statements is correct? 1 / 1 point

- ○ An Azure region contains one or more datacenters that are connected by using a high latency network.
- ○ An Azure region is found in each country where Microsoft has a subsidiary office.
- ◉ An Azure region contains one or more datacenters that are connected by using a low-latency network.
- ○ An Azure region can be found in every country in Europe and the Americas only.

Correct
An Azure region is a set of datacenters deployed within a latency-defined perimeter and connected through a dedicated regional low-latency network.

11. Tradewind Traders has recently migrated some of its data and resources to Azure cloud services. As part of their future planning, management has requested information on cloud services that will provide a set of version control tools to manage the developer's code. Which of the following will satisfy this requirement? 1 / 1 point

- ○ Azure Storage
- ○ Azure DevTest Labs
- ◉ Azure DevOps Repos
- ○ Azure Cosmos DB

Correct
Azure DevOps Repos is a set of version control tools that you can use to manage your code. Azure DevOps repos are a set of repositories that allow you to version control and manage your project code. It helps to work and coordinate code changes across a team.

12. Tradewind Traders is planning to migrate its data and resources to Azure cloud services. The company has many independent departments and as part of this migration, the company wants to allow each department to use different payment options for the resources allocated to them. Which of the following will allow you to configure different payment options for each department? 1 / 1 point

- ○ Multiple Container Instances
- ◉ Multiple Subscriptions
- ○ Multiple Resource Groups
- ○ Multiple Reservations

Correct
There are different payment options in Azure including pay-as-you-go (PAYG), Enterprise Agreement (EA), and Microsoft Customer Agreement (MCA) accounts. Your Azure costs are per subscription. You are charged monthly for all resources in a subscription. Therefore, to use different payment options per department, you will need to create a separate subscription per department.

13. Tradewind Traders are in the process of migrating their resources to Azure cloud services. Currently, they have several VMs deployed to their Azure subscription. Management has asked you to research how their on-premises users will be able to securely access the resources that have been migrated to Azure. Based on that research, which of the following will you need to create to implement this solution? 1 / 1 point

Select all options that apply.

- ☐ An Application Gateway
- ☑ A Gateway Subnet

Correct
The virtual network gateway needs to be located in a dedicated subnet in the Azure virtual network. This dedicated subnet is known as a gateway subnet.

Note: a virtual network (answer 0) is also required. However, as we already have virtual machines deployed in Azure, we can assume that the virtual network is already in place.

- ☑ A Virtual Network Gateway

Correct
To implement a solution that enables the client computers on your on -premises network to communicate to the Azure virtual machines, you need to configure a VPN (Virtual Private Network) to connect the on-premises network to the Azure virtual network. The Azure VPN device is known as a Virtual Network Gateway.

- ☐ A Load Balancer
- ☐ A Virtual network

14. Tradewind Traders has recently migrated some of its data and resources to Azure cloud services. Management wants to implement security that will limit the applications that can run on certain virtual machines. Which of the following approaches provide such a solution? 1 / 1 point

- ◉ Implement an application control rule in Azure Security Center.
- ○ Connect the virtual machines to Azure Sentinel.
- ○ Administrators periodically review which applications are running on each VMs by creating and running PowerShell scripts.

Correct
With Azure Security Center, you can define a list of allowed applications to ensure that only applications you allow can run. Azure Security Center can also detect and block malware from being installed on your VMs.

15. Tradewind Traders has recently migrated to Azure cloud services. Users have deployed multiple resources since the migration however today one of the developers has received a message when creating several SQL database instances stating that that the Azure subscription limits must be increased. What must be done to increase this limit? 0 / 1 point

- ○ Create a service health alert
- ◉ Upgrade your support plan
- ○ Create a new support request.
- ○ Modify an Azure policy

Incorrect
Many Azure resources have quota limits. The purpose of the quota limits is to help you control your Azure costs. It is common to require an increase to the default quota. You can request a quota limit increase by opening a support request. Selecting your subscription and the service you want to increase the quota in this case SQL Database Managed Instance would be the quota type.

16. Tradewind Traders is planning to migrate to Azure cloud services but before they do, management has asked you to spend some time researching the Database solutions available in Azure with specific regard to the use of multiple APIs. Based on your research, which of the following cloud database solutions is most appropriate to provide this feature? 1 / 1 point

- ◉ Azure Cosmos DB
- ○ Azure Database for PostgreSQL
- ○ Azure Database for MySQL
- ○ Azure SQL Database

Correct
Cosmos DB's level of flexibility means that as you migrate your company's databases to Azure Cosmos DB, your developers can stick with the API where they're most comfortable.

17. Tradewind Traders has recently migrated some of its data and resources to Azure cloud services. Management requires that users can create virtual machines by using their Android tablets. You recommend that they use the Azure portal. Will this recommendation work? 1 / 1 point

- ◉ Yes
- ○ No

Correct
The Azure portal is a web-based, unified console that provides an alternative to command-line tools. With the Azure portal, you can manage your Azure subscription using a graphical user interface. Being web based, the Azure portal can be run on a browser from a tablet that runs the Android operating system.

18. Tradewind Traders is planning to migrate its data and resources to Azure cloud services. The company has asked you to research Azure Single Sign On. Based on your research, is the following statement correct in respect of Single Sign-On in Azure? 1 / 1 point

Single sign-on enables a user to sign in one time and use that credential to access multiple resources and applications from different providers.

- ◉ Yes
- ○ No

Correct
Single sign-on enables a user to sign in one time and use that credential to access multiple resources and applications from different providers.

19. Tradewind Traders is planning to migrate to Azure cloud services. Management has asked you to spend some time researching the big data and analytic solutions available in Azure. Based on your research, which of the following provides a fully managed, open source analytics service for enterprises that makes it easier and more cost effective to process massive amounts of data while running popular open-source frameworks? 1 / 1 point

- ◉ Azure HDInsight
- ○ Azure Databricks
- ○ Azure Synapse Analytics
- ○ Azure Data Lake Analytics

Correct
Azure HDInsight is a fully managed, open-source analytics service for enterprises. It is a cloud service that makes it easier, faster, and more cost effective to process massive amounts of data. HDInsight allows you to run popular open-source frameworks and create cluster types.

20. Tradewind Traders is planning to migrate to Azure cloud services and management wants to start developing AI solutions. You have been asked to research what AI features are available in Azure. Based on your research, what service can you use to build a virtual agent that can understand and reply to questions just like a human? 1 / 1 point

- ○ Azure Cognitive Services
- ○ Azure Machine Learning
- ◉ Azure Bot Service

Correct
The Azure Bot Service and Bot Framework is a platform for creating virtual agents that understand and reply to questions just like a human.

21. Tradewind Traders has recently migrated to Azure cloud services management wants you to implement resource locks to prevent accidental changes or deletions. Which of the following are valid options when configuring resource locks? 1 / 1 point

Select all options that apply.

- ☐ CanNotModify
- ☑ ReadOnly

Correct
ReadOnly means authorized people can read a resource, but they can't delete or change the resource. Applying this lock is like restricting all authorized users to the permissions granted by the Reader role in Azure RBAC.

- ☑ CanNotDelete

Correct
CanNotDelete means authorized people can still read and modify a resource, but they can't delete the resource without first removing the lock.

22. Tradewind Traders is planning to migrate to Azure cloud services. Management has asked you to research some of the features of high availability within Azure cloud services. Based on your research, Azure Availability Zones can protect which of the following types of failure? 0 / 1 point

- ○ Azure datacenter failure
- ○ Physical Server failure
- ◉ Azure Region failure
- ○ Azure Storage failure

Incorrect
An Azure region is paired with another region within the same geography (such as the US, Europe, or Asia). This approach allows for the replication of resources, such as VM storage, across a geography that should reduce the likelihood of natural disasters, civil unrest, power outages, or physical network outages affecting both regions at once.

23. Tradewind Traders has recently migrated to Azure cloud services and management wants to start benefiting from DevOps. DevOps is a new approach that helps to align technical teams to work towards their common goal. Which of the following provides a suite of services that address each stage of the software development lifecycle (SDL)? 1 / 1 point

- ○ GitHub and GitHub Actions
- ◉ Azure DevOps Services
- ○ Azure DevTest Labs

Correct
Azure DevOps is a suite of services that address every stage of the Software Development Lifecycle (SDL).

24. Tradewind Traders has recently migrated to Azure cloud services. Management has asked you to research Azure Blueprints which are composed of artifacts. Which of the following resources as artifacts are currently supported by Azure Blueprints? 1 / 1 point

Select all options that apply.

- ☑ Role Assignment

Correct
Azure Blueprints currently supports Resource Groups, ARM template, Policy Assignment, and Role Assignment as artifacts.

- ☑ Policy Assignment

Correct
Azure Blueprints currently supports Resource Groups, ARM template, Policy Assignment, and Role Assignment as artifacts.

- ☐ Management Groups
- ☑ ARM Templates

Correct
Azure Blueprints currently supports Resource Groups, ARM template, Policy Assignment, and Role Assignment as artifacts.

25. Tradewinds Traders is planning to migrate to Azure cloud services however management has questions about management and responsibilities once resources are migrated. You have identified three cloud service models. In which model does the cloud provider keep the hardware up to date but the operating system maintenance and network configuration are left to the cloud tenant? 1 / 1 point

- ○ SaaS
- ◉ IaaS
- ○ PaaS

Correct
IaaS is the cloud service model that is closest to managing physical servers. In this model, the cloud provider keeps the hardware up to date, but operating system maintenance and network configuration are left to the cloud tenant.

26. Tradewind Traders has recently migrated to Azure cloud services. Their software development teams work on many different projects. The company wants to publish an open-source API that allows third-parties to integrate their inventories of new and used items. They also want to use the API to offer a wider variety of products directly from their ecommerce site. They will need a platform to share example code, collect feedback on the API, allow contributors to report issues, and build communities around feature requests. 1 / 1 point

Which of the following would you recommend they implement?

- ○ Azure DevOps Services
- ○ Azure DevTest Labs
- ◉ GitHub and GitHub Actions

Correct
With GitHub, your company can publish its code, accept community contributions to improve the code examples, accept feedback, and bug reports. Because this scenario involves open-source code, GitHub is a leading candidate.

27. Tradewind Traders has recently migrated to Azure cloud services. Management wants their users to have access to a unified console that provides an alternative to command-line tools where you can build, manage, and monitor everything from simple web apps to complex cloud deployments. Which tool would you recommend they use? 1 / 1 point

- ○ Azure Advisor
- ◉ Azure Portal
- ○ Microsoft Trust Center
- ○ Azure Monitor

Correct
The Azure portal is a web-based, unified console that provides an alternative to command-line tools. You can build, manage, and monitor everything from simple web apps to complex cloud deployments.

28. Tradewind Traders is planning to migrate to Azure cloud services however management has asked you to research some of the main features of cloud storage. In your research, you discover that Azure storage offers different access tiers for blob and file storage. This allows you to store object data most cost effectively. Based on your research, which is the most cost-effective tier to optimize storage for data that is infrequently accessed and stored for at least 30 days? 1 / 1 point

- ○ Hot storage tier
- ◉ Cool storage tier
- ○ Archive storage tier

Correct
Cool storage tier is optimized for data that is infrequently accessed and stored for at least 30 days.

29. Tradewind Traders has recently migrated some of its data and resources to Azure cloud services. Management wants to allow HTTP access from the Internet to a specific virtual machine. You modify the settings on your Azure Firewall. Does this meet the requirements of management? 1 / 1 point

- ○ No
- ◉ Yes

Correct
Azure Firewall is a managed, cloud-based network security service that protects your Azure Virtual Network resources. It's a fully stateful firewall as a service with built-in high availability and unrestricted cloud scalability. In this question, we need to add a rule to Azure Firewall to allow the connection to the virtual machine on port 80 (HTTP).

30. Tradewind Traders has recently migrated to Azure cloud services and management is in the process of setting up an SLA with Microsoft. They want clarification on the time duration that the service is unavailable based on the percentages listed. How much cumulative downtime per year will an SLA percentage of 99.95 give? 1 / 1 point

- ○ 8.76 hours
- ○ 52.56 minutes
- ○ 3.65 days
- ◉ 4.38 hours

Correct
An SLA percentage of 99.95 will give an annual cumulative downtime of 4.38 hours.

31. Tradewind Traders is planning to migrate to Azure cloud services but before they do, management has asked you to spend some time researching the Database solutions available in Azure specifically the capability to elastically and independently scale throughput and storage across any number of Azure regions worldwide. Based on your research, which of the following cloud database solutions is most appropriate to provide this feature? — 0 / 1 point

- Azure Cosmos DB
- Azure SQL Database
- Azure Database for MySQL
- Azure Database for PostgreSQL

Incorrect
Azure SQL Database is a relational database that is based on the latest stable version of the Microsoft SQL Server database engine. SQL Database is a high-performance, reliable, fully managed, and secure database.

32. Tradewind Traders has migrated its data and resources to Azure cloud services. They currently have multiple subscriptions and virtual networks in place. As part of their ongoing cloud implementation management wants to have the ability to prevent virtual machines from being created in certain resource groups. Which of the following can be used to prevent VM's being created in specific resource groups? — 1 / 1 point

- Azure policy
- Lock
- Azure role
- Tag

Correct
An Azure Policy is a service in Azure that you use to create, assign, and manage policies. These policies enforce different rules and effects over your resources, so those resources stay compliant with your corporate standards and service level agreements. In this question, we would create an Azure policy assigned to the resource group that denies the creation of virtual machines in the resource group.

33. Tradewind Traders is planning to migrate to Azure cloud services but before they do, management has asked you to spend some time researching the Database solutions available in Azure specifically the ability to migrate existing on-premises SQL databases to Azure SQL Databases. Based on your research, is it possible to migrate directly? — 1 / 1 point

- Yes
- No

Correct
That's correct, you can migrate your existing SQL Server databases with minimal downtime using the Azure Database Migration Service. The Azure Database Migration Service performs all the required steps. You just change the connection string in your apps.

34. Tradewind Traders has migrated its data and resources to Azure cloud services. They currently have multiple subscriptions and virtual networks across multiple regions. As part of their ongoing cloud implementation management is implementing a policy that limits the creation of additional Azure resources by administrators to a region based on their office location and country. Which of the following can be used to implement this policy? — 1 / 1 point

- Read-only lock
- Reservation
- Azure policy
- Management Group

Correct
Azure policies can be used to define requirements for resource properties during deployment and for already existing resources. Azure Policy controls properties such as the types or locations of resources.

35. Tradewind Traders is planning to migrate to Azure cloud services. Management has asked you to spend some time researching the big data and analytic solutions available in Azure. Based on your research, which of the following provides an on-demand analytics job service that simplifies big data by enabling users to write queries to transform their data and extract valuable insights? — 1 / 1 point

- Azure Data Lake Analytics
- Azure Synapse Analytics
- Azure HDInsight
- Azure Databricks

Correct
Azure Data Lake Analytics is an on demand analytics job service that simplifies big data. Instead of deploying, configuring, and tuning hardware, you write queries to transform your data and extract valuable insights.

36. Tradewind Traders has recently migrated to Azure cloud services and management wants to start developing AI solutions. Management requires the development of an app that can predict future outcomes based on private historical data. Which Azure service will you recommend to management? — 1 / 1 point

- Azure Machine Learning
- Azure Bot Service
- Azure Cognitive Services

Correct
Azure Machine Learning is a platform for making predictions. It consists of tools and services that allow you to connect to data to train and test models to accurately predict a future result.

37. Tradewind Traders is planning to migrate to Azure cloud services, however, management has asked you to research some of the main benefits of cloud services. One of these benefits is referred to as agility. — 1 / 1 point

Which of the following benefits of cloud services are characteristic of agility?

- Your cloud-based applications can provide a continuous user experience with no apparent downtime even when things go wrong.
- Cloud-based resources can be deployed and configured quickly as your requirements change.
- You can deploy your applications with the confidence that comes from knowing that your data is safe in the event of a disaster.
- Applications and data can be deployed to regional datacenters around the globe.

Correct
With agility, cloud-based resources can be deployed and configured quickly as your application requirements change.

38. Tradewind Traders has recently migrated to Azure cloud services and management wants to start developing AI solutions. Management requires the development of an app that can understand the content and meaning of images, video, audio, or translate text into a different language. Which Azure services do you think are the most appropriate to use in this scenario? — 1 / 1 point

- Azure Machine Learning
- Azure Cognitive Services
- Azure Bot Service

Correct
Azure Cognitive Services provides pre-built machine learning models that enable applications to see, hear, speak, understand, and even begin to reason.

39. Tradewinds Traders is planning to migrate to Azure cloud services. Management has questions regarding the expenditure once they migrate. You have been asked to research expenditure types and how they differ. Based on your research, you have identified two types of expenditures that are relevant to Cloud migration. Capital Expenditure (CapEx) and Operational Expenditure (OpEx). — 1 / 1 point

Which of these expenditure types require the upfront spend on physical infrastructure that can then be deducted as an expense over time?

- Capital Expenditure (CapEx)
- Operational Expenditure (OpEx)

Correct
Capital Expenditure (CapEx) is the upfront spending of money on physical infrastructure and then deducting that upfront expense over time. The upfront cost from CapEx has a value that reduces over time.

40. Tradewind Traders has recently migrated to Azure cloud services and management wants you to research the features of GitHub and Azure DevOps. Based on this research do you agree with the following statement? — 1 / 1 point

GitHub is lighter weight than Azure DevOps, with a focus on individual developers contributing to open source while Azure DevOps, is more focused on enterprise development with heavier project management, planning tools, and fine-grained access control.

- Yes
- No

Correct
GitHub has a long and trusted history with public repositories and is trusted by tens of thousands of open-source projects. GitHub is "lighter-weight" than Azure DevOps, with a focus on individual developers contributing to open source. Azure DevOps, on the other hand, is more focused on enterprise development with heavier project management and planning tools, and finer-grained access control.

41. Tradewinds Traders is planning to migrate to Azure cloud services however management has questions regarding the expenditure once they migrate. You have been asked to research expenditure types and how they differ. Based on your research you have identified two types of expenditure that are relevant to Cloud migration. Capital Expenditure (CapEx) and Operational Expenditure (OpEx). — 1 / 1 point

Which of these expenditure types requires no upfront cost and allows you to pay for services as you use them?

- Operational Expenditure (OpEx)
- Expenditure (CapEx)

Correct
Operational Expenditure (OpEx) is spending money on services or products now and being billed for them now. You can deduct this expense in the same year you spend it. There is no up-front cost, as you pay for a service or product as you use it.

42. Tradewind Traders has recently migrated to Azure cloud services. Management wants you to research the features of Azure DevTest Labs which they feel may be a good fit for their developers on an ongoing basis. — 1 / 1 point

Based on your research, do you agree with the following definition?

DevTest labs provide automated provisioning of pre-created lab environments with required configurations and tools already installed.

- True
- False

Correct
Azure DevTest Labs allows for the provisioning of pre-created lab environments with required configurations and tools already installed. It is a huge timesaver for quality assurance professionals and developers.

43. Tailwind Traders has recently migrated to Azure cloud services. Management now requires ongoing analysis of how well they are using their services compared to industry best practices. Which monitoring tool would you recommend using for this? — 1 / 1 point

- Azure Monitor
- Azure Service Health
- Azure Advisor

Correct
Azure Advisor evaluates your Azure resources and makes recommendations to help you improve reliability, security, and performance, achieve operational excellence, and reduce costs.

44. Tradewind Traders is planning to migrate to Azure cloud services however management has asked you to research some of the main features of cloud services. One of these features is Geo-distribution. — 1 / 1 point

What does Geo-Distribution mean?

- You can deploy your applications with the confidence that comes from knowing that your data is safe in the event of a disaster.
- Cloud-based resources can be deployed and configured quickly as your requirements change.
- Applications and data can be deployed to regional datacenters around the globe.
- Your cloud-based applications can provide a continuous user experience with no apparent downtime even when things go wrong.

Correct
With Geo-distribution, applications and data can be deployed to regional datacenters around the globe ensuring that your customers always have the best performance in their region.

45. Tradewind Traders is planning to migrate to Azure cloud services however management has asked you to research some of the main features of cloud storage. Which of the following is the most suitable for the storage of streaming video and audio? — 1 / 1 point

- Azure Files Storage
- Azure Storage Tiers
- Azure Blob Storage
- Azure Disk Storage

Correct
Blob Storage is ideal for serving images or documents directly to a browser, storing files for distributed access, and streaming media.

46. Tailwind Traders have recently migrated to Azure cloud services. The company has multiple offices around the globe which requires IT staff to travel between them regularly. The IT manager is now hoping to provide a solution that will allow employees to monitor the services remotely. Which service Azure Cloud services do you think is best to use in this scenario? — 1 / 1 point

- Azure CLI
- Azure Mobile App
- Azure PowerShell

Correct
The Azure mobile app running on a phone or tablet could help key employees keep an eye on the health of the cloud environment. The Azure mobile app is a good compromise in this scenario, it allows employees the freedom to be away from the office while still being able to perform one-off management and administrative tasks.

47. Tradewind Traders is planning to migrate to Azure cloud services however management has asked you to research connectivity features between your on-premises environment and Cloud resources. In your research, you learn that Azure virtual networks enable you to filter traffic between subnets. Which of the following are valid filtering approaches? — 1 / 1 point

Select all options that apply.

- [x] Network virtual appliances

Correct
A network virtual appliance is a specialized VM that can be compared to a hardened network appliance. A network virtual appliance carries out a particular network function, such as running a firewall or performing Wide Area Network (WAN) optimization.

- [x] Network security groups

Correct
A network security group is an Azure resource that can contain multiple inbound and outbound security rules. You can define these rules to allow or block traffic, based on factors such as source and destination IP address, port, and protocol.

- [ ] Border Gateway Protocol

48. Tailwind Traders has recently migrated to Azure cloud services. Management has asked you to work on optimizing their cloud services for reliability, security, performance, costs, and operations based on expert best practices. Which Azure monitoring tool would you recommend to best satisfy this requirement? — 1 / 1 point

- Azure Monitor
- Azure Service Health
- Azure Advisor

Correct
Azure Advisor evaluates your Azure resources and makes recommendations to help you improve reliability, security, and performance, achieve operational excellence, and reduce costs.

49. Tradewind Traders is planning to migrate to Azure cloud services however management has asked you to research Policy based VPN gateways. In your research, you learn that Policy based VPN Gateways evaluate all data packets against sets of IP addresses to determine the tunnel that the packet is going to be sent through. — 0.75 / 1 point

Which of the following are key features of policy-based VPN gateways in Azure?

Select all options that apply.

- [ ] Compatibility with legacy on-premises VPN devices
- [x] Use of static routing.

Correct
Combinations of address prefixes from both networks control how traffic is encrypted and decrypted through the VPN tunnel. The source and destination of the tunneled networks are defined in the policy and don't need to be declared in routing tables.

- [ ] Support for IKEv2.
- [ ] Dynamic routing protocols

You didn't select all the correct answers

50. Tailwind Traders has recently migrated its data and resources to Azure cloud services. Management has asked you to provide a personalized view of the health of the Azure services, regions, and resources. Which of the following tools would best satisfy these requirements? — 1 / 1 point

- Azure Monitor
- Azure Advisor
- Azure Service Health

Practice exam covering Course 1: Artificial Intelligence on Microsoft Azure

Latest Submission Grade 90%

1. Suppose you need to develop a web-based AI solution for a customer support system. Users will interact with a web app that will guide them to the best resource or answer. Which service should you use? — 1 / 1 point

- QnA Maker
- Custom Vision
- Translator Text
- Face

Correct
QnA Maker is a cloud-based API service that lets you create a conversational question-and-answer layer over your existing data.

2. True or False? — 1 / 1 point

Identifying suspicious sign ins by looking for deviations from usual patterns is an example of anomaly detection.

- True
- False

Correct
Anomaly detection identifies data points, events, and/or observations that deviate from a dataset's normal behaviour.

3. Ensuring that AI systems operate as they were intended, respond to unanticipated conditions, and resist harmful manipulations is a consideration of which responsible AI principle? — 1 / 1 point

- Fairness
- Accountability
- Reliability and safety

Correct
The principle of reliability and safety states that AI systems should perform initially and safely.

4. Extracting vehicle plate numbers from images is a capability of which AI workload type? — 1 / 1 point

- Image classification
- Optical character recognition (OCR)
- Object detection
- Facial recognition

Correct
OCR can extract text from images and documents with mixed languages and writing styles.

5. Which two tasks in the list below can be performed by usingComputerVision? Each correct answer presents a complete solution. — 1 / 1 point

Select all options that apply.

- [x] Detect the colour scheme in an image

Correct
Computer Vision can detect brands and can also detect the colour schemes from images.

- [ ] Extract key phrases.
- [x] Detect brands in an image

Correct
Computer Vision can detect brands and can also detect the colour schemes from images.

- [ ] Translate text between images
- [ ] Predict stock prices

6. A company wants to build a recycling machine for plastic bottles. The recycling machine must automatically identify bottles of the correct shape and reject all other items. Which type of AI workload should the company use? — 0 / 1 point

- Natural language processing
- Conversational AI
- Anomaly detection
- Computer vision

Incorrect
Try going back and reviewing Understand Computer Vision.

7. You're creating a solution that counts the number of people present in an image. Which Computer Vision model can help you achieve the task? — 1 / 1 point

- Face detection
- Image Analysis
- Optical character recognition

Correct
Face detection is a specialized form of object detection that locates human faces in an image. By counting all the faces, you can count all the people present in an image.

8. Providing customers with information and control over the collection, use, and storage of their data is a consideration of which responsible AI principle? — 1 / 1 point

- Privacy and security
- Reliability and safety
- Fairness

Correct
The principle of privacy and security states that AI systems should be secure and respect privacy.

9. An automated chat that supports customer service by answering questions about refunds and items exchange is an example of which AI workload type? — 1 / 1 point

- Anomaly detection
- Conversational AI
- Natural language processing

Correct
Conversational AI tools enable developers to build, connect, deploy, and manage intelligent bots that naturally interact with their users.

10. Which two tasks in the list below can be performed by using natural language processing? Each correct answer presents a complete solution. — 1 / 1 point

Select all options that apply.

- [ ] Detect celebrities in an image
- [ ] Detect the colour scheme in an image
- [x] Interpret spoken language

Correct
Natural language processing can help analyze and interpret text in emails and also interpret spoken language.

- [x] Analyze and interpret text in emails

Azure AI Fundamentals – [AZ-900T00]

Practice exam covering Course 2: Microsoft Azure Machine Learning

Latest Submission Grade 100%

1. In a machine learning algorithm, what method should you use to split data for training and evaluation? 1 / 1 point
   - Use features for training and labels for evaluation
   - Randomly split the data into rows for training and columns for evaluation
   - Randomly split the data into rows for training and rows for evaluation
   - Use labels for training and features for evaluation

   Correct
   In Azure Machine Learning, the percentage split is the available technique to split the data. In this technique, random data of a given percentage will be split to train and test data.

2. Let's suppose you want to create an AI system that can predict how many minutes late a flight will arrive based on the amount of snowfall at an airport. Which machine learning type should you use? 1 / 1 point
   - Classification
   - Regression
   - Clustering

   Correct
   Regression is a supervised machine learning technique used to predict numeric values.

3. Predicting how many minutes it will take someone to run a race based on past race times is a use case for? 1 / 1 point
   - Clustering
   - Classification
   - Regression

   Correct
   Regression is a supervised machine learning technique used to predict numeric values.

4. Let's suppose you are working on an AI application that should predict the weather. From the dataset you have, you want to pick temperature and pressure to train the model. Which machine learning task enables you to do that? 1 / 1 point
   - Feature selection
   - Model training
   - Feature engineering

   Correct
   Feature selection is the process of selecting a subset of relevant, useful features to use in building an analytical model.

5. True or False? 1 / 1 point

   When working in Azure Machine Learning designer, it is possible to save your progress as a pipeline draft.
   - True
   - False

   Correct
   Azure Machine Learning designer offers the possibility to save progress as a pipeline draft.

6. Predicting whether someone uses a bicycle to travel to work based on the distance from home to work is a use case for? 1 / 1 point
   - Regression
   - Clustering
   - Classification

   Correct
   Classification is a supervised machine learning technique used to predict categories or classes.

7. True or False? 1 / 1 point

   Accuracy is always the primary metric used to measure a model's performance.
   - True
   - False

   Correct
   There are different metrics that can be used to measure a model's performance.

8. True or False? 1 / 1 point

   Automated machine learning is the process of automating the time consuming, iterative tasks of machine learning model development.
   - True
   - False

   Correct
   Automated machine learning is the process of automating the time consuming, iterative tasks of machine learning model development.

9. Which module in the Azure Machine Learning designer should you use if you want to create a training dataset and a validation dataset from an existing dataset? 1 / 1 point
   - Add rows
   - Split data
   - Select columns in dataset
   - Join data

   Correct
   Datasets can be split into training datasets and validation datasets by splitting the data.

10. You want to create a CRM application that uses AI to segment customers into different groups to support a marketing department. Which machine learning type should you use? 1 / 1 point
    - Clustering
    - Regression
    - Classification

Practice exam covering Course 3: Computer Vision in Microsoft Azure

Latest Submission Grade 97.5%

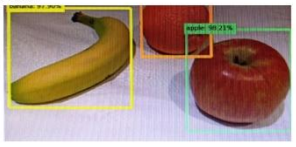
1. You plan to use Form Recognizer service to process receipts that are scanned into PDF files. What is the maximum file size of PDF file you can submit to the model? 1 / 1 point
   - 200 MB
   - 50 MB
   - 10 MB

   Correct
   When using Form Recognizer service, one of the guidelines for best results is to submit files that are not larger than 50 MB size.

2. The company you work for manages a dockyard where hundreds of containers of merchandise are processed every day. You need to implement an AI solution that can extract ships and containers registration numbers from images. Which AI workload should you use? 1 / 1 point
   - Optical character recognition (OCR)
   - Object detection
   - Facial recognition
   - Image classification

   Correct
   OCR has represents the ability to extract text from images is handled by the Computer Vision service, which also provides image analysis capabilities.

3. Detecting faces in images is a capability of which AI workload type? 1 / 1 point
   - Object detection

4. Yo — Which type of computer vision was used?
   - Optical character recognition (OCR)
   - Object detection
   - Semantic segmentation
   - Image classification

   Correct
   Object detection is a form of machine learning based computer vision in which a model is trained to recognize individual types of object in an image, and to identify their location in the image.

5. You're working on an AI application that needs to determine the location of cars in an image so that it can estimate the distance between the cars. Which computer vision service should you use? 1 / 1 point
   - Semantic segmentation
   - Image classification
   - Object detection
   - Facial recognition

   Correct
   Object detection is a form of machine learning based computer vision in which a model is trained to recognize individual types of object in an image, and to identify their location in the image.

6. Your application must be capable of identifying celebrities,landmarks and brands from images. Which AI cognitive service should you use for this scope? 1 / 1 point
   - Computer Vision
   - Video Indexer
   - Custom vision

   Correct
   Computer Vision offers the capability of identifying celebrities, landmarks or brands from images.

7. True or False? 1 / 1 point

   Detecting image color schemes is a capability of Computer vision service.
   - True
   - False

   Correct
   Computer Vision service has additional capabilities, such as detecting image color schemes.

8. Which two tasks can be performed by using the Computer Vision service? 0.75 / 1 point

   Select all that apply.
   - [ ] Extract text from scanned documents
   - [x] Extract written text from an image

   Correct
   Computer Vision offers a variety of features, such as extracting written text from images and documents, detecting objects in images, and several other.

   - [x] Detect objects in an image

   Correct
   Computer Vision offers a variety of features, such as extracting written text from images and documents, detecting objects in images, and several other.

   - [ ] Translate the text in an image

   You didn't select all the correct answers

9. True or False? 1 / 1 point

   Extreme angles do not impair facial detection in images.
   - True
   - False

   Correct
   Extreme angles may impair facial detection in images.

10. You work for a social media company and you need to implement an AI solution that can detect images that contain adult content or depict gory, violent scenes before they are posted and shared. Which AI workload should you use? 1 / 1 point
    - Object detection
    - Form recognizer
    - Content moderator

Practice exam covering Course 4: Natural Language Processing in Microsoft Azure

Latest Submission Grade 82.5%

1. Which AI service can you use to interpret the meaning of a user input such as "Show me the nearest gas station"? 1 / 1 point
   - Language Understanding (LUIS)
   - Translator Text
   - Text Analytics
   - Speech

   Correct
   Language Understanding (LUIS) is a cloud-based conversational AI service that applies custom machine-learning intelligence to a user's conversational, natural language text to predict overall meaning, and pulls out relevant, detailed information.

2. Which NLP workload returns text from a language to a specified target language? 1 / 1 point
   - Translation
   - Language modeling
   - Text Analytics

   Correct
   Translator is a cloud-based machine translation service you can use to translate text from one language to another.

3. True or False? 0 / 1 point

   The Text Analytics service can detect handwritten signatures in a document.
   - True
   - False

   Incorrect
   Try going back and reviewing Get started with Text Analytics in Azure.

4. You are developing a solution that needs to identify the main talking points in a collection of documents. 1 / 1 point

   Which type of natural language processing should you use?
   - Entity recognition
   - Sentiment analysis
   - Key phrase extraction
   - Language detection

   Correct
   Key phrase extraction evaluates unstructured text, and for each document returns a list of key phrases.

5. True or False? 1 / 1 point

   Monitoring public news sites for negative mentions of a product is an example of natural language processing.
   - True
   - False

   Correct
   Monitoring public news sites for negative mentions of a product is an example of natural language processing.

6. You need to develop a natural language processing solution in Azure that will analyze customer reviews and determine how positive or negative each review is. 1 / 1 point

   Which type of natural language processing workload is best suited for this scenario?
   - Entity recognition
   - Key phrase extraction
   - Language detection
   - Sentiment analysis

   Correct
   Sentiment analysis can help in determining the sentiment in a text, therefore labelling if a customer review is positive or negative.

7. You need to apply Text Analytics API features to a technical support ticketing system. 1 / 1 point

   In order to extract DateTime values from the support ticket that are relevant for mapping when the issue first occurred, which API feature should you use?
   - Entity recognition
   - Sentiment analysis
   - Language detection
   - Key phrase extraction

   Correct
   Entity Recognition is the ability to identify different entities in text and categorize them into pre-defined classes or types.

8. True or False? 1 / 1 point

   Azure Bot Service engages with customers in a conversational manner.
   - True
   - False

   Correct
   Azure Bot Service engages with customers in a conversational manner.

9. You have to provide content for a business chatbot that will answer simple user questions. 0.25 / 1 point

   Which way(s) can you use in QnA Maker to provide a knowledge base to the chatbot?

   Select all options that apply.
   - [x] Connect the bot to the Cortana channel and ask questions using Cortana.

   This should not be selected
   Try going back and reviewing Get started with QnA Maker and Azure Bot Service.

   - [x] Use automated machine learning to train a model based on a file that contains questions

   This should not be selected
   Try going back and reviewing Get started with QnA Maker and Azure Bot Service.

   - [x] Generate the questions and answers from an existing webpage

   Correct
   QnA maker can populate knowledge bases through FAQ pages, by manually entering questions or answers or by importing pre-defined chit-chat data sources.

   - [ ] Manually enter the questions and answers

10. Which two scenarios can be used as examples of conversational AI workloads? 1 / 1 point

    Select all options that apply.
    - [ ] Assembly line machinery that automatically inserts keyboards into laptops
    - [x] A smart device in your home that responds to questions such as "What will the weather be like next week?"

    Correct
    Conversational AI is the set of technologies behind automated messaging and speech-enabled applications that offer human-like interactions between computers and humans, such as chatbots or virtual assistant devices.

    - [x] A website that uses a knowledge base to interactively respond to users questions

Test Prep

Latest Submission Grade 100%

1. A hospital wants to categorize patients that are pregnant as low-risk or high-risk regarding complications based on data like patient age and known medical conditions. What kind of machine learning model should the hospital use? 1 / 1 point

- (•) Classification
- ( ) Regression
- ( ) Time series forecasting

Correct
To predict a category, or class, a classification model can be used.

2. Which of the following are machine learning models? 1 / 1 point

Select all that apply.

- [x] Regression

Correct
Time series forecasting is a machine learning model.

- [ ] Polarization
- [x] Time series forecasting

Correct
Time series forecasting is a machine learning model.

3. A meteorological institute wants to predict, based on data from the past, how much it will rain next Sunday. What machine learning model is the best fit for this case? 1 / 1 point

- ( ) Regression
- ( ) Classification
- (•) Time series forecasting

Correct
Time series forecasting enables predictions of numeric values at a future point in time.

4. A toy company wants to predict the daily demand in order to assure that they have the necessary stock to honour all orders. What machine learning model can be used in this case? 1 / 1 point

- ( ) Classification
- ( ) Clustering
- (•) Regression

Correct
Regression is a supervised machine learning technique used to predict numeric values.

5. True or False? 1 / 1 point

Azure Machine Learning includes an automated machine learning capability that leverages the scalability of cloud compute to automatically try multiple pre-processing techniques and model-training algorithms in parallel to find the best performing supervised machine learning model for your data.

- (•) True
- ( ) False

Correct
Azure Machine Learning includes an automated machine learning capability that leverages the scalability of cloud compute to automatically try multiple pre-processing techniques and model-training algorithms in parallel to find the best performing supervised machine learning model for your data.

6. True or False? 1 / 1 point

A bike rental company can use historic data to train a model that predicts daily rental demand in order to make sure sufficient staff and cycles are available.

- (•) True
- ( ) False

Correct
A regression model can fulfil this task.

7. What setting should you configure if you want to end the experiment if the model achieves a certain score or less on normalized root mean squared error metric? 1 / 1 point

- ( ) Blocked algorithms
- ( ) Training compute target
- (•) Metric score threshold

Correct
This metric causes the experiment to end if a model achieves a certain score (or less) on normalized root mean squared error.

Test Prep

Latest Submission Grade 93.57%

1. What features and capabilities are available in Azure Machine Learning? 0.75 / 1 point

Select all that apply.

- [x] Publish predictive services

Correct
Azure Machine Learning is a cloud-based service with a wide range of features and capabilities that help data scientists to prepare data, train models, publish predictive services, and monitor their usage.

- [x] Prepare data

Correct
Azure Machine Learning is a cloud-based service with a wide range of features and capabilities that help data scientists to prepare data, train models, publish predictive services, and monitor their usage.

- [ ] Monitor usage of used services

You didn't select all the correct answers

2. True or False? 1 / 1 point

After creating and running a pipeline to train the model, you need a second pipeline that performs the same data transformations for new data, and then uses the trained model to predict label values based on its features.

- (•) True
- ( ) False

Correct
An inference pipeline will form the basis for a predictive service that you can publish for applications to use.

3. What type of compute resources can be created in Azure Machine Learning Studio? 0.8 / 1 point

- [ ] Spot clusters
- [x] Compute clusters

Correct

- [ ] Inference clusters
- [x] Compute instances

Correct
The four types of compute resources available in Azure Machine Learning Studio are: Compute instances, Compute Clusters, Inference clusters and Attached Compute.

You didn't select all the correct answers

4. You are creating a training pipeline for a regression model and you want to make sure that the dataset is complete, otherwise you need to perform various operations to fix the data. Which module should you add to the pipeline? 1 / 1 point

- ( ) Select columns in a dataset
- (•) Clean missing data
- ( ) Normalize data

Correct
Clean missing data helps to check data for missing values and then perform various operations to fix the data or insert new values. The goal of such cleaning operations is to prevent problems caused by missing data that can arise when training a model.

5. You are creating a training pipeline for a regression model and your dataset contains hundreds of columns. For a particular part of your model, you want to use data only from some specific columns. Which module should you add to the pipeline? 1 / 1 point

- ( ) Normalize data
- (•) Select columns in a dataset
- ( ) Clean missing data

Correct
This module is used to choose a subset of columns to use in downstream operations.

6. Which of the following scenarios can be resolved by using a regression model? 1 / 1 point

- [x] Predict selling price of a car using data like engine size, mileage, number of seats etc.

Correct
Regression is a form of machine learning that is used to predict a numeric label based on an item's features

- [x] Predict daily rental demand of bicycles by using historic data.

Correct
Regression is a form of machine learning that is used to predict a numeric label based on an item's features

- [x] Predict yearly income of customers based on their occupation, age, education etc.

Correct
Regression is a form of machine learning that is used to predict a numeric label based on an item's features

- [ ] Determine if patients with some pre-existing conditions are more likely to suffer from diabetes

7. You created a machine learning model and trained it. Now you want to run the model to predict data. Which compute target should you use? 1 / 1 point

- ( ) Compute Clusters
- ( ) Compute Instances
- (•) Inference Clusters

Test Prep

Latest Submission Grade 85.71%

1. **Which metric presents the ratio of correct predictions (true positives + true negatives) to the total number of predictions?** 1 / 1 point

- ○ Recall
- ○ F1 Score
- ○ Precision
- ◉ Accuracy

Correct
Accuracy presents the ratio of correct predictions (true positives + true negatives) to the total number of predictions.

2. **You use an Azure Machine Learning designer pipeline to train and test a binary classification model. You review the model's performance metrics in an Evaluate Model module, and note that it has an AUC score of 0.6. What can you conclude about the model?** 0 / 1 point

- ○ The model performs better than random guessing
- ○ The model predicts accurately for 40% of cases
- ◉ The model can explain 60% of the variance between true and predicted labels.

Incorrect
Try going back and reviewing *Evaluate a Classification Model*.

3. **Which metric presents the fraction of positives cases correctly identified?** 1 / 1 point

- ○ F1 Score
- ○ Recall
- ○ Accuracy
- ◉ Precision

Correct
Precision presents the fraction of positive cases correctly identified (the number of true positives divided by the number of true positives plus false positives)

4. **Which of the following scenarios can be resolved by applying classification models?** 1 / 1 point

- ☑ A bank wanting to determine if a specific set of clients are eligible for taking a loan.

Correct
Classification is a form of machine learning that is used to predict which category, or class, an item belongs to.

- ☐ A company who wants to predict the churn rate of their subscribers for next month.
- ☑ A toy company wanting to determine which clients are inclined to buy a specific toy.

Correct
Classification is a form of machine learning that is used to predict which category, or class, an item belongs to.

5. **Which of the following are models that help predict between two or several categories?** 1 / 1 point

Select all that apply.

- ☑ Multi-class neural network

Correct
Two-class decision forests and Two-class logistic regressions help predict between two categories, while Multi-class neural networks help predict between several categories.

- ☐ Linear Regression
- ☑ Two-class logistic regression

Correct
Two-class decision forests and Two-class logistic regressions help predict between two categories, while Multi-class neural networks help predict between several categories.

- ☑ Two-class decision forest

Correct
Two-class decision forests and Two-class logistic regressions help predict between two categories, while Multi-class neural networks help predict between several categories.

6. **True or False?** 1 / 1 point

Classification is an example of a supervised machine learning technique in which you train a model using data that includes both the features and known values for the label, so that the model learns to fit the feature combinations to the label.

- ◉ True
- ○ False

Correct
Classification is an example of a supervised machine learning technique in which you train a model using data that includes both the features and known values for the label, so that the model learns to fit the feature combinations to the label.

7. **You are using Azure Machine Learning designer to create a training pipeline for a binary classification model.At some point, you want to separate the data into training and testing sets. Which model should you add to the pipeline?** 1 / 1 point

- ○ Join data
- ◉ Split data
- ○ Select columns in dataset

Correct

Test Prep

Latest Submission Grade 96.42%

1. **Which of the following is a clustering algorithm?** 1 / 1 point

- ○ Two-Class Logistic Regression
- ○ Two-Class Neural Network
- ◉ K-Means

Correct
K-Means is a clustering algorithm.

2. **What is the purpose of a clustering model?** 1 / 1 point

- ○ Answers simple two-choice questions
- ◉ Separates similar data points into intuitive groups
- ○ Makes forecasts by estimating the relationship between values

Correct
Clustering models have the purpose of separating similar data points into intuitive groups.

3. **Which of the following scenarios can be resolved by applying clustering modules/algorithms?** 1 / 1 point

Select all that apply.

- ☐ A bike rental company that wants to predict the number of customers for the next day so that it will assure the necessary staff and cycles.
- ☑ A radio company that wants to apply tags (like rock, pop, R&B etc) to songs or artists.

Correct
Clustering models have the purpose of separating similar data points into intuitive groups.

- ☑ A social media company that wants to group similar users based on their posts.

Correct
Clustering models have the purpose of separating similar data points into intuitive groups.

4. **When evaluating a clustering model, what metrics can you visualize in the Evaluate results section?** 0.75 / 1 point

Select all that apply.

- ☐ Maximal distance to cluster center
- ☑ Average distance to cluster center

Correct
The metrics that can be visualized in the Evaluate results section of a clustering module are: Average distance to other center, Average distance to cluster center, Number of points, Maximal distance to cluster center.

- ☑ Number of points

Correct
The metrics that can be visualized in the Evaluate results section of a clustering module are: Average distance to other center, Average distance to cluster center, Number of points, Maximal distance to cluster center.

You didn't select all the correct answers

5. **You are building an Azure Machine learning pipeline that involves a clustering module. You need to prepare the data and change some of the numeric values from the dataset to use a common scale, without distorting differences in the ranges of values or losing information.**

Which module should you apply? 1 / 1 point

- ○ Edit metadata
- ◉ Normalize Data
- ○ Split data

Correct
The goal of normalization is to change the values of numeric columns in the dataset to use a common scale, without distorting differences in the ranges of values or losing information.

6. **True or False?** 1 / 1 point

Clustering is an example of supervised machine learning, in which you train a model to separate items into clusters based purely on their characteristics or features.

- ○ True
- ◉ False

Correct
Clustering is an example of unsupervised machine learning, in which you train a model to separate items into clusters based purely on their characteristics or features.

7. **A Hospital Care chain wants to open a series of Emergency-Care wards within a region. The chain knows the location of all the maximum accident-prone areas in the region. They have to decide the number of the Emergency Units to be opened and the location of these Emergency Units, so that all the accident-prone areas are covered in the vicinity of these Emergency Units.**

Which type of machine learning model is best to be applied in this scenario? 1 / 1 point

- ◉ Clustering
- ○ Regression
- ○ Classification

Test prep

Latest Submission Grade 100%

1. You are planning on using the Text Analytics service to detect the language in which documents are written. What response parameters will the service detect? 1 / 1 point

- [x] The language name
  - Correct: The service will detect the language name, the ISO 639-1 language code, and a score indicating a level of confidence in the language detection.
- [ ] An array with all the paragraphs in which the predominant language was not identified, in case a mix of multiple languages exists
- [x] The ISO 639-1 language code
  - Correct: The service will detect the language name, the ISO 639-1 language code, and a score indicating a level of confidence in the language detection.
- [x] A score indicating a level of confidence in the language detection
  - Correct: The service will detect the language name, the ISO 639-1 language code, and a score indicating a level of confidence in the language detection.

2. You analyzed a document with Text Analytics service and discovered that the language used is English, having a confidence score of 0.8. What does that mean? 1 / 1 point

- (•) The predominant language in the text is English
- ( ) A small amount of the text is in English
- ( ) Only 80% of the text was analyzed
  - Correct: When the confidence score is less than 1, it means that the analyzed text is in mixed language. A confidence score of 0.8 means that the Text Analytics service is 80% confident that the main language detected is English, but some other languages were possibly detected.

3. After analyzing a text with Text Analytics service, the service returned that the language detected is unknown, with a score of NaN. What does this mean? 1 / 1 point

Select all options that apply.

- [x] Text is ambiguous in nature
  - Correct: When results return a value of unknown for the language name and the language identifier, and a score of NaN, it means that text is ambiguous in nature or has mixed language content.
- [ ] Analysis of text failed
- [x] Text has mixed language content
  - Correct: When results return a value of unknown for the language name and the language identifier, and a score of NaN, it means that text is ambiguous in nature or that has mixed language content.

4. You are building an application that analyzes the sentiment from small texts posted on Twitter. For some of the analyzed texts, the sentiment score is precisely 0.5. What does this mean? 1 / 1 point

Select all options that apply.

- [x] A wrong language code might be used
  - Correct: A score of 0.5 might indicate that the sentiment of the text is indeterminate, and could result from text that does not have sufficient context to discern a sentiment, insufficient phrasing or a wrong language code was used.
- [ ] The sentiment in those texts are completely neutral
- [x] The texts might be too small to analyze
  - Correct: A score of 0.5 might indicate that the sentiment of the text is indeterminate, and could result from a text that does not have sufficient context to discern a sentiment, insufficient phrasing, or a wrong language code was used.
- [x] The texts do not have sufficient context to discern a sentiment
  - Correct: A score of 0.5 might indicate that the sentiment of the text is indeterminate, and could result from a text that does not have sufficient context to discern a sentiment, insufficient phrasing, or a wrong language code was used.

5. You are planning on creating a solution that will analyze the sentiment of a document and will extract the main talking points. Which feature(s) of Text Analytics should you take into account? 1 / 1 point

Select all options that apply.

- [ ] Entity recognition
- [x] Key phrase extraction
  - Correct: You can use key phrase extraction to quickly identify the main concepts or talking points in a document.
- [x] Sentiment analysis
  - Correct: You can use sentiment analysis to evaluate the text of a document and get sentiment scores (positive, neutral, negative) for each sentence.

6. You perform sentiment analysis on a document with the help of the Text Analytics service. A score of 0.65 is returned. What does this indicate? 1 / 1 point

- (•) The document is positive
- ( ) The document is neutral
- ( ) The document is negative
  - Correct: Score values closer to 1 indicate a more positive sentiment where scores closer to 0 indicate negative sentiment.

7. True or False? 1 / 1 point

When using speech-to-text API, the audio source can only be a recorded audio file.

- ( ) True
- (•) False
  - Correct: You can use the speech-to-text API to perform real-time or batch transcription of audio into a text format. The audio source for transcription can be a real-time audio stream from a microphone or an audio file.

8. When sending an audio recording for speech-to-text processing, what kind of transcription is being performed? 1 / 1 point

- ( ) Audio transcription
- ( ) Real-time transcription
- (•) Batch transcription
  - Correct: Audio recordings are processed with the help of batch transcription.

9. True or False? 1 / 1 point

When you use the text-to-speech API, a generic voice will be used to vocalize the text.

- ( ) True
- (•) False
  - Correct: When you use the text-to-speech API, you can specify the voice to be used to vocalize the text. This capability offers you the flexibility to personalize your speech synthesis solution and give it a specific character.

10. True or False? 1 / 1 point

Custom voices can also be developed and used with text-to-speech API.

- (•) True
- ( ) False

Test prep

Latest Submission Grade 100%

1. You are using Translator Text API to translate text and filter out profanity. How can this be achieved? 1 / 1 point

- ( ) Enabling selective translation
- ( ) Translator Text API does not provide a feature to achieve this
- (•) Enabling profanity filtering
  - Correct: You can control profanity translation by either marking the translated text as profane or by omitting it in the results.

2. You work at a company named "Peach" and you've just built a solution that scans legal documents and translates them from English to French. Since the company name is a commonly used word, you face the risk that the company name would be translated to the equivalent word of "peach" in French. How can you overcome this? 1 / 1 point

- ( ) Translator Text API does not provide a feature to achieve this
- ( ) By enabling profanity filtering
- (•) By enabling selective translation
  - Correct: With selective translation, you can tag content so that it isn't translated. For example, you may want to tag code, a brand name, or a word/phrase that doesn't make sense when localized.

3. You are building a solution that will translate speeches in real-time live from one language to another. Which service should you use? 1 / 1 point

- ( ) Text analytics
- ( ) Translator text
- (•) Speech
  - Correct: The Speech service can translate from audio sources to text.

4. When creating a Language Understanding application, what type of utterances should you map to the "None" intent? 1 / 1 point

- ( ) Utterances that don't expect a response back
- (•) Utterances that do not map any of the other intents
- ( ) Utterances that map to non-logical intents
  - Correct: The "None" intent is considered a fallback, and is typically used to provide a generic response to users when their requests don't match any other intent.

5. True or False? 1 / 1 point

To create an eligible Language Understanding application, you need to create entities and intents in a specific order so that the service can understand how to process them.

- ( ) True
- (•) False
  - Correct: When you create entities and intents, you can do so in any order.

6. You are authoring a Language Understanding application to support a home automation device. You want users to be able to give specific instructions to switch on lights, like "Turn on the light". What should you create? 1 / 1 point

- ( ) Add utterances similar to "Turn on the light" in the "None" intent
- (•) Define a "light" entity and a "TurnOn" intent with utterances similar to "Turn on the light".
- ( ) Create a "turnOn" entity and a "light" intent
  - Correct: The intent encapsulates the task (turning on the light) and the entity specifies the item to which the intent is applied (the light).

7. True or False? 1 / 1 point

The only way to author Language Understanding models is to write code to define the elements of it.

- ( ) True
- (•) False
  - Correct: You can write code to define the elements of your model, but in most cases, it's quicker to author your

Test prep

Latest Submission Grade 92.85%

1. You are building a QnA Maker knowledge base through the QnA Maker portal. In which of the following ways can you populate the knowledge base? 1 / 1 point

Select all options that apply.

- [x] Generate from an existing FAQ document or web page
  - Correct: Questions and answers can be provided in the following manners: generated from an existing FAQ document or web page, imported from a pre-defined chit-chat data source, or entered and edited manually.
- [x] Enter and edit manually
  - Correct: Questions and answers can be provided in the following manners: generated from an existing FAQ document or web page, imported from a pre-defined chit-chat data source, or entered and edited manually.
- [ ] By specifying a SQL database as a back-end
- [x] Import from a pre-defined chit-chat data source
  - Correct: Questions and answers can be provided in the following manners: generated from an existing FAQ document or web page, imported from a pre-defined chit-chat data source, or entered and edited manually.

2. To consolidate questions in a knowledge base, what do you need to do? 1 / 1 point

- (•) Use alternative phrasing
- ( ) Repeat the same question several times
- ( ) Set a confidence score on the question
  - Correct: Questions in the knowledge base can be assigned alternative phrasing to help consolidate questions with the same meaning.

3. You are building a user support bot solution with QnA Maker. What's the most efficient way to test your knowledge base, after creating it? 1 / 1 point

- ( ) Making REST API calls to the service
- ( ) Publishing the service and testing it from a custom-built application
- (•) Using the built-in test interface in QnA Maker portal
  - Correct: After training, you can use the built-in test interface in the QnA Maker portal to test your knowledge base by submitting questions and reviewing the answers that are returned.

4. You have published your QnA Maker knowledge base and now you want to permit your client applications to use it over its REST interface. Which of the following do client applications need to access the knowledge base? 0.5 / 1 point

Select all options that apply.

- [x] The knowledge base connection string
  - This should not be selected: Try going back and reviewing *Get started with QnA Maker and Azure Bot Service*.
- [x] The knowledge base ID
  - Correct: To access the knowledge base, client applications require: the knowledge base ID, the knowledge base endpoint, and the knowledge base authorization key.
- [x] The knowledge base authorization key
  - Correct: To access the knowledge base, client applications require: the knowledge base ID, the knowledge base endpoint, and the knowledge base authorization key.
- [ ] The knowledge base endpoint

5. True or False? 1 / 1 point

When your bot is ready to be delivered to users, you can only connect it to a single channel.

- ( ) True
- (•) False
  - Correct: When your bot is ready to be delivered to users, you can connect it to multiple channels.

6. You need to create a support bot for internal use in your organization. Users need to be able to submit questions to the bot using Microsoft Teams and through an internal web-page. What should you do? 1 / 1 point

- ( ) Create two knowledge bases with the same question and answer pairs. Then create a bot for each knowledge base; one connected to the Microsoft Teams channel, and the other to the Web Chat channel
- (•) Create a knowledge base. Then create a bot for the knowledge base and connect the Microsoft Teams and the Web Chat channels for your bot
- ( ) Create a knowledge base. Then create two bots that use the same knowledge base - one bot connected to the Microsoft Teams channel, and the other to the Web Chat channel
  - Correct: The Microsoft Teams channel enables your bot to receive and respond to messages in Microsoft Teams, and the Web Chat channel enables interactions through a web chat interface.

7. True or False? 1 / 1 point

For simple updates, you can edit bot code directly in the Azure portal.

- (•) True
- ( ) False
  - Correct: For simple updates, you can edit bot code directly in the Azure portal.

Microsoft Certified: Azure AI Fundamentals

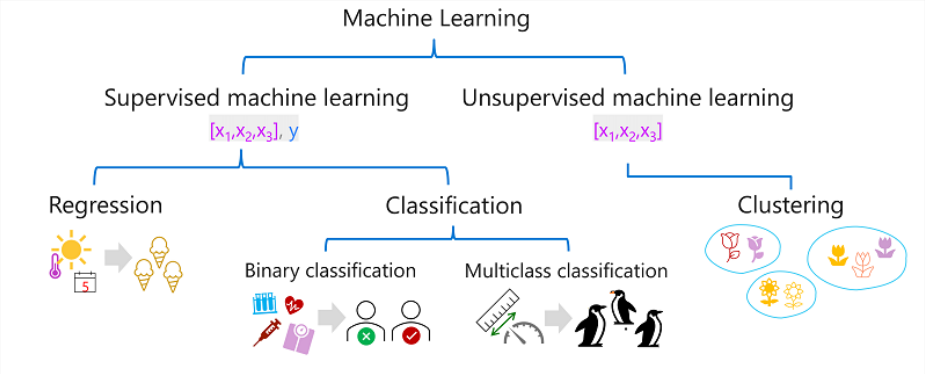
Chapter I – Microsoft Azure AI Fundamentals: AI Overview

What is machine learning?

Machine learning has its origins in statistics and mathematical modeling of data. The fundamental idea of machine learning is to use data from past observations to predict unknown outcomes or values

Automated machine learning: this feature enables non-experts to quickly create an effective ML model from data.
Azure Machine Learning designer: a graphical interface enabling no-code development of ML solutions.
Data metric visualization: analyze and optimize your experiments with visualization.
Notebooks: write and run your own code in managed Jupyter Notebook servers that are integrated in studio.

Types of machine learning



Regression evaluation metrics

- Mean Absolute Error (MAE)
- Mean Squared Error (MSE)
- Root Mean Squared Error (RMSE)
- Coefficient of determination (R2)

Binary classification evaluation metrics

- Accuracy
- Recall
- Precision
- F1-score
- Area Under the Curve (AUC)

Multiclass classification mode [algorithm: One-vs-Rest (OvR)]

- Metrics are as per classifications models

Evaluating a clustering model

Average distance to cluster center: How close, on average, each point in the cluster is to the centroid of the cluster.
Average distance to other center: How close, on average, each point in cluster is to the centroid of all other clusters.
Maximum distance to cluster center: The furthest distance between a point in the cluster and its centroid.
Silhouette: A value between -1 and 1 that summarizes the ratio of distance between points in the same cluster and points in different clusters (The closer to 1, the better the cluster separation).

Features and capabilities of Azure Machine Learning

- **Centralized storage** and **management** of datasets for model training and evaluation.
- **On-demand compute resources** on which you can run machine learning jobs, such as training a model.
- Automated machine learning **(AutoML)**, which makes it easy to run multiple training jobs with different algorithms and parameters to find the best model for your data.
- **Visual tools** to define orchestrated pipelines for processes such as model training or inferencing.
- **Integration** with common machine learning frameworks such as MLflow, which make it easier to manage model training, evaluation, and deployment at scale.
- **Built-in support** for visualizing and evaluating metrics for responsible AI, including model explainability, fairness assessment, and others.

Fundamentals of Azure AI services

Azure AI services are a portfolio of AI capabilities that unlock automation for workloads in language, vision, intelligent search, content generation, and much more. They are straightforward to implement and don't require specialist AI knowledge.

AI services on the Azure platform

Azure AI services are AI capabilities that can be built into web or mobile applications, in a way that's straightforward to implement. These AI services include image recognition, natural language processing, speech, AI-powered search.

Understand Responsible AI – A set of six principles designed to ensure that AI applications provide amazing solutions

1) Fairness

AI systems should treat all people fairly. For example, suppose you create a machine learning model to support a loan approval application for a bank. The model should predict whether the loan should be approved or denied without bias. This bias could be based on gender, ethnicity, or other factors that result in an unfair advantage or disadvantage to specific groups of applicants.

2) Reliability and safety

AI systems should perform reliably and safely. For example, consider an AI-based software system for an autonomous vehicle; or a machine learning model that diagnoses patient symptoms and recommends prescriptions. Unreliability in these kinds of systems can result in substantial risk to human life.

3) Privacy and security

AI systems should be secure and respect privacy. The machine learning models on which AI systems are based rely on large volumes of data, which may contain personal details that must be kept private. Even after the models are trained and the system is in production, privacy and security need to be considered. As the system uses new data to make predictions or take action, both the data and decisions made from the data may be subject to privacy or security concerns.

4) Inclusiveness

AI systems should empower everyone and engage people. AI should bring benefits to all parts of society, regardless of physical ability, gender, sexual orientation, ethnicity, or other factors.

5) Transparency

AI systems should be understandable. Users should be made fully aware of the purpose of the system, how it works, and what limitations may be expected.

6) Accountability

People should be accountable for AI systems. Designers and developers of AI-based solutions should work within a framework of governance and organizational principles that ensure the solution meets ethical and legal standards that are clearly defined.

Service	Description
Azure AI Search	Bring AI-powered cloud search to your mobile and web apps.
Azure OpenAI	Perform a wide variety of natural language tasks.
Bot Service	Create bots and connect them across channels.
Content Safety	An AI service that detects unwanted contents.
Custom Vision	Customize image recognition for your business.
Document Intelligence	Turn documents into intelligent data-driven solutions.
Face	Detect and identify people and emotions in images.
Immersive Reader	Help users read and comprehend text.
Language	Build apps with industry-leading natural language understanding capabilities.
Speech	Speech to text, text to speech, translation, and speaker recognition.
Translator	Use AI-powered translation technology to translate more than 100 in-use, at-risk, and endangered languages and dialects.
Video Indexer	Extract actionable insights from your videos.
Vision	Analyze content in images and videos.

Create Azure AI service resources

Azure AI services are cloud-based, and like all Azure services you need to create a resource to use them. There are two types of AI service resources: **multi-service** or **single-service**.

- **Multi-service resource:** a resource created in the Azure portal that provides access to multiple Azure AI services with a single key and endpoint. Use the resource Azure AI services when you need several AI services or are exploring AI capabilities. When you use an Azure AI services resource, all your AI services are billed together.
- **Single-service resources:** a resource created in the Azure portal that provides access to a single Azure AI service, such as Speech, Vision, Language, etc. Each Azure AI service has a unique key and endpoint. These resources might be used when you only require one AI service or want to see cost information separately.

Once you create an Azure AI service resource, you can build applications using the REST API, software development kits (SDKs), or visual studio interfaces. Most Azure AI services are accessed through a RESTful API, although there are other ways. The API defines what information is passed between two software components: the Azure AI service and whatever is using it.

Azure AI services are easy to use AI capabilities made available as resources on the Azure platform. Azure AI service capabilities include Language, Speech, Vision, Decision, Search, and Azure OpenAI.

- **API –** application programming interfaces (APIs) enable software components to communicate, so one side can be updated without stopping the other from working.
- **Artificial Intelligence (AI) –** computer programs that respond in ways that are normally associated with human reasoning, learning, and thought.
- **Azure AI services –** a portfolio of AI services that can be incorporated into applications quickly and easily without specialist knowledge. Azure AI services is also the name for the multi-service resource created in the Azure portal that provides access to several different Azure AI services with a single key and endpoint.
- **Endpoint –** the location of a resource, such as an Azure AI service.

- **Key –** a private string that is used to authenticate a request.
- **Machine learning –** the ability for computer programs to learn from large amounts of data as "training".
- **Multi-service resource –** AI service resource created in Azure portal that provides access to a bundle of AI services.
- **Single-service resource –** a resource created in the Azure portal that provides access to a single Azure AI service, such as Speech, Vision, Language, etc. Each Azure AI service has a unique key and endpoint.
- **RESTful API –** a scalable web application programming interface used to access Azure AI services.

Knowledge Checks

1. **You want to create a model to predict sales of ice cream based on historic data that includes daily ice cream sales totals and weather measurements. Which Azure service should you use?**
   Azure Machine Learning
   Azure AI Bot Service
   Azure AI Language

2. **You work for a wildlife sanctuary and are considering using AI to identify bird species from images. Which AI service should you use to prototype your idea?**
   Azure AI Vision
   Azure AI Search
   Azure OpenAI

3. **A predictive app provides audio output for visually impaired users. Which principle of Responsible AI is reflected here?**
   Transparency
   Inclusiveness
   Fairness

4. **You want to create a model to predict the cost of heating an office building based on its size in square feet and the number of employees working there. What kind of machine learning problem is this?**
   Regression
   Classification
   Clustering

5. **You need to evaluate a classification model. Which metric can you use?**
   Mean squared error (MSE)
   Precision
   Silhouette

6. **In deep learning, what is the purpose of a loss function?**
   To remove data for which no known label values are provided
   To evaluate the aggregate difference between predicted and actual label values
   To calculate the cost of training a neural network rather than a statistical model

7. **What does automated machine learning in Azure Machine Learning enable you to do?**
   Automatically deploy new versions of a model as they're trained
   Automatically provision Azure Machine Learning workspaces for new data scientists in an organization
   Automatically run multiple training jobs using different algorithms and parameters to find the best model

8. **An application requires three separate AI services. To see the cost for each separately, what type of resource(s) should be created?**

A multi-service resource that includes all the AI services
A single-service resource for each AI service
It's not possible to see costs for individual AI services

9. **After logging into one of the Azure studios, what is one task to complete to begin using the studio?**
   Input a key and endpoint into the studio
   Customize the API request.
   Associate a resource with the studio

10. **What is an Azure AI services resource?**
    A bundle of several AI services in one resource
    An AI service to recognize faces
    A single-service resource for Azure AI Search

Chapter II – Microsoft Azure AI Fundamentals: Computer Vision

Images and image processing

A common way to perform image processing tasks is to apply *filters* that modify the pixel values of the image to create a visual effect. A filter is defined by one or more arrays of pixel values, called filter *kernels*.

Convolutional neural networks (CNNs)

CNNs use filters to extract numeric feature maps from images, and then feed the feature values into a deep learning model to generate a label prediction. During the *training* process for a CNN, filter kernels are initially defined using randomly generated weight values. Then, as the training process progresses, the models predictions are evaluated against known label values, and the filter weights are adjusted to improve accuracy.

Transformers

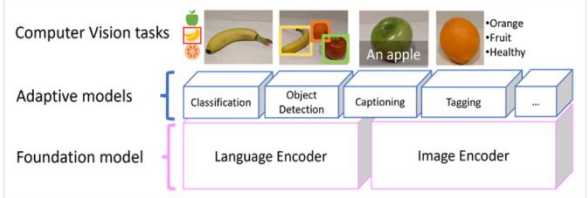
Most advances in computer vision over the decades have been driven by improvements in CNN-based models. However, in another AI discipline - *natural language processing* (NLP), another type of neural network architecture, called a transformer has enabled the development of sophisticated models for language. Transformers work by processing huge volumes of the data and encoding language tokens (representing individual words or phrases) as vector based embeddings (arrays of numeric values). Tokens that are semantically similar are encoded in similar positions, creating a semantic language model that makes it possible to build sophisticated NLP solutions for text analysis, translation, language generation, and other tasks.

Multi-modal models

The success of transformers as a way to build language models has led AI researchers to consider whether the same approach would be effective for image data. The result is the development of *multi-modal* models, in which the model is trained using a large volume of captioned images, with no fixed *labels*. An image encoder extracts features from images based on pixel values and combines them with text embeddings created by a language encoder. The overall model encapsulates relationships between natural language token embeddings and image features.

The **Microsoft *Florence* model** (foundation model) is just such a model, trained with huge volumes of captioned images from the Internet, it includes both a language encoder and an image encoder.

1. Image classification: Identifying to which category an image belongs.
2. Object detection: Locating individual objects within an image.
3. Captioning: Generating appropriate descriptions of images.
4. Tagging: Compiling a list of relevant text tags for an image.



Azure resources for Azure AI Vision service

To use Azure AI Vision, you need to create a resource for it in your Azure subscription**.**

- **Azure AI Vision:** A specific resource for the Azure AI Vision service. Use this resource type if you don't intend to use any other Azure AI services, or if you want to track utilization and costs for your Azure AI Vision resource separately. Azure AI Vision supports multiple image analysis capabilities, including:
  - Optical character recognition (OCR) - extracting text from images.
  - Generating captions and descriptions of images.
  - Detection of thousands of common objects in images.
  - Tagging visual features in images
- **Azure AI services:** A general resource that includes Azure AI Vision along with many other Azure AI services; such as Azure AI Language, Azure AI Custom Vision, Azure AI Translator, and others. Use this resource type if you plan to use multiple AI services and want to simplify administration and development.

Azure AI Face service

Microsoft Azure provides multiple Azure AI services that you can use to detect and analyze faces, including:

Azure AI Vision, which offers face detection and face analysis, like returning the bounding box coordinates.
Azure AI Video Indexer, which you can use to detect and identify faces in a video.
Azure AI Face, which offers pre-built algorithms that can detect, recognize, and analyze faces.

Attributes –

- **Accessories:** indicates whether the given face has accessories. This attribute returns possible accessories including headwear, glasses, and mask, with confidence score between zero and one for each accessory.
- **Blur:** how blurred the face is, which can be an indication of how likely the face is to be the main focus of the image.
- **Exposure:** such as whether the image is underexposed or over exposed. This applies to the face in the image and not the overall image exposure.
- **Glasses:** whether or not the person is wearing glasses.
- **Head pose:** the face's orientation in a 3D space.
- **Mask:** indicates whether the face is wearing a mask.
- **Noise:** refers to visual noise in the image. If you have taken a photo with a high ISO setting for darker settings, you would notice this noise in the image. The image looks grainy or full of tiny dots that make the image less clear.
- **Occlusion:** determines if there might be objects blocking the face in the image.
- **Quality For Recognition**: a rating of high, medium, or low that reflects if the image is of sufficient quality to attempt face recognition on.

Azure resources for Face To use the Face service, you must create one of the following types of resource in your Azure subscription:

- **Face**: Use this specific resource type if you don't intend to use any other Azure AI services, or if you want to track utilization and costs for Face separately.
- **Azure AI services**: A general resource that includes Azure AI Face along with many other Azure AI services such as Azure AI Content Safety, Azure AI Language, and others. Use this resource type if you plan to use multiple Azure AI services and want to simplify administration and development.

Azure AI Vision's OCR Engine

Azure AI Vision service has the ability to extract machine-readable text from images. Azure AI Vision's *Read API* is the OCR engine that powers text extraction from images, PDFs, and TIFF files.

To use the Azure AI Vision service you must first create a resource for it in your Azure subscription. You can use either of the following resource types:

- **Azure AI Vision:** A specific resource for vision services. Use this resource type if you don't intend to use any other AI services, or if you want to track utilization and costs for your AI Vision resource separately.
- **Azure AI services:** A general resource that includes Azure AI Vision along with many other Azure AI services such as Azure AI Language, Azure AI Speech, and others. Use this resource type if you plan to use multiple Azure AI services and want to simplify administration and development.

Knowledge check

1. **Computer vision is based on the manipulation and analysis of what kinds of values in an image?**
   Timestamps in photograph metadata
   Pixels
   Image file names

   2. You want to use the Azure AI Vision service to analyze images. You also want to use the Azure AI Language service to analyze text. You want developers to require only one key and endpoint to access all of your services. What kind of resource should you create in your Azure subscription?
   Azure AI Vision
   Azure AI services
   Azure OpenAI service

   3. You want to use the Azure AI Vision service to identify the location of individual items in an image. Which of the following features should you retrieve?
   Objects
   Visual Tags
   Dense Captions

   4. How does the Face service indicate the location of faces in images?
   A pair of coordinates for each face, indicating the center of the face
   Two pairs of coordinates for each face, indicating the location of the eyes
   A set of coordinates for each face, defining a rectangular bounding box around the face

   5. What is one aspect that might impair facial detection?
   Glasses
   Extreme angles
   Fast shutter speed

   6. What two actions are required to try out the capabilities of the Face service?
   Create an Azure AI Search resource, and open Vision Studio
   Create a Face resource, and open Vision Studio
   Create a Face resource, and open Azure AI Studio

   7. You want to extract text from images and then use Azure AI Language to analyze the text. You want developers to require only one key and endpoint to access all of your services. What kind of resource should you create in your Azure subscription?
   Azure AI Vision
   Azure AI services
   Azure AI Language

   8. You plan to use Azure AI Vision's Read API. What results can the Read API provide?

Results arranged in pages, lines, and words
Only the bounding box coordinates
Results arranged by pages that have photographs first, then pages that exclusively have text

Chapter III – Microsoft Azure AI Fundamentals: Natural Language Processing

Azure AI Language is a cloud-based service that includes features for understanding and analyzing text. Azure AI Language includes various features that support sentiment analysis, key phrase identification, text summarization, and conversational language understanding.

Tokenization: The first step in analyzing a corpus is to break it down into *tokens.* "*we choose to go to the moon*".
Text normalization: Before generating tokens, you may choose to *normalize* the text by removing punctuation and changing all words to lower case. For analysis that relies purely on word frequency, this approach improves overall performance. However, some semantic meaning may be lost
Stop word removal: Stop words are words that should be excluded from the analysis. For example, "the", "a", or "it" make text easier for people to read but add little semantic meaning. By excluding these words, a text analysis solution may be better able to identify the important words.
n-grams: They are multi-term phrases such as "I have" or "he walked". A single word phrase is a unigram, a two-word phrase is a bi-gram, a three-word phrase is a tri-gram, and so on. By considering words as groups, a machine learning model can make better sense of the text.
Stemming: It is a technique in which algorithms are applied to consolidate words before counting them, so that words with the same root, like "power", "powered", and "powerful", are interpreted as being the same token.

Common NLP tasks supported by language models include:

- Text analysis, such as extracting key terms or identifying named entities in text.
- Sentiment analysis and opinion mining to categorize text as positive or negative.
- Machine translation, in which text is automatically translated from one language to another.
- Summarization, in which the main points of a large body of text are summarized.
- Conversational AI solutions such as bots or digital assistants in which the language model can interpret natural language input and return an appropriate response.

Azure AI Language is a part of the Azure AI services offerings that can perform advanced natural language processing over unstructured text. Azure AI Language's text analysis features include:

- Named entity recognition identifies people, places, events, and more. This feature can also be customized to extract custom categories.
- Entity linking identifies known entities together with a link to Wikipedia.
- Personal identifying information (PII) detection identifies personally sensitive information, including personal health information (PHI).
- Language detection identifies the language of the text and returns a language code such as "en" for English.
- Sentiment analysis and opinion mining identifies whether text is positive or negative.
- Summarization summarizes text by identifying the most important information.
- Key phrase extraction lists the main concepts from unstructured text.

Create a resource for Azure AI Language
To use Azure AI Language in an application, you must provision an appropriate resource in your Azure subscription. You can choose either of the following types of resource:

- **A Language resource -** choose this resource type if you only plan to use Azure AI Language services, or if you want to manage access and billing for the resource separately from other services.

- **An Azure AI services resource -** choose this resource type if you plan to use Azure AI Language in combination with other Azure AI services, and you want to manage access and billing for these services together.

Question Answering

You can easily create a question answering solution on Microsoft Azure using **Azure AI Language** service. Azure AI Language includes a **custom question answering** feature that enables you to create a knowledge base of question-and-answer pairs that can be queried using natural language input.

If you have an Azure subscription, you can use **Language Studio** to explore the capabilities of Azure AI Language's Question Answering feature.

Fundamentals of conversational language understanding

Azure AI Language service supports **conversational language understanding (CLU)**. You can use CLU to build language models that interpret the meaning of phrases in a conversational setting. One example of a CLU application is one that's able to turn devices on and off based on speech. The application is able to take in audio input such as, *"Turn the light off"*, and understand an action it needs to take, such as turning a light off.

Three core concepts: *utterances*, *entities*, and *intents*.

- **Utterances** An utterance is an example of something a user might say, and which your application must interpret. For example, when using a home automation system, a user might use the following utterances:

  "*Switch the fan on.*" / "*Turn on the light.*"
- **Entities** An entity is an item to which an utterance refers. For example, **fan** and **light** in the following utterances:

  "*Switch the* **fan** *on.*" / "*Turn on the* **light**."

  You can think of the **fan** and **light** entities as being specific instances of a general **device** entity.
- **Intents** An intent represents the purpose, or goal, expressed in a user's utterance. For example, for both of the previously considered utterances, the intent is to turn a device on; so in your CLU application, you might define a **TurnOn** intent that is related to these utterances.

Intent	Related Utterances	Entities
Greeting	"Hello"	
	"Hi"	
	"Hey"	
	"Good morning"	
TurnOn	"Switch the fan on"	fan (device)
	"Turn the light on"	light (device)
	"Turn on the light"	light (device)
TurnOff	"Switch the fan off"	fan (device)
	"Turn the light off"	light (device)
	"Turn off the light"	light (device)
CheckWeather	"What is the weather for today?"	today (datetime)
	"Give me the weather forecast"	
	"What is the forecast for Paris?"	Paris (location)
	"What will the weather be like in Seattle tomorrow?"	Seattle (location), tomorrow (datetime)
None	"What is the meaning of life?"	
	"Is this thing on?"	

Azure resources for conversational language understanding

To use CLU capabilities in Azure, you need a resource in your Azure subscription. You can use the following types of resource:

- **Azure AI Language**: A resource that enables you to build apps with industry-leading natural language understanding capabilities without machine learning expertise. You can use a language resource for *authoring* and *prediction*.
- **Azure AI services**: A general resource that includes CLU along with many other Azure AI services. You can only use this type of resource for *prediction*.

Azure AI Speech provides speech to text and text to speech capabilities through speech recognition and synthesis

- **Speech recognition -** *the ability to detect and interpret spoken input*
  Speech recognition takes the spoken word and converts it into data that can be processed - often by transcribing it into text. The spoken words can be in the form of a recorded voice in an audio file, or live audio from a microphone. Speech patterns are analyzed in the audio to determine recognizable patterns that are mapped to words. To accomplish this, the software typically uses multiple models, including:
  - *Acoustic model that converts the audio signal into phonemes (representations of specific sounds).*
  - *Language model that maps phonemes to words, usually using a statistical algorithm that predicts the most probable sequence of words based on the phonemes.*

- **Speech synthesis -** *the ability to generate spoken output*
  Speech synthesis is concerned with vocalizing data, usually by converting text to speech. A speech synthesis solution typically requires the following information:
  - *The text to be spoken*
  - *The voice to be used to vocalize the speech*
  To synthesize speech, the system typically tokenizes the text to break it down into individual words, and assigns phonetic sounds to each word. It then breaks the phonetic transcription into prosodic units (such as phrases, clauses, or sentences) to create phonemes that will be converted to audio format. These phonemes are then synthesized as audio and can be assigned a particular voice, speaking rate, pitch, and volume.

Microsoft Azure offers both speech recognition and speech synthesis capabilities through **Azure AI Speech** service i.e., speech to text API (Real-time transcription, Batch transcription) and text to speech API (Speech synthesis voices)

Azure resources for Azure AI Speech

To use Azure AI Speech in an application, you must create an appropriate resource in your Azure subscription. You can choose to create either of the following types of resource:

- **A Speech resource -** choose this resource type if you only plan to use Azure AI Speech, or if you want to manage access and billing for the resource separately from other services.
- **An Azure AI services resource -** choose this resource type if you plan to use Azure AI Speech in combination with other Azure AI services, and you want to manage access and billing for these services together.

Fundamentals of language translation

- **Literal and semantic translation:** A literal translation is where each word is translated to the corresponding word in the target language. This approach presents some issues. For one case, there may not be an equivalent word in the target language. Another case is where literal translation can change the meaning of the phrase or not get the context correct.
- **Text and speech translation:** Text translation can be used to translate documents from one language to another, translate email communications that come from foreign governments, and even provide the ability to translate web pages on the Internet. Many times you see a Translate option for posts on social media sites, or the Bing search engine can offer to translate entire web pages that are returned in search results.

Microsoft provides Azure AI services that support translation. Specifically, you can use the following services:

- The **Azure AI Translator service**, which supports text-to-text translation.
- The **Azure AI Speech service**, which enables speech to text and speech-to-speech translation.

You can create an Azure AI services resource that provides access to both services through a single Azure resource, consolidating billing and enabling applications to access both services through a single endpoint and authentication key. **Azure AI Translator** includes the following capabilities:

- **Text translation -** used for quick and accurate text translation in real time across all supported languages.
- **Document translation -** used to translate multiple documents across all supported languages while preserving original document structure.
- **Custom translation -** used to enable enterprises, app developers, and language service providers to build customized neural machine translation (NMT) systems.

Knowledge check –

1. You want to use Azure AI Language to determine the key talking points in a text document. Which feature of the service should you use?
Sentiment analysis
Key phrase extraction
Entity detection

2. You use Azure AI Language to perform sentiment analysis on a sentence. The confidence scores .04 positive, .36 neutral, and .60 negative are returned. What do these confidence scores indicate about the sentence sentiment?
The document is positive.
The document is neutral.
The document is negative.

3. When might you see NaN returned for a score in language detection?
When the score calculated by the service is outside the range of 0 to 1
When the predominant language in the text is mixed with other languages
When the language is ambiguous

4. Your organization has an existing frequently asked questions (FAQ) document. You need to create a knowledge base that includes the questions and answers from the FAQ with the least possible effort. What should you do?
Create an empty knowledge base, and then manually copy and paste the FAQ entries into it.
Import the existing FAQ document into a new knowledge base.
Import a pre-defined chit-chat data source.

5. You want to create a knowledge base for your organization's bot service. Which Azure AI service is best suited to creating a knowledge base?
Conversational Language Understanding
Question Answering
Optical Character Recognition

6. You need to provision an Azure resource that will be used to author a new conversational language understanding application. What kind of resource should you create?
Azure AI Speech
Azure AI Language
Azure AI services

7. You are authoring a conversational language understanding application to support an international clock. You want users to be able to ask for the current time in a specified city, for example "What is the time in London?". What should you do?
Define a "city" entity and a "GetTime" intent with utterances that indicate the city entity.
Create an intent for each city, each with an utterance that asks for the time in that city.
Add the utterance "What time is it in city" to the "None" intent.

8. You have published your conversational language understanding application. What information does a client application developer need to get predictions from it?
The endpoint and key for the application's prediction resource
The endpoint and key for the application's authoring resource
The Azure credentials of the user who published the language understanding application

9. You plan to build an application that uses Azure AI Speech to transcribe audio recordings of phone calls into text, and then submit the transcribed text to Azure AI Language to extract key phrases. You want to manage access and billing for the application services with a single Azure resource. Which type of Azure resource should you create?
Speech
Language
Azure AI services

10. You want to use Azure AI Speech service to build an application that reads incoming email message subjects aloud. Which API should you use?
Speech to text
Text to speech
Translator

11. What is the main function of the Azure AI Translator service?
To translate spoken audio from a streaming source into text or an audio stream.
To support text-to-text translation between more than 130 languages using a Neural Machine Translation model
To support multiple AI capabilities including text analysis, translation, and speech.

12. Your team would like to build an application that translates digital copies of books. Which Azure AI Translator capability would you use?
Text translation
Document translation
Custom translation

13. You're developing an application that must take English input from a microphone and generate a real-time audio output in Hindi. Which capability of Azure AI Speech would you use?
Text-to-speech
Speech translation
Speech-to-text

Chapter IV – Microsoft Azure AI Fundamentals: Document Intelligence and Knowledge Mining

Fundamentals of Azure AI Document Intelligence

Azure AI Document Intelligence consists of features grouped by three model type:

- ***Document analysis:*** General document analysis that returns structured data representations, including regions of interest and their inter-relationships
- ***Prebuilt models:*** A pretrained models that have been built to process common document types such as invoices, business cards, ID documents.
- ***Custom models:*** Can be trained to identify specific fields that are not included in the existing pretrained models.

The ability to extract text, layout, and key-value pairs is known as document analysis.

Fundamentals of Knowledge Mining and Azure AI Search

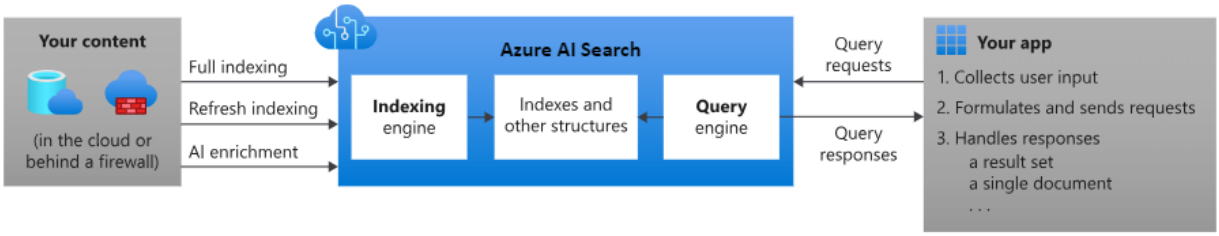
Knowledge mining solutions provide automated information extraction from large volumes of often unstructured data.

Azure AI Search provides the infrastructure and tools to create search solutions that extract data from various structured, semi-structured, and non-structured documents.

Azure AI Search results contain only your data, which can include text inferred or extracted from images, or new entities and key phrases detection through text analytics. It's a **Platform as a Service (PaaS)** solution.

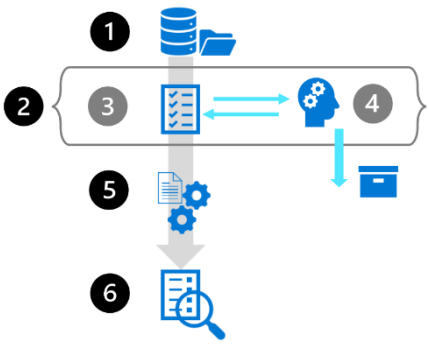
Azure AI Search features –

- **Data from any source:** accepts data from any source provided in JSON format, with auto crawling support for selected data sources in Azure.
- **Multiple options for search and analysis:** including vector search, full text, and hybrid search.
- **AI enrichment:** has Azure AI capabilities built in for image and text analysis from raw content.
- **Linguistic analysis:** offers analysis for 56 languages to intelligently handle phonetic matching or language-specific linguistics. Natural language processors available in Azure AI Search are also used by Bing and Office.
- **Configurable user experience:** has options for query syntax including vector queries, text search, hybrid queries, fuzzy search, autocomplete, geo-search filtering based on proximity to a physical location, and more.
- **Azure scale, security, and integration:** at the data layer, machine learning layer, and with Azure AI services and Azure OpenAI.



Identify elements of a search solution:

A search index contains your searchable content. In an **Azure AI Search** solution, you create a search index by moving data through the following **indexing** pipeline:



1) Start with a data source: The storage location of your original data artifacts, such as PDFs, video files, and images. For Azure AI Search, your data source could be files in ***Azure Storage***, or text in a database such as ***Azure SQL Database*** or ***Azure Cosmos DB***.

2) Indexer: Automates the movement data from the data source through document cracking and enrichment to indexing. An indexer automates a portion of data ingestion and exports the original file type to JSON (action called ***JSON serialization***).

3) Document cracking: The indexer opens files and ***extracts content***.

4) Enrichment: The indexer moves data through ***AI enrichment*** *(skills)*, which implements Azure AI on your original data to extract more information. A skillset defines the operations that extract and enrich data to make it searchable. These AI skills can be either built-in skills, such as text translation or Optical Character Recognition (OCR), or custom skills that you provide. ***Examples of AI enrichment*** include adding captions to a photo and evaluating text sentiment.

5) Push to index: The serialized JSON data populates the ***search index***.

6) The result: It is a populated ***search index*** which can be explored through ***queries***. When users make a search query such as "coffee", the search engine looks for that information in the search index. A search index has a structure similar to a table, known as the ***index schema***. A typical search index schema contains fields, the field's data type (such as string), and field attributes. The fields store searchable text, and the field attributes allow for actions such as filtering and sorting.

Below is an example of a search index schema,

```
{
  "name": "index",
  "fields": [
    {
      "name": "content", "type": "Edm.String", "analyzer": "standard.lucene", "fields": []
    }
    {
      "name": "keyphrases", "type": "Collection(Edm.String)", "analyzer": "standard.lucene", "fields": []
    },
    {
      "name": "imageTags", "type": "Collection(Edm.String)", "analyzer": "standard.lucene", "fields": []
    },
  ]
}
```

Create an index in the Azure portal

The first step to creating an Azure AI Search solution is to provision an ***Azure AI Search resource***. Once the Azure AI Search resource is created, you can manage components of your service from the resource Overview page in the portal. Identify your ***data source***. You may also create an Azure Storage object to contain your original data.

Stages of indexing as, Additional Information

Three methods to create your search solution:

- Azure portal's **Import data wizard**
- With the **REST API**
- With a software development kit **(SDK)**

A) Using the Azure portal's Import data wizard – Contained within the Azure AI Search service in Azure portal is the Import data wizard, which automates processes in the Azure portal to create various objects needed for the search engine.

- ***Data Source:*** Persists connection information to source data, including credentials. A data source object is used exclusively with indexers.
- ***Index:*** Physical data structure used for full text search and other queries.
- ***Indexer:*** A configuration object specifying a data source, target index, an optional AI skillset, optional schedule, and optional configuration settings for error handling and base-64 encoding.

- ***Skillset:*** A complete set of instructions for manipulating, transforming, and shaping content, including analyzing and extracting information from image files. Except for very simple and limited structures, it includes a reference to an Azure AI services resource that provides enrichment.
- ***Knowledge store:*** Stores output from an AI enrichment pipeline in tables and blobs in Azure Storage for independent analysis or downstream processing.

Query data in an Azure AI Search index – Index and query design are closely linked. After we build the index, we can perform queries.
Azure AI Search supports two types of syntax: simple and full Lucene. **Simple syntax** covers all the common query scenarios, while ***full Lucene*** is useful for advanced scenarios.

Knowledge check –

1. **You plan to use Azure AI Document Intelligence's prebuilt receipt model. Which kind of Azure resource should you create?**
   Azure AI Vision resource
   Azure AI Document Intelligence or Azure AI services resource
   Azure AI Language resource

2. **What are the main types of documents that prebuilt models in Azure AI Document Intelligence can process?**
   Financial services and legal, US tax, US mortgage, and personal identification documents
   Novels, newspapers, and magazines
   Medical records, academic transcripts, and scientific articles

3. **What is the purpose of document analysis in the context of document intelligence?**
   It is used to convert text into speech.
   It is used to create new documents based on existing ones.
   It is used to extract text, layout, and key-value pairs from documents, providing locations of text on a page identified by bounding box coordinates.

4. **Which data format is accepted by Azure AI Search when you're pushing data to the index?**
   CSV.
   SQL.
   JSON.

5. **Which explanation best describes an indexer and an index?**
   An indexer converts documents into JSON and forwards them to a search engine for indexing.
   An indexer can be used instead of an index if the files are already in the proper format.
   An indexer is only used for AI enrichment and skillset execution.

6. **If you set up a search index of written news documents without including any skillsets, what information would you still be able to query?**
   The sentiment.
   The full text.
   The AI-generated image captions.

Chapter V – Microsoft Azure AI Fundamentals: Generative AI

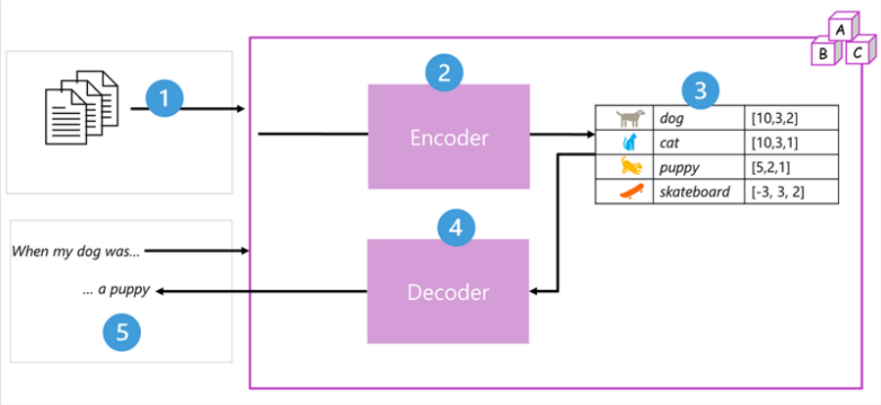
Generative AI describes a category of capabilities within AI that create original content. One popular example of such an application is Microsoft Copilot, a chatbot companion to browse the web more effectively.

Generative AI applications are powered by language models, which are a specialized type of machine learning model that you can use to perform natural language processing (NLP) tasks, including:

- Determining sentiment or otherwise classifying natural language text.
- Summarizing text.
- Comparing multiple text sources for semantic similarity.
- Generating new natural language.

Transformer models

- An ***encoder block*** that creates semantic representations of the training vocabulary.
- A ***decoder block*** that generates new language sequences.



1. The ***model*** is trained with a large volume of natural language text, often sourced from internet, public sources text.
2. The sequences of text are broken down into tokens (for example, individual words) and the encoder block processes these token sequences using a technique called ***attention*** to determine relationships between tokens (which tokens influence the presence of other tokens in a sequence, different tokens that are commonly used in the same context)
3. The output from the encoder is a collection of ***vectors*** (multi-valued numeric arrays) in which each element of the vector represents a semantic attribute of the tokens. These vectors are referred to as embeddings.
4. The decoder block works on a new sequence of text tokens and uses the ***embeddings*** generated by the encoder to generate an appropriate natural language output.
5. For example, given an input sequence like "When my dog was", the model can use the attention technique to analyze the input tokens and the semantic attributes encoded in the embeddings to predict an appropriate completion of the sentence, such as "a puppy."

Large and small language models

Large Language Models (LLMs)	Small Language Models (SLMs)
LLMs are trained with vast quantities of text that represents a wide range of general subject matter – typically by sourcing data from the Internet and other generally available publications.	SLMs are trained with smaller, more subject-focused datasets
When trained, LLMs have many billions (even trillions) of parameters (weights that can be applied to vector embeddings to calculate predicted token sequences).	Typically have fewer parameters than LLMs.
Able to exhibit comprehensive language generation capabilities in a wide range of conversational contexts.	This focused vocabulary makes them very effective in specific conversational topics, but less effective at more general language generation.
Their large size can impact their performance and make them difficult to deploy locally on devices and computers.	The smaller size of SLMs can provide more options for deployment, including local deployment to devices and on-premises computers; and makes them faster and easier to fine-tune.
Fine-tuning the model with additional data to customize its subject expertise can be time-consuming, and expensive in terms of the compute power required to perform the additional training.	Fine-tuning can potentially be less time-consuming and expensive.

Using language models

The latest open-source models from Microsoft and multiple partners, including *OpenAI, HuggingFace, Mistral, Meta and others*.

A few of common Azure OpenAI models are:

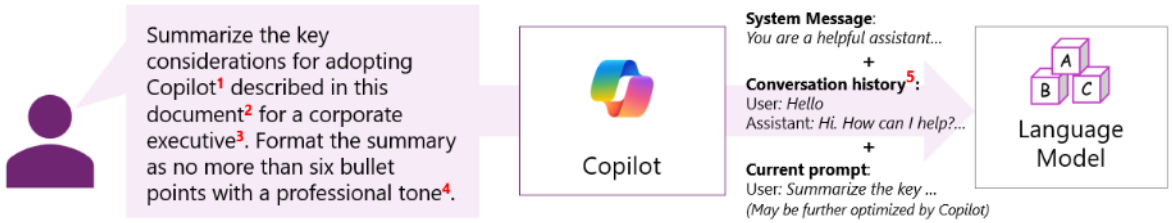
- ***GPT-3.5-Turbo, GPT-4, GPT-4o:*** Conversation-in and message-out language models.
- ***GPT-4 Turbo with Vision:*** A language model developed by OpenAI that can analyze images and provide textual responses to questions about them. It incorporates both natural language processing and visual understanding.
- ***DALL-E:*** A language model that generates original images, variations of images, and can edit images.

What are copilots? Copilots are generative AI assistants that are integrated into applications often as chat interfaces.

- ***Azure AI Studio*** is a **PaaS (platform as a service)** development portal for professional software developers that gives you full control over the language model you want to use, including the capability to fine-tune the model with your own data.
- ***Copilot Studio*** is designed to work well for low-code development scenarios in which technically proficient business users or developers can create conversational AI experiences. The resulting copilot is a **fully managed SaaS** (software as a service) solution, hosted in your Microsoft 365 environment and delivered through chat channels like Microsoft Teams.

Microsoft Copilot Usages

- Web browsing with AI (Edge browser)
- Copilot for Microsoft 365 (Office 365 applications)
- Copilot in Dynamics 365 Customer Service (Customer queries)
- Copilot in Microsoft Fabric (Data visualization)
- Microsoft Copilot for Security (Security checkers)
- GitHub Copilot (Code automates)



- ***A system message*** that sets conditions and constraints for the language model behaviour. For example, "You're a helpful assistant that responds in a cheerful, friendly manner." These system messages determine constraints and styles for the model's responses.
- ***The conversation history*** for the current session, including past prompts and responses. The history enables you to refine the response iteratively while maintaining the context of the conversation.
- ***The current prompt*** potentially optimized by the copilot to reword it appropriately for the model or to add more grounding data to scope the response.

Knowledge check –

1. **What are Large Language Models?**
   Models that detect additional meaning in paragraphs of text.
   Lists of words and code that computers use to generate text.
   Models that use deep learning to process and understand natural language on a massive scale.

2. **Which Microsoft Copilot should a customer support agent use to research and resolve a support issue?**

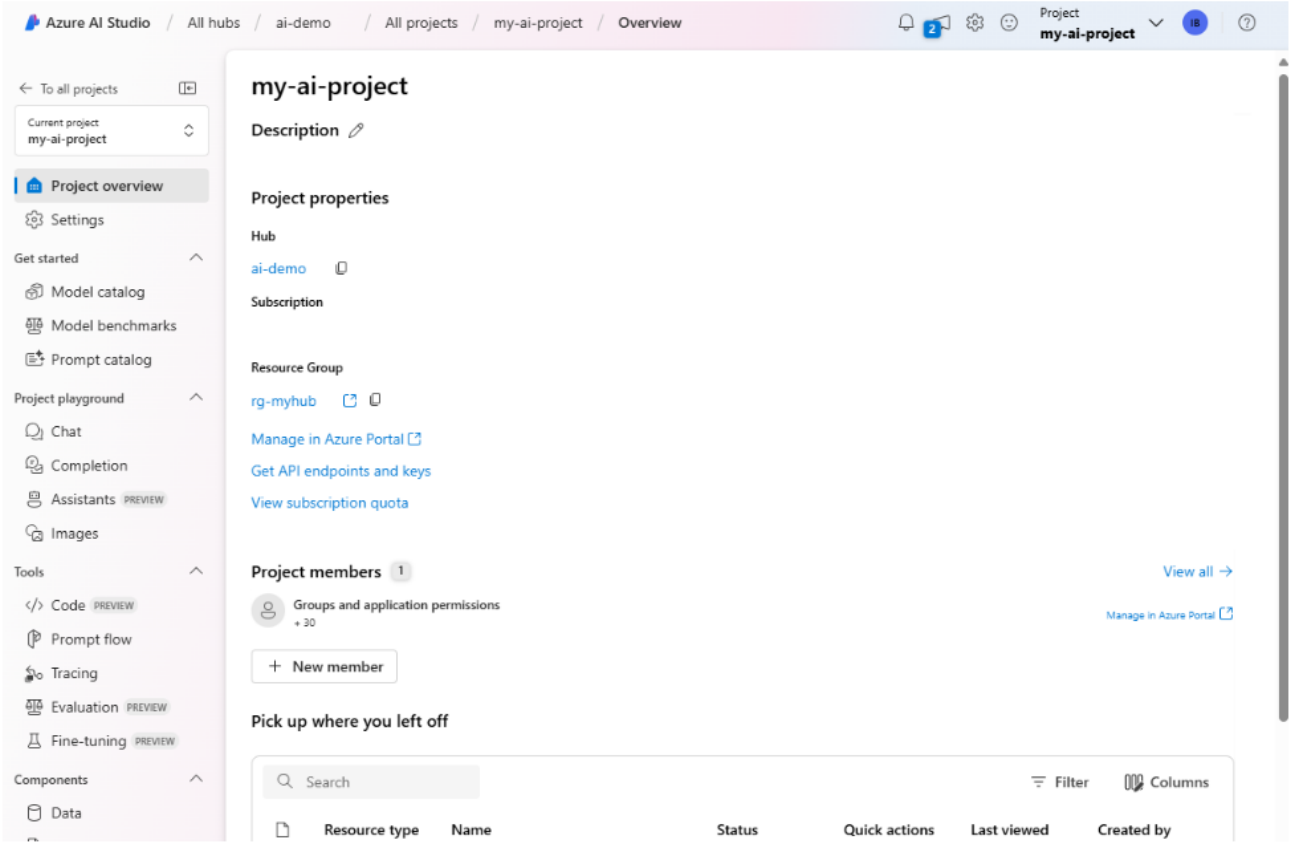
Microsoft Copilot for Microsoft Edge
Microsoft Copilot for Dynamics 365 Customer Service
Microsoft Copilot for Security

3. **Which tool should a professional developer use to build a custom copilot and deploy it as a service endpoint in Azure?**
   Microsoft Copilot for Azure
   Microsoft Copilot Studio
   Microsoft Azure AI Studio

Chapter VI – Introduction to Azure AI Studio [Bonus]

An ***AI hub*** provides a collaborative workspace for AI solution development and management.

- ***Azure AI Studio*** provides a single tool for AI development with multiple Azure AI services.
- An ***Azure AI resource*** defines a collaborative workspace for AI development with Azure AI Studio.
- An ***Azure AI project*** provides a shared collection of assets and code for a particular AI solution.



All AI development in Azure AI Studio is performed within a project.

- ***Deploy large language models*** to support a chatbot or copilot.
- ***Test models*** in the chat playground.
- Add your own data to ***augment prompts***.
- Use ***prompt flow*** to define flows that combine models, prompts, and custom code.
- ***Evaluate model*** responses to prompts.
- ***Manage indexes*** and datasets for custom data.
- Define ***content filters*** to mitigate potentially harmful responses.
- Use ***Visual Studio Code*** in your browser to create custom code.
- Deploy solutions as ***web apps*** and ***containerized services***.

In addition to the core **AI hub resource**, other Azure resources are created to provide supporting services.

- A ***Storage account*** in which the data for your AI projects is stored securely.
- A ***Key vault*** in which credentials used to access external resources and other sensitive values are secured.
- A ***Container registry*** to store Docker images used by your AI solutions.
- An ***application insights resource*** to record usage and performance metrics.
- An ***Azure OpenAI Service resource*** that provides generative AI models for your applications.

Knowledge check –

1. **Which of the following best describes Azure AI Studio?**
   An online marketplace where you can buy and sell AI models
   A collaborative development environment for AI projects on Azure.
   A graphics editing application that uses AI to generate images.

2. **How can you enable a colleague to collaborate with you on an AI project?**
   Add them as a member in the appropriate role to your Azure AI hub.
   Deploy a model as a web app and configure authentication for the web app service.
   Tell the colleague to create their own Azure AI hub in the same Azure subscription as yours.

3. **You have deployed an Azure OpenAI GPT model in Azure AI Studio. What's the easiest way to test it?**
   Deploy the model as a web app, configure authentication, and use it in a browser.
   Export the model and test it locally using Visual Studio Code.
   On the Playground page, select the deployment and use the chat interface.