Azure
AI
Fundamentals

(AI-900)

Project Workbook
Student Edition

Azure AI Fundamentals (AI-900) Project Workbook

First Edition

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![LearnKey logo]

Introduction

Azure
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Best Practices Using LearnKey's Online Training

LearnKey offers video-based training solutions that are flexible enough to accommodate private students and educational facilities and organizations.

Our course content is presented by top experts in their respective fields and provides clear and comprehensive information. The full line of LearnKey products has been extensively reviewed to meet superior standards of quality. Our course content has also been endorsed by organizations such as Certiport, CompTIA®, Cisco, and Microsoft. However, it is the testimonials given by countless satisfied customers that truly set us apart as leaders in the information training world.

LearnKey experts are highly qualified professionals who offer years of job and project experience in their subjects. Each expert has been certified at the highest level available for their field of expertise. This expertise provides the student with the knowledge necessary to obtain top-level certifications in their chosen field.

Our accomplished instructors have a rich understanding of the content they present. Effective teaching encompasses presenting the basic principles of a subject and understanding and appreciating organization, real-world application, and links to other related disciplines. Each instructor represents the collective wisdom of their field and within our industry.

Our Instructional Technology

Each course is independently created based on the manufacturer's standard objectives for which the course was developed.

We ensure that the subject matter is up-to-date and relevant. We examine the needs of each student and create training that is both interesting and effective. LearnKey training provides auditory, visual, and kinesthetic learning materials to fit diverse learning styles.

Course Training Model

The course training model allows students to undergo basic training, building upon primary knowledge and concepts to more advanced application and implementation. In this method, students will use the following toolset:

Pre-assessment: The pre-assessment is used to determine the student's prior knowledge of the subject matter. It will also identify a student's strengths and weaknesses, allowing the student to focus on the specific subject matter he/she needs to improve the most. Students should not necessarily expect a passing score on the pre-assessment as it is a test of prior knowledge.

Video training sessions: Each training course is divided into sessions or domains and lessons with topics and subtopics. LearnKey recommends incorporating all available external resources into your training, such as student workbooks, glossaries, course support files, and additional customized instructional material. These resources are located in the folder icon at the top of the page.

Exercise labs: Labs are interactive activities that simulate situations presented in the training videos. Step-by-step instructions and live demonstrations are provided.

Post-assessment: The post-assessment is used to determine the student's knowledge gained from interacting with the training. In taking the post-assessment, students should not consult the training or any other materials. A passing score is 80 percent or higher. If the individual does not pass the post-assessment the first time, LearnKey recommends incorporating external resources, such as the workbook and additional customized instructional material.

Workbook: The workbook has various activities, such as fill-in-the-blank worksheets, short answer questions, practice exam questions, and group and individual projects that allow the student to study and apply concepts presented in the training videos.

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Using This Workbook

This project workbook contains practice projects and exercises to reinforce the knowledge you have gained through the video portion of the **Azure AI Fundamentals (AI-900)** course. The purpose of this workbook is twofold. First, get you further prepared to pass the Azure AI Fundamentals (AI-900) exam, and second, to get you job-ready skills and increase your employability in the area of artificial intelligence solutions.

The projects within this workbook follow the order of the video portion of this course. To save your answers in this workbook, you must first download a copy to your computer. You will not be able to save your answers in the web version. You can complete the workbook exercises as you go through each section of the course, complete several of these at the end of each domain, or complete them after viewing the entire course. The key is to go through these projects to strengthen your knowledge of this course.

Each project is based upon a specific video (or videos) in the course and specific test objectives. The materials you will need for this course include:

- LearnKey's **Azure AI Fundamentals (AI-900)** courseware.

- Access to Microsoft Azure (a trial account works).

- The course project files. All applicable project files are located in the support area where you downloaded this workbook.

We value your feedback about our courses. If you have any questions, comments, or concerns, please let us know by visiting https://about.learnkey.com.

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Skills Assessment

Instructions: Rate your skills on the following tasks from 1-5 (1 being needs improvement, 5 being excellent).

Skills	1	2	3	4	5
Identify features of common AI workloads.					
Identify guiding principles for responsible AI.					
Identify common machine learning types.					
Describe core machine learning concepts.					
Identify core tasks in creating a machine learning solution.					
Describe capabilities of no-code machine learning with Azure Machine Learning studio.					
Identify common types of computer vision solution.					
Identify Azure tools and services for computer vision tasks.					
Identify features of common NLP Workload Scenarios.					
Identify Azure tools and services for NLP workloads.					
Identify common use cases for conversational AI.					
Identify Azure services for conversational AI.					

Azure AI Fundamentals (AI-900) Video Times

Domain 1	Video Time
Features of Common AI Workloads	00:09:37
Guiding Principles for Responsible AI	00:07:52
Total Time	**00:17:29**

Domain 2	Video Time
Common Machine Learning Types	00:07:09
Core Machine Learning Concepts	00:07:58
Core Tasks	00:10:10
No-Code Machine Learning	00:07:06
Total Time	**00:32:23**

Domain 3	Video Time
Computer Vision Solutions	00:08:41
Computer Vision Task Tools and Services	00:10:38
Total Time	**00:19:19**

Domain 4	Video Time
Common NLP Workload Scenarios	00:10:50
Tools and Services for NLP Workloads	00:09:24
Total Time	**00:20:14**

Domain 5	Video Time
Use Cases for Conversational AI	00:06:10
Azure Services for Conversational AI	00:06:46
Total Time	**00:12:56**

Domain 1
Lesson 1

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Fill-in-the-Blanks

Instructions: While watching Domain 1 Lesson 1, fill in the missing words according to the information presented by the instructor. [References are found in the brackets.]

1. A machine learning model is a group of data transformed for readiness for predictions and then using _____, trained and scored, to predict future outcomes. [Prediction/Forecasting Workloads]

2. One example of an anomaly can include detecting unusual spikes in network _____. [Anomaly Detection Workloads]

3. Anomaly detection detects data outside of a normal data _____. [Anomaly Detection Workloads]

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Prediction/Forecasting Workloads

Artificial Intelligence, or AI, is a machine learning model's ability to take current data and predict future trends or identify future specific instances of an object based on two major items: data and the algorithms taken to predict the future.

A machine learning model is a group of data transformed for readiness for predictions and then using algorithms, trained and scored, to predict future outcomes.

Purpose

Upon completing this project, you will better understand machine learning models and forecasting workloads.

Steps for Completion

1. Search within the Azure AI Gallery online for a sample that can help predict student performance based on past history.

   a. A search may include the phrase **Student Performance using ML**

2. The Forecasting Model for Microsoft Dynamics 365 Business Central is used to manage cash flow and inventory levels and make predictions for both. For what could this model be used?

   a. _____

Anomaly Detection Workloads

Anomaly detection workloads are created within Azure, and they work with data to identify anomalies or data outside the normal ranges of what is found within a machine learning model.

Purpose

Upon completing this project, you will better understand anomaly detection workloads.

Steps for Completion

1. Search within the Azure AI Gallery online for a sample that shows anomalies to detect credit risk through anomalies in one's credit patterns.

   a. A search may include the phrase **Anomaly Detection: Credit Risk**

2. How does this workload determine anomalies within credit patterns?

   a. _____
   _____
   _____
   _____
   _____ .

3. Once results are generated, users can decide whether to use anomalies in any predictive models. Most of the time, one will probably _____ to use anomalies when trying to make predictions.

Domain 1
Lesson 2

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Fill-in-the-Blanks

Instructions: While watching Domain 1 Lesson 2, fill in the missing words according to the information presented by the instructor. [References are found in the brackets.]

1. Computer vision workloads are machine learning models trained to identify one or more subjects within a video or a series of _____. [Computer Vision Workloads]

2. Computer vision models can identify objects and _____ and extract text from an image. [Computer Vision Workloads]

3. A common occurrence in AI is to take data and split it to where part of the data is used to train the model, and then the data is tested through _____ to see whether the training used on the data is working. [NLP and Knowledge Mining Workloads]

4. Chatbots provide human-like interaction with a human, usually in the form of an _____. [Conversational AI Workloads]

5. Chatbots are built using a list of _____ and _____ that are commonly asked. [Conversational AI Workloads]

Computer Vision Workloads

Computer vision workloads are machine learning models trained to identify one or more subjects within a video or a series of pictures. These workloads include many variations, but the idea is that users take images of something they want their model to detect and train the model to detect the object. Then, the object is identified within other pictures or media using the trained model.

Purpose

Upon completing this project, you will better understand computer vision workloads.

Steps for Completion

1. List the tasks computer vision models can perform on media, such as videos or images.

    a. _____

    b. _____

    c. _____

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NLP and Knowledge Mining Workloads

The next two workloads to learn about are natural language processing (NLP) and knowledge mining. Sentiment analysis is a form of NLP that takes text and measures whether the text has positive or negative comments, saving users from reading all their customers' comments to determine those customers' thoughts.

A similar workload in AI is that of knowledge mining. One example of knowledge mining is text mining, which determines whether a text message is legitimate or spam. The text is sampled and then split and trained to look for indicators that a message may be spam.

Purpose

Upon completing this project, you will better understand NLP and knowledge mining workloads.

Steps for Completion

1. Search within the Azure AI Gallery online for a sample that shows sentiment analysis.

   a. A search may include the phrase **Content/Sentiment Analysis**

2. It is a common occurrence in AI to _____ data so that part of it is used to train the model, and then the data is tested through Score Model to see whether the training used on the data works.

3. Search within the Azure AI Gallery online for a sample that shows whether a text message is legitimate or spam.

   a. A search may include the phrase, **Text Mining DIY**

4. View the dataset of the text file.csv step.

Conversational AI Workloads

A common AI workload type is a chatbot, which is built through conversational AI workloads. Chatbots provide human-like interaction with a human, usually in the form of an online chat. These bots are built through Azure Bot Services using a list of commonly asked questions and answers.

Purpose

Upon completing this project, you will better understand conversational AI workloads.

Steps for Completion

1. Search within the Azure AI Gallery online for a sample that shows a dynamic chatbot web service.

    a. A search may include the phrase **Dynamic Chatbot web service**

2. View the dataset of the 111111111 – Copy.csv step.

3. View the properties of the Preprocess Text step.

4. What are some common text cleansing mechanisms used to preprocess text? List a minimum of three answers.

    a. _____
    _____
    _____
    _____.

Domain 1
Lesson 3

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Fill-in-the-Blanks

Instructions: While watching Domain 1 Lesson 3, fill in the missing words according to the information presented by the instructor. [References are found in the brackets.]

1. AI models should be built to either avoid _____, or identify potential areas of _____, or both. [Fairness]

2. A self-driving vehicle must be trained properly on what to _____ when trying to drive. [Reliability and Safety]

3. As data is used to build AI models, it is very important to protect that data as, many times, data is sensitive, such as _____ information. [Privacy and Security]

4. Within a model, a(n) _____ can do what a user does and also control access to the workspace. [Privacy and Security]

5. Mitigating social bias promotes inclusiveness, which dictates that AI models need to benefit people from all parts of society, regardless of _____, gender, sexual orientation, or _____. [Inclusiveness]

6. Microsoft has three design principles for inclusiveness: recognize _____, solve for one, extend for many, and learn from _____. [Inclusiveness]

7. Transparency is the act of making known the purpose, _____, and results of a solution. [Transparency]

8. Transparency is also how people who use a _____ know the what, why, and how of a solution. [Transparency]

9. Details for this guideline include defining legal and _____ standards that apply to AI models before the models are built. [Accountability]

10. The _____ Portability and Accountability Act (HIPAA) applies to any entity holding patient information. [Accountability]

Fairness, Reliability, and Safety

There are six guiding principles for responsible AI, and it is important to know all six topics and the characteristics of each. The first principle is fairness. Users should avoid factors that can cause bias based on race, gender, sexual orientation, and location. AI models should be built to either avoid bias, or identify potential areas of bias, or both.

The second guiding principle for AI is that of reliability and safety. A lack of either can cause bodily harm, as with the example of self-driving vehicles. However, not every AI model will have safety as a major concern, but reliability should be a concern.

Purpose

Upon completing this project, you will better understand the guiding principles of fairness within AI, as well as reliability and safety.

Steps for Completion

1. Navigate to the Guidelines for Human-AI Interaction website.

2. View the Mitigate social biases card.

3. List three examples of avoiding bias.

   a. _____
   _____
   _____
   _____.

4. View the Support efficient correction card.

5. List two examples of improving reliability.

   a. _____
   _____
   _____.

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Privacy, Security, and Inclusiveness

The third guiding principle for AI is privacy and security. As data is used to build AI models, it is very important to protect that data as, many times, data is sensitive. One can secure data by defining who is allowed into an AI model.

Inclusiveness dictates that AI models need to benefit people from all parts of society, regardless of ethnicity, gender, sexual orientation, or mobility. Another method to promote inclusiveness is to match relevant social norms, including being polite with direction, placing importance on what people may deem to be important, and using a semi-formal tone in conversation. Inclusiveness includes people from all walks of society, while fairness is making sure bias is not being shown toward or against individuals.

Purpose

Upon completing this project, you will better understand the guiding principles of privacy and security within AI, as well as inclusiveness.

Steps for Completion

1. Search within the Azure AI Gallery online for a sample that shows a dynamic chatbot web service.

    a. A search may include the phrase **Dynamic Chatbot web service**

2. Invite the user **tvet@learnkey.com** to the workspace.

3. Navigate to the Microsoft Inclusive Design page.

    a. The current web link is https://devblogs.microsoft.com/premier-developer/microsoft-inclusive-design/

4. List and summarize the three principles of inclusive design.

    a. _____
       _____
       _____.

    b. _____
       _____
       _____.

    c. _____
       _____
       _____.

Transparency and Accountability

The next guideline principle for responsible AI design is transparency. Transparency is the act of making known the purpose, limitations, and results of a solution. Transparency is also how people who use a solution know the what, why, and how of a solution.

The sixth guideline principle is accountability, making sure AI models conform to organizational principles and legal and regulatory standards before the models are built.

Purpose

Upon completing this project, you will better understand transparency and accountability.

Steps for Completion

1. Navigate to the Guidelines for Human-AI Interaction website.

2. List at least three cards that help create transparency in a workspace.

   a. _____
   _____
   _____
   _____
   _____
   _____ .

3. The _____, applies to any company taking credit cards, including any retail store.

4. The _____, is a European law on data privacy and protection and applies to anyone doing business in the European Union.

Domain 2
Lesson 1

Azure
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Fill-in-the-Blanks

Instructions: While watching Domain 2 Lesson 1, fill in the missing words according to the information presented by the instructor. [References are found in the brackets.]

1. A regression machine learning model uses statistical _____ to predict numeric outcomes based on input data. [Regression Scenarios]

2. Within learning models, it is key to use _____ of data to help predict future outcomes. [Regression Scenarios]

3. Classification machine learning scenarios predict a _____ to which an entity will belong. [Classification Scenarios]

4. A Two-Class Logistic Regression model is used to train two possible _____. [Classification Scenarios]

5. Clustering groups items based on their _____, rather than have data assigned to pre-determined groups. [Clustering Scenarios]

6. Clustering is known as an _____ model because there are no column labels determining the actual grouping of the results. [Clustering Scenarios]

Regression Scenarios

There are a few specific types of machine learning models, all of which have relationships with their specific output types. A regression machine learning model uses statistical analysis to predict numeric outcomes based on input data.

Purpose

Upon completing this project, you will better understand regression scenarios.

Steps for Completion

1. Search within the Azure AI Gallery online for a sample that shows a prediction using linear regression.

   a. A search may include the phrase **Bike count prediction using Linear Regression – Swati Kaiwar**

2. View the Bike Rental dataset.

3. View the columns used in the dataset.

4. List at least three of the selected columns.

   a. _____
   _____
   _____ .

5. View the Train Model properties.

6. What type of column will be used to display the output data?

   a. _____

Classification Scenarios

While a regression machine learning scenario predicts numeric outcomes, a classification machine learning scenario predicts a category to which an entity will belong. A classic classification machine learning scenario has two conditions.

Purpose

Upon completing this project, you will better understand classification scenarios.

Steps for Completion

1. Search within the Azure AI Gallery online for a sample that shows a classification machine learning scenario.

   a. A search may include the phrase **Employee Promotion Experiment**

2. View the Employee promotion dataset.

   a. Open the Excel file.

3. View the Split Data properties in the Employee Promotion Experiment.

4. What percentage of the data will be trained using a Two-Class Logistic Regression model?

   a. _____

5. View the Train Model properties.

6. Which column label will be used to display the outcomes?

   a. _____

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Clustering Scenarios

Another common machine learning model is a clustering machine learning scenario. Clustering groups items based on their features, rather than have data assigned to pre-determined groups, as is the case with the classification machine learning model. Clustering is known as an unsupervised model because there are no column labels determining the actual grouping. Classification and regression machine learning models fall under the supervised category because models learn what to do based on a defined column, also known as a label.

Purpose

Upon completing this project, you will better understand clustering scenarios.

Steps for Completion

1. Search within the Azure AI Gallery online for a sample that shows a clustering machine learning scenario.

   a. A search may include the phrase **Tutorial Clustering YouTube Views**

2. View the Top_5k_YT_Views dataset.

3. View the Train Clustering Model properties.

4. Which columns are being used to determine the groups?

   a. _____

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Lesson 2

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Fill-in-the-Blanks

Instructions: While watching Domain 2 Lesson 2, fill in the missing words according to the information presented by the instructor. [References are found in the brackets.]

1. Features are _____ values used to predict labels. [Features and Labels]

2. Features are used as input for a machine learning model, and labels are the _____, specifically the model's output column or columns. [Features and Labels]

3. Training datasets are used to train a model to help _____ an outcome. [Training and Validation Datasets]

4. A randomized split makes an _____ sample size for training a model, which helps get the most plausible outcome for training the model. [Training and Validation Datasets]

5. A _____ algorithm takes data and allows for just two possible results. [Machine Learning Algorithms]

6. Some regression algorithms are _____, some are decision-based, and some are more numeric. [Machine Learning Algorithms]

7. The Mean Absolute Error algorithm measures how close predictions are to actual _____. [Model Evaluation Metrics]

Features and Labels

There are some specific elements of common machine learning model types for people to understand. The first two pieces involve features and labels. In any machine learning model, one must know what will be used to predict an outcome. Features are data values used to predict labels. Typically, one will find these in the columns selected from a dataset. Labels are numeric outcomes within an AI model.

Purpose

Upon completing this project, you will better understand the purpose of features and labels.

Steps for Completion

1. Search within the Azure AI Gallery online for a sample that shows a prediction using linear regression.

    a. A search may include the phrase **Bike count prediction using Linear Regression – Swati Kaiwar**

2. Run the model to view results of the experiment.

3. View the Columns in Dataset results.

4. List at least four of the columns used to determine a prediction for bike sales.

    a. _____

    _____.

5. View the Train Model properties.

6. Which column is being used as the label?

    a. _____

Training and Validation Datasets

There are two basic datasets in a machine learning model: training and validation. Training datasets are used to train a model to help predict an outcome. For regression machine learning, a dataset would contain columns people can use for features and labels. Often, 70-80% of the data used to create the model is used for training purposes, and the other 20-30% for the validation dataset.

Purpose

Upon completing this project, you will better understand training and validation datasets.

Steps for Completion

1. Search within the Azure AI Gallery online for a sample that shows a classification machine learning scenario.

   a. A search may include the phrase **Employee Promotion Experiment**

2. Run the model to view the results of the experiment.

3. View the Split data properties.

4. What percentage of the data is used to train the model?

   a. _____

5. View the Score Model dataset.

6. How many rows were used to score the data using this model?

   a. _____

Machine Learning Algorithms and Evaluation Metrics

It is important to know how machine learning algorithms are used for model training. Algorithms help to train a model by priority, such as time or accuracy. Some regression algorithms are linear, meaning over time, some are decision-based, and some are numeric. The type of algorithm needed for a model depends on the goal of the experiment. A model algorithm uses a decision tree to generate outcomes.

Purpose

Upon completing this project, you will better understand machine learning algorithms and model evaluation metrics. You will need at least a trial version of Microsoft Azure Machine Learning Studio (classic) for this and the following projects.

Steps for Completion

1. Search within the Azure AI Gallery online for a sample that shows a classification machine learning scenario.

    a. A search may include the phrase **Employee Promotion Experiment**

    b. Ensure the model has been run to review the results of the experiment.

2. View the Evaluation results.

3. Based on the results of the model, are employees likely to get promoted?

    a. _____

4. Add a Decision Forest Regression algorithm to the model.

5. Move the decision tree from the Two-Class Logistic Regression algorithm to the Decision Forest Regression algorithm.

6. Run the model experiment.

7. View the Evaluation results.

8. What percentage mean absolute error is the model claiming?

    a. _____

9. Move the decision tree back to the Two-Class Logistic Regression algorithm.

10. Delete the Decision Forest Regression algorithm.

11. Save the project.

Domain 2
Lesson 3

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Fill-in-the-Blanks

Instructions: While watching Domain 2 Lesson 3, fill in the missing words according to the information presented by the instructor. [References are found in the brackets.]

1. When users receive data for an _____, the ingestion process, the data may not be what they need for a sound machine learning model. [Data Ingestion and Preparation]

2. Columns can be removed, and columns containing _____ can be added. [Feature Engineering and Selection]

3. Feature engineering is the act of _____ an existing feature to the needs of a machine learning model. [Feature Engineering and Selection]

4. A true positive is a match between an actual and _____ positive outcome. [Model Training and Evaluation]

5. In many matrices for machine learning outcomes, a 1 represents _____, and a 0 represents _____. [Model Training and Evaluation]

6. The API key for a web service can be accessed as needed from an _____. [Model Deployment and Management]

7. Making a project _____ hides the experiment from everyone unless they have the web link to the experiment. [Model Deployment and Management]

Data Ingestion and Preparation

When creating a machine learning model, people should understand the tasks to build an experiment. These tasks are also considered a pipeline within an AI model. The first set of tasks deals with data ingestion and preparation. When users receive data for an AI model, the ingestion process, the data may not be what they need for a sound machine learning model. For this reason, one should know how to prepare and alter an AI model. One such alteration is adding and removing columns, which is demonstrated in this and the following projects.

Purpose

Upon completing this project, you will be able to remove columns from experiment models.

Steps for Completion

1. Open your saved **Employee Promotion Experiment** within Azure Machine Learning Studio.

    a. Ensure the model has been run to review the results of the experiment.

2. View the Employee_promotion.csv dataset.

    a. You will remove the recruitment_channel column in the following steps.

3. Add the Select Columns in Dataset task to the experiment window.

4. Within the column selector, include all columns except for the recruitment_channel column.

5. Connect the Employee_promotion.csv port to the Select Columns in Dataset task.

6. Connect the Select Columns in Dataset task to the Split Data task.

7. Run the model experiment.

8. View the dataset results of the Select Columns in Dataset task.

    a. The recruitment_channel column should not be in the results.

9. Save the project.

10. Take a screenshot of the model experiment.

11. Save the screenshot as **231-Completed** to your Domain 2 Student folder.

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Feature Engineering and Selection

Feature engineering is the act of manipulating an existing feature to the needs of a machine learning model. The choosing of the columns of data to use in the model is known as feature selection.

Purpose

Upon completing this project, you will be able to add columns with formulas to experiment models.

Steps for Completion

1. Open your saved **Employee Promotion Experiment** within Azure Machine Learning Studio.

    a. Ensure the model has been run to review the results of the experiment.

2. Add the Apply a SQL Transformation task to the model.

3. Connect the Select Columns in Dataset task to the Apply a SQL Transformation task.

4. Within the SQL Query Script window, add **previous_year_rating + awards_won? + avg_training_score as total_score** to the query. It should resemble the following format:

    a.

5. Connect the Apply a SQL Transformation task to the Split Data task.

6. Save the project.

7. Take a screenshot of the model experiment.

8. Save the screenshot as **232-Completed** to your Domain 2 Student folder.

Model Training and Evaluation

The top four model evaluation terms to understand are true positives, true negatives, false positives, and false negatives. These terms apply to classification machine learning models. A true positive is a match between an actual and predicted positive outcome; so is a true negative, except that the outcome is negative. A false positive represents an outcome that should be negative but is positive, and a false negative represents an outcome that should be positive but is negative. In many of these matrices, a 1 represents positive, and a 0 represents negative.

Purpose

Upon completing this project, you will better understand how to evaluate the results of an experimental model.

Steps for Completion

1. Open your saved **Employee Promotion Experiment** within Azure Machine Learning Studio.

    a. Ensure the model has been run to review the results of the experiment.

2. View the Train Model results.

3. View the Score Model dataset.

4. View the Evaluate Model results.

5. What is the accuracy percentage?

    a. _____

6. In this example, what is a true positive?

    a. _____.

Model Deployment and Management

There are a few ways to deploy a machine learning model and view the model's data output. People can save the evaluations as their own dataset, and they can also deploy a web service for an experiment. If a web service is added to a model, it creates input and output tasks for that experiment. At that point, the model can be published to a public gallery, or it can remain unlisted.

Purpose

Upon completing this project, you will better understand model deployment and management.

Steps for Completion

1. Search within the Azure AI Gallery online for a sample that shows a prediction using linear regression.

   a. A search may include the phrase **Bike count prediction using Linear Regression – Swati Kaiwar**

   b. Ensure the model has been run to review the results of the experiment.

2. Save the Evaluate Model task as a dataset.

   a. Set the name for the new dataset as **Bike Count Evaluation Results**

3. Set a predictive web service for the model.

   a. Accept the defaults for the web service.

4. Run the experiment.

5. Deploy the web service.

6. View the API key of the web service.

7. Take a screenshot of the page, ensuring the API key of the web service is visible.

8. Save the screenshot as **234-Completed** to your Domain 2 Student folder.

9. Save the project.

Domain 2
Lesson 4

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Fill-in-the-Blanks

Instructions: While watching Domain 2 Lesson 4, fill in the missing words according to the information presented by the instructor. [References are found in the brackets.]

1. Creating a new compute will create a cluster of virtual machines for handling a _____. [Automated Machine Learning UI]

2. Time series forecasting is _____ over time. [Automated Machine Learning UI]

3. There are _____ main methods available within the Azure Machine Learning Studio to create machine learning models. [Azure Machine Learning Designer]

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Automated Machine Learning UI

There are two major methods used to set up machine learning models for regression or classification. One such tool is the Automated Machine Learning User Interface (UI), which can be utilized in Microsoft Azure. The Automated Machine Learning UI allows people to create models without needing to write code.

Purpose

Upon completing this project, you will better understand the purpose of an Automated Machine Learning UI. Remember, resources cost money, so if you are going to build an experimental workspace, you will want to delete the attached resources when you are done.

Steps for Completion

1. Navigate to the Microsoft Azure home page.

2. Search for and select **Machine Learning**

3. Add a new machine learning workspace to a new workgroup called **WorkloadTest**

4. Name the workspace **YouthEducation1**

5. Create the workspace.

6. Launch the studio.

7. Create a new automated ML run.

8. Create a dataset from the open dataset, **US Population by ZIP code**

9. Name and create the dataset **ZipCode1**

10. Use the dataset to create an experiment named **ZipCodeExp1**

11. Set the target column to sex to predict future populations by gender.

12. Create a new compute cluster with a low-priority virtual machine and the least expensive core option.

13. Name the compute, **ZipCodeCompute1**

14. Ensure the task type is set to Classification

15. Finish creating the automated ML run.

16. Take a screenshot of the page, ensuring the details of the model are visible.

17. Save the screenshot as **241-Completed** to your Domain 2 Student folder.

18. Save the project.

Azure Machine Learning Designer

The second main method of using the Azure Machine Learning Studio to create machine learning models is through the Azure Machine Learning Designer.

Purpose

Upon completing this project, you will better understand both methods of creating Machine Learning Models in Azure Machine Learning Studio.

Steps for Completion

1. Open your saved **YouthEducation1** model within Azure Machine Learning Studio.

2. Open the model within the Designer option.

3. Create a new pipeline using the Easy-to-use prebuilt modules.

4. Add the ZipCode1 dataset to the window.

5. Add a Split Data task to the window.

6. Create a link between the ZipCode1 dataset and the Split Data task.

7. Add a Train Model task to the window.

   a. Set the default compute target to the ZipCodeCompute1 virtual machine.

8. Take a screenshot of the page, ensuring the pipeline is visible.

9. Save the screenshot as **242-Completed** to your Domain 2 Student folder.

10. If desired, add regressions, score the model, and then evaluate the output of the pipeline.

11. Save the project.

<div style="border:1px solid">

Project Details

Project file
YouthEducation1

Estimated completion time
10 minutes

Video reference
Domain 2
  Topic: No-Code Machine Learning
    Subtopic: Azure Machine Learning Designer

Objectives covered
2 Describe fundamental principles of machine learning on Azure
  2.4 Describe capabilities of no-code machine learning with Azure Machine Learning studio
    2.4.2 Azure Machine Learning designer

</div>

Domain 3
Lesson 1

Azure
AI
Fundamentals
(AI-900)

LK LearnKey

Fill-in-the-Blanks

Instructions: While watching Domain 3 Lesson 1, fill in the missing words according to the information presented by the instructor. [References are found in the brackets.]

1. Computer vision is the piece of AI that uses _____ to identify parts of an image or video. [Image Classification]

2. Image classification solutions train an AI model to identify and assign part of an image to a _____. [Image Classification]

3. Object detection is the feature that identifies specific objects within _____. [Object Detection]

4. Semantic segmentation colors in _____ of identified objects on images to make those images stand out. [Semantic Segmentation]

5. When one extracts text from an image, they can use that text elsewhere, such as for text-in apps, a search, or a _____. [Optical Character Recognition]

6. The Face service has a _____ system it uses to identify faces, demographics information, and even someone's mood based on facial features. [Facial Detection, Recognition, and Analysis]

Image Classification

In AI, computer vision is the piece of AI that uses models to identify parts of an image or video. These parts can range anywhere from faces to objects to even identifying and extracting text from an image. Image classification solutions train an AI model to identify and assign part of an image to a category.

Purpose

Upon completing this project, you will better understand image classification.

Steps for Completion

1. Search within the Azure AI Gallery online for a sample experiment that uses image classification to recognize three clothing types.

    a. A search may include the phrase **Image recognition [Predictive Exp.]**

2. View the sample_1.csv dataset.

3. Which letters are used to represent each of the three clothing categories?

    a. _____

4. Return to the experiment.

5. Where can you find the images used to train this model?

    a. _____

![LK LearnKey]

Object Detection and Semantic Segmentation

The next computer vision solution to understand is object detection, which takes images or video and adds bounding boxes around objects people train a machine learning model to identify.

Another type of machine learning model is semantic segmentation. This model is an image solution that identifies a part of an image or video and then colors its pixels, making that part of the image or video stand out. This model is not typically built in a graphical user interface.

Purpose

Upon completing this project, you will better understand the object detection and semantic segmentation features.

Steps for Completion

1. The image below is a screenshot of a video that shows two examples of object detection. What might this object detection be used for to teach hikers?

   a. _____
      _____
      _____
      _____.

2. Semantic segmentation models are some of the more advanced machine learning techniques. They require a lot of _____ in Python or R to have images colored for identified objects' pixels.

LK LearnKey

Optical Character Recognition

Optical character recognition is another type of computer vision solution. It allows users to extract text from an image and use that text elsewhere, such as for text-in apps, a search, or a database.

Purpose

Upon completing this project, you will better understand optical character recognition.

Steps for Completion

1. Search within the Azure AI Gallery online for the Computer Vision home page.

   a. A search may include the phrase **Azure AI Computer Vision**

2. Set the demo page's operation to Read text.

3. Under the Upload tab, browse within the Domain 3 Student folder for the **Arches Delicate Arch Sign with Text-Small.jpg** file.

   a. The image you upload must be below 4 MB in size for this feature on this demo page, meaning that most photos taken on a smartphone will need to be reduced in size before being uploaded here.

4. Take a screenshot of the page, ensuring the Preview window is visible.

5. Save the screenshot as **314-Completed** to your Domain 3 Student folder.

Project Details

Project file
Arches Delicate Arch Sign with Text-Small.jpg

Estimated completion time
5 minutes

Video reference
Domain 3
   Topic: Computer Vision Solutions
      Subtopic: Optical Character Recognition

Objectives covered
3 Describe features of computer vision workloads on Azure
   3.1 Identify common types of computer vision solutions
      3.1.4 Identify features of optical character recognition solutions

---

Facial Detection, Recognition, and Analysis

The last common type of computer vision solution involves everything about the face: facial detection, facial recognition, and facial analysis. The Face service has a point system to identify faces, demographics information, and even someone's mood based on facial features.

Purpose

Upon completing this project, you will be able to create a face service.

Steps for Completion

1. Search within the Azure Portal online for the Create Face feature.

   a. A search should include the word **face**

2. Create a face within the WorkloadTest Resource group.

   a. Set the region to West US.

   b. Name the project **FacesDemo3**

   c. Select the Free pricing tier.

   d. Indicate that this service is not for police use.

3. Within the Go to resource option, navigate to the Keys and Endpoint page.

4. Copy the key assigned to this service (Key 1).

5. Use the Quickstart page to navigate to the API Console.

6. With the Face - Detect feature selected, choose the West US region.

7. Set the Name option to use the resource name **FacesDemo3**

8. Paste the copied key in the Ocp-Apim-Subscription-Key field.

9. Copy and paste the URL, https://youthedworkspa6937536204.blob.core.windows.net/pics/Me2-Small.jpg, to replace the current URL in the Request body field.

10. Send the request.

11. Request more information about the image by changing the Query parameters

    a. Set the returnFaceAttributes parameter to age.

    b. Set the detectionModel field to detection_01.

12. Send the request.

13. What age does the model estimate the face to be?

    a. _____

Project Details

Project file
Me2-Small.jpg

Estimated completion time
10-15 minutes

Video reference
Domain 3
   Topic: Computer Vision Solutions
      Subtopic: Facial Detection, Recognition, and Analysis

Objectives covered
3 Describe features of computer vision workloads on Azure
   3.1 Identify common types of computer vision solutions
      3.1.5 Identify features of facial detection, facial recognition, and facial analysis solutions

Domain 3
Lesson 2

Azure
AI
Fundamentals
(AI-900)

LK LearnKey

Fill-in-the-Blanks

Instructions: While watching Domain 3 Lesson 2, fill in the missing words according to the information presented by the instructor. [References are found in the brackets.]

1. Cognitive Services are AI services that create models that act based on something one can see, such as parts of an image or text, or hear, such as _____. [Computer Vision]

2. Analyzing an image involves identifying what is in an _____, including people, animals, objects, celebrities, and landmarks. [Computer Vision]

3. The Custom Vision service allows one to train an AI model to _____ among what is seen in pictures. [Custom Vision]

4. One needs at least _____ images to train an image classification model. [Custom Vision]

5. The Face service uses the Face API to detect faces, _____, and other facial characteristics. [Face Service]

6. The Face verification feature analyzes two pictures to see if the face belongs to the _____ person. [Face Service]

7. The Form Recognizer service can detect _____ on forms. [Form Recognizer Service]

Computer Vision

Users need to understand some overall computer vision concepts and capabilities, including specific services and when to use them. One such feature is Cognitive Services, which are AI services that create models that act based on something people can see or hear. One can use Cognitive Services to analyze an image. Analyzing an image involves identifying what is in an image, including people, animals, objects, celebrities, and landmarks.

Purpose

Upon completing this project, you will better understand computer vision and how to analyze an image. The Cognitive Services resource is not free, so if you are only using it for this course, remember to delete your project once you complete this course.

Steps for Completion

1. Search within the Azure Portal online for the Cognitive Services directory.

    a. A search should include the phrase **Cognitive Services**

2. Create a new Computer Vision project.

    a. Add the project to the WorkloadTests resource group.

    b. Set the region to South Central US.

    c. Name the project **SoUtahCVTest2**

    d. Select the Free pricing tier.

3. Within the Go to resource option, navigate to the Keys and Endpoint page.

4. Copy the key assigned to this service (Key 1).

5. Use the Quickstart page to navigate to the API Console.

6. With the Analyze Image option selected, choose the South Central US region.

7. Set the Name option to use the resource name **SoUtahCVTest2**

8. Paste the copied key in the Ocp-Apim-Subscription-Key field.

9. Copy and paste the URL, https://youthedworkspa6937536204.blob.core.windows.net/pics/20140823_154006_Android.jpg, to replace the current URL in the Request body field.

10. Send the request.

11. Which animal is identified in the image?

    a. _____

12. What is the certainty score of the animal identification?

    a. _____

Project Details

Project file
20140823_154006_Android.jpg

Estimated completion time
10-15 minutes

Video reference
Domain 3
   Topic: Computer Vision Task Tools and Services
       Subtopic: Computer Vision

Objectives covered
3 Describe features of computer vision workloads on Azure
   3.2 Identify Azure tools and services for computer vision tasks
       3.2.1 Identify capabilities of the Computer Vision service

LK LearnKey

Custom Vision

The Custom Vision service allows one to train an AI model to differentiate among what is seen in pictures. When training an image classification model within Custom Vision, one will need at least ten images. To create a well-trained model, at least 50 images should be input. Some of these images can be negative, meaning they do not match the initial tag.

Purpose

Upon completing this project, you will be able to use the Custom Vision service.

Steps for Completion

1. Navigate to the **customvision.ai/projects** site.

2. Create a new Custom Vision project named **Arches2**

   a. Create a new resource named **SoUtahArches2**

      i. Set the Subscription to Azure subscription 1

      ii. Set the Resource Group to WorkloadTest

   b. Set the project resource to SoUtahArches2

   c. Ensure the project is a classification type.

3. Add images to the project from the Arches folder within your Domain 3 Student folder.

   a. Open **Arches Delicate Arch Sign with Text-Small.jpg**, **Arches Delicate Arch-Small.jpg**, **Arches Double Arch-Small.jpg**, **Arches Windows Arches-Small.jpg**, and **Canyonlands Mesa Arch-Small.jpg**.

   b. Assign the tag, **Arch**, to each image.

4. Add images to the project from the Negatives folder within your Domain 3 Student folder.

   a. Open **Canyonlands Cairn-Small.JPG**, **Canyonlands Grand View-Small.JPG**, **Canyonlands Green River Overlook-Small.JPG**, **Canyonlands Neck Spring Trail 2-Small.JPG**, **Canyonlands Neck Spring Trail-Small.JPG**, **Goblin Valley State Park-Small.JPG**, and **Little Grand Canyon-Small.JPG**.

   b. Assign the Negative tag to each image.

5. Train the images with the default setting, Quick Training.

6. Use the Quick Test feature to test the **Dead Horse Point Fauna-Small.JPG** image from your Domain 3 Student folder.

7. Does the model predict that there is an arch in the image?

   a. _____

Face Service

Another cognitive service to understand is the Face service, which uses the Face API to detect faces, emotions, and other facial characteristics. Within the Demo area of Face service, there are three aspects of the Face service: Face detection, Face verification, and Perceived emotion recognition.

Purpose

Upon completing this project, you will better understand the capabilities of the Face service.

Steps for Completion

1. Search within the Azure Portal online for the Face service home page.

    a. A search should include the phrase **Microsoft Azure facial recognition**

2. Navigate to the demo area under the Demo tab.

3. On the Face detection page, add the **Me-Small.jpg** file from your Domain 3 Student folder.

4. Set the Detection Model to detection_01.

5. List the results of the person's detected features. What type of hair do they have? Are they smiling? What is their age?

    a. _____
       _____.

6. On the Face verification page, add the **Me-Small.jpg** and **Me2-Small.jpg** files from your Domain 3 Student folder.

7. What does the verification result say about the likelihood of the two faces belonging to the same person?

    a. _____

8. On the Perceived emotion recognition page, add the **Me2-Small.jpg** file from your Domain 3 Student folder.

9. What do the detection results say the chances are that the person is happy?

    a. _____

![LK LearnKey logo]

Form Recognizer Service

The last tool and service we will look at in this section on tools and services for computer vision tasks is the Form Recognizer service. The Form Recognizer service can detect text on forms and, in some cases, generate key-value pairs, though the key-value pairs tend to be generic.

Purpose

Upon completing this project, you will be able to use the Form Recognizer service.

Steps for Completion

1. Open the SoUtahCVTest2 cognitive service within Microsoft Azure.

2. Within the Go to resource option, navigate to the Keys and Endpoint page.

3. Copy the key assigned to this service (Key 1).

4. Use the Quickstart page to navigate to the API Console.

5. With the OCR option selected, choose the West US 2 region.

6. Set the Name option to use the resource name **SoUtahCVTest2**

7. Paste the copied key in the Ocp-Apim-Subscription-Key field.

8. Copy and paste the URL,

   https://youthedworkspa6937536204.blob.core.windows.net/pics/testreceipt.jpg, to replace the current URL in the Request body field.

9. Send the request.

10. Take a screenshot of the Response content results.

11. Save the screenshot as **324-Completed** to your Domain 3 Student folder.

Domain 4
Lesson 1

Azure
AI
Fundamentals
(AI-900)

Fill-in-the-Blanks

Instructions: While watching Domain 4 Lesson 1, fill in the missing words according to the information presented by the instructor. [References are found in the brackets.]

1. Users can utilize a key phrase extraction to identify keywords in a series of _____ or reviews. [Key Phrase Extraction]

2. A _____ visualization provides users with a graphical representation of the important phrases within text. [Key Phrase Extraction]

3. One example of a type of entity is an _____, such as LearnKey, Inc. [Entity Recognition]

4. The _____ feature in an entity recognition model allows users to view breakdowns of the entities within text. [Entity Recognition]

5. A sentiment analysis model can determine the overall _____ and/or _____ of a text. [Sentiment Analysis]

6. In sentiment analysis, text is scored for positive, _____, and negative intent on a scale of zero to one. [Sentiment Analysis]

7. In language modeling, _____ are written or spoken word statements. [Language Modeling]

8. An _____ is the noun on which an _____ is taking place. [Language Modeling]

9. Users can utilize a speech recognition and synthesis workload to generate _____ messages or text responses to customer questions. [Speech Recognition and Synthesis]

10. The _____ service can generate speech from text or vice-versa. [Speech Recognition and Synthesis]

11. The Translator Text service performs _____ translation, while the Speech service performs speech-to-speech translation. [Translation]

12. Users can assign a _____, such as English and Spanish, to a translator project. [Translation]

LK LearnKey

Key Phrase Extraction

Key phrase extraction is a natural language processing workload that evaluates text, identifying important words or phrases.

Users can create a key phrase extraction workload through the Text Analytics service.

Purpose

Upon completing this project, you will better understand the uses of a key phrase extraction model.

Steps for Completion

1. Label the steps for creating a keyword extraction model in order from 1 to 4.

    a. _____ Execute the script and perform a word cloud visualization.

    b. _____ Add a file to the model, such as book reviews from Amazon.

    c. _____ Extract key phrases from the text.

    d. _____ Partition and sample the data.

2. List three situations in which a key phrase extraction model is used to identify important phrases within text.

    a. _____

    _____.

    b. _____

    _____.

    c. _____

    _____.

LK LearnKey

Entity Recognition

Entity recognition is a type of natural language processing workload that identifies entities within a text. An entity is a person, location, organization, quantity, or date within text.

Users can create an entity recognition workload through the Text Analytics service.

Purpose

Upon completing this project, you will better understand the uses of an entity recognition model.

Steps for Completion

1. Label the examples as either E for Entity or NE for Not an entity.

    a. _____ Microsoft

    b. _____ Salt Lake City

    c. _____ iOS

    d. _____ Five apple bushels

    e. _____ October 31

    f. _____ Microsoft Word

    g. _____ Dog

    h. _____ George Washington

    i. _____ Mount Everest

LK LearnKey

Sentiment Analysis

Sentiment analysis is a natural language processing workload that analyzes keywords and phrases in a text to determine its overall mood.

Users can create a sentiment analysis workload through the Text Analytics service.

Purpose

Upon completing this project, you will better understand how to utilize a sentiment analysis experiment.

Steps for Completion

1. Search within the Azure Portal online for the Cognitive Services directory.

    a. A search should include the phrase **Cognitive Services**

2. Navigate to the Text Analytics service.

3. Select the Sentiment section in the Cognitive Services APIs.

4. Set the Host Name to resource and name the resource **SoUtahLanguage1**

5. In a separate tab, navigate to the SoUtahSemantics1 Cognitive Services area in your instance of Azure.

6. Navigate to the Keys and Endpoint section.

7. Copy the API key under KEY 1.

8. Return to the sentiment analysis experiment and paste the API key in the Ocp-Apim-Subscription-Key field.

9. Open the file **SOUT Travel Visitor Comments.docx** found in your Domain 4 Student folder.

10. Copy the first paragraph

11. Return to the sentiment analysis experiment and replace the first sample comment with the copied text.

12. Copy the second paragraph in the Word file.

13. Return to the sentiment analysis experiment and replace the second sample comment with the copied text.

14. Send the request.

15. Take a screenshot of the experiment results.

16. Save the file as **413-Completed**

<div style="border: 1px solid teal; padding: 10px;">

Project Details

Project file
SOUT Travel Visitor Comments.docx

Estimated completion time
15-20 minutes

Video reference
Domain 4
   Topic: Common NLP Workload Scenarios
      Subtopic: Sentiment Analysis

Objectives covered
4 Describe features of Natural Language Processing (NLP) workloads on Azure
   4.1 Identify features of common NLP Workload Scenarios
      4.1.3 Identify features and uses for sentiment analysis

</div>

LK LearnKey

Language Modeling

Language modeling is a concept among natural language processing workloads that predicts intents and entities in languages from user input. Language modeling includes three important aspects: utterances, intents, and entities.

Purpose

Upon completing this project, you will better understand how a language modeling experiment functions.

Steps for Completion

1. Navigate to the AI Demos page of the Microsoft website.

2. Navigate to the Language Understanding service.

3. Select See it in action.

4. Type **turn off the living room light** and apply the statement.

5. Take a screenshot of the results.

6. Save the file as **414-Completed** to your Domain 4 Student folder.

7. Analyze the statement: Switch on the living room light. Which part of the statement are the intent, entity, and utterance?

    a. Intent _____

    b. Entity _____

    c. Utterance _____

LearnKey

Speech Recognition and Synthesis

Speech recognition and synthesis are a type of natural language processing workload involved in converting speech to text. Speech recognition detects and interprets what is spoken, while speech synthesis is generated speech.

Users can test speech recognition and synthesis workloads through the Speech service.

Purpose

Upon completing this project, you will better understand how to utilize speech recognition and synthesis.

Steps for Completion

1. Navigate to the Speech to Text page under azure.microsoft.com.

2. Test the Speech to Text app with the following: **Speech recognition detects and interprets what is spoken. Speech synthesis is generated speech**

3. Stop the app.

4. Take a screenshot of the generated text.

5. Save the file as **415-Completed** to your Domain 4 Student folder.

LK LearnKey

Translation

Translation is a natural language processing workload that encompasses text translations, speech translations, and speech-to-text translations.

Users can test translation workloads through the Translator Text service.

Purpose

Upon completing this project, you will better understand how to utilize translation workloads.

Steps for Completion

1. Search within the Azure Portal online for the Azure Custom Translator.

    a. A search should include the phrase **Custom Translator**

2. Create a workspace named **SpanishTranslations**

    a. Set South Central US as the region.

    b. Navigate to the Keys and Endpoint section of the SoUtahSemantics1 Cognitive Services.

    c. Copy the API key under KEY 1.

    d. Return to the workspace and paste the key in the Azure subscription key field.

    e. Save the workspace.

3. Take a screenshot of the workspace details.

4. Save the file as **416a-Completed** to your Domain 4 Student folder.

5. Create a project named **SpanishToEnglish1**

    a. Set Spanish to English as the Language Pair.

    b. Set Travel as the Category.

6. Take a screenshot of the project details.

7. Save the file as **416b-Completed**

8. Upload files to the project.

    a. Upload a source file using the file **SOUT Travel Visitor Comments – Spanish.docx** from your Domain 4 Student folder.

    b. Upload a target file using the file **SOUT Travel Visitor Comments – English.docx**

    c. Name the document **Sample1**

    d. Upload the files.

9. Take a screenshot of the upload progress.

10. Save the file as **416c-Completed**

Domain 4
Lesson 2

Azure
AI
Fundamentals
(AI-900)

Fill-in-the-Blanks

Instructions: While watching Domain 4 Lesson 2, fill in the missing words according to the information presented by the instructor. [References are found in the brackets.]

1. The _____ feature of the Text Analytics service identifies the languages in which text is written. [Text Analytics Service]

2. The Cognitive Services feature of Azure works with sight, _____, and text situations. [Text Analytics Service]

3. LUIS is a useful tool for natural language processing workloads geared toward _____. [LUIS]

4. Users can create new intents or employ _____ domain intents for use in the LUIS app. [LUIS]

5. The Speech service supports _____ recognition, intent recognition, and speech translation. [Speech Service]

6. Users can customize speech-to-text, text-to-speech, and _____ through the Speech Studio feature. [Speech Service]

7. The Translator Text service utilizes a _____ model for translations. [Text Translation Service]

8. AI workloads that employ _____ can output a more accurate translation than those that rely on literal text. [Text Translation Service]

LK LearnKey

Text Analytics Service

Text Analytics is a suite of web services through which users can perform various natural language processing workloads. Features of the Text Analytics service include entity detection, sentiment analysis, and key phrase extraction.

Purpose

Upon completing this project, you will better understand how to utilize the Text Analytics service.

Steps for Completion

1. Search within the Azure Portal online for the Text Analytics service.

    a. A search should include the phrase **Text Analytics**

2. Create a new Text Analytics service named **SoUtahLanguage1**

    a. Assign the service to the WorkloadTest resource group.

    b. Set West US as the region.

    c. Set the service to the free pricing tier.

    d. Review and create the service.

3. Select Go to resource.

4. Navigate to the Keys and Endpoint section and copy the API key under KEY 1.

5. Navigate to the Quickstart section and select API Console (V3 Preview).

6. Select the Detect Language feature.

7. Select West US.

8. Set the Host Name to resource and name the resource **SoUtahLanguage1**

9. Paste the API key in the Ocp-Apim-Subscription-Key field.

10. Open the file **SOUT Travel Visitor Comments - Language.docx** found in your Domain 4 Student folder.

11. Copy the text in the document.

12. Return to the Text Analytics page.

13. Paste the copied text over the Spanish text in line 14.

14. Send the request.

15. Take a screenshot of the results.

16. Save the file as **421-Completed** to your Domain 4 Student folder.

LK LearnKey

LUIS

The Language Understanding Service (LUIS) is a language application that utilizes intents, entities, and utterances to train AI to interpret text more accurately. The main purpose of LUIS is to help AI models match up phrases that are worded differently but mean the same basic thing.

Purpose

Upon completing this project, you will better understand how to utilize LUIS.

Steps for Completion

1. Search within the Azure Cognitive Services directory for the LUIS page.

   a. A search can include the phrase **Language Understanding** or **LUIS**

2. Choose an authoring resource.

   a. Create a new authoring resource named **SoUtahLUIS2**

   b. Set the resource to Azure subscription 1 and the resource group to WorkloadTest.

   c. Finish creating the resource.

3. Create a new app named **LUISTestApp2**

4. Add a prebuilt domain intent to the app.

   a. Search for **places**

   b. Select Places.GetDistance and Places.GetReviews

   c. Select Done.

5. Take a screenshot of the Intents page.

6. Save the file as **422-Completed** to your Domain 4 Student folder.

7. Select the Places.GetDistance intent.

8. List two prebuilt utterances included in the intent.

   a. _____.

   b. _____.

LK LearnKey

Speech Service

The Speech service is an Azure Cognitive Service with various speech-related and text-related capabilities. It offers support for up to 45 languages and provides helpful tools for NLP workloads geared toward speech recognition and synthesis.

Purpose

Upon completing this project, you will better understand how to utilize the Speech service.

Steps for Completion

1. Search within the Azure Portal online for Speech services.

   a. A search should include the word **Speech**

2. Create a new Speech service.

3. Name the service **SoUtahSpeech2**

   a. Set the service to the free pricing tier.

   b. Assign it to the WorkloadTest resource group.

   c. Create the service.

4. Take a screenshot of the service.

5. Save the file as **423-Completed** to your Domain 4 Student folder.

6. Select Go to resource.

7. Select the Discover tab.

8. List six speech solutions offered by the Speech service.

   a. _____

   b. _____

   c. _____

   d. _____

   e. _____

   f. _____

LK LearnKey

Text Translation Service

While similar to the Speech service, the Translator Text service primarily performs text-to-text tasks. It offers both literal and semantic translations in up to 60 languages. The Translator Text service is helpful for NLP workloads focused on translation tasks.

Purpose

Upon completing this project, you will better understand the benefits of the Translator Text service.

Steps for Completion

1. Explain why AI workloads that use literal translations are often inaccurate.

   a. _____
   _____
   _____
   _____
   _____
   _____ .

2. List three features offered by the Translator Text (Translator 3.0) service.

   a. _____
   _____ .

   b. _____
   _____ .

Domain 5
Lesson 1

Azure
AI
Fundamentals
(AI-900)

Fill-in-the-Blanks

Instructions: While watching Domain 5 Lesson 1, fill in the missing words according to the information presented by the instructor. [References are found in the brackets.]

1. The _____ tool contains knowledge bases used for training a chatbot. [Webchat Bots]

2. In online webchats, chatbots can provide _____ answers to customer questions. [Webchat Bots]

3. Users can create a _____ to ensure a telephone voice menu bot provides the correct responses to customer inquiries. [Telephone Voice Menus]

4. Knowledge bases contain _____ and _____ pairs to train chatbots and voice menus to handle potential inquiries. [Telephone Voice Menus]

5. Cortana is the personal digital assistant service provided by _____. [Personal Digital Assistants]

6. A _____ personal digital assistant responds to verbal questions. [Personal Digital Assistants]

7. The main tool for building knowledge bases for bots is _____. [Conversational AI Solutions]

8. Most conversational AI pieces require a _____ as a starting point. [Conversational AI Solutions]

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Webchat Bots

A chatbot or bot is an AI agent built to converse with humans. They are trained to respond to customer inquiries and are often deployed in online environments, such as webchats.

Purpose

Upon completing this project, you will better understand the uses of a chatbot.

Steps for Completion

1. List two tools used to build and deploy chatbots.

   a. _____

   b. _____

2. Explain the benefits of deploying a chatbot on a website.

   a. _____
   _____
   _____
   _____
   _____
   _____
   _____ .

Telephone Voice Menus

Telephone voice menus are automated responses to phone inquiries. They are most often built to direct a caller to the appropriate resource, such as directing a customer to a specific hotel.

Purpose

Upon completing this project, you will better understand the difference between a chatbot and a telephone voice menu.

Steps for Completion

1. Explain one similarity between a chatbot and a telephone voice menu.

   a. _____
   _____
   _____
   _____
   _____
   _____ .

2. Explain one difference between a chatbot and a telephone voice menu.

   a. _____
   _____
   _____
   _____
   _____
   _____ .

Personal Digital Assistants

A personal digital assistant is an AI bot that takes written or verbal input from users and returns one or more results. It is a fast, effective way for users to obtain information.

Purpose

Upon completing this project, you will better understand how to utilize a personal digital assistant.

Steps for Completion

1. Open the Cortana service on your Windows device.

2. Verbalize a search by saying: **Are flights from Salt Lake City to Los Angeles leaving on time?**

3. Take a screenshot of the search results.

4. Save the file as **513-Completed** to your Domain 5 Student folder.

5. Indicate whether the following statements are true or false.

   a. _____ Personal digital assistants utilize knowledge bases with answers to potential questions.

   b. _____ Unlike other personal digital assistants, Cortana cannot respond to text-based inquiries.

   c. _____ Certain AI models from the Azure AI Gallery can produce the same information given by personal digital assistants.

   d. _____ Personal digital assistants can be used to replace bots in telephone voice menus.

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Conversational AI Solutions

Chatbots, telephone voice menus, and personal digital assistants share several commonalities. These conversational AI solutions depend on knowledge bases, which respond to potential customer inquiries. They are also built and deployed using the same tools: QnA Maker and Azure Bot service.

Purpose

Upon completing this project, you will better understand how to add QnA pairs to a knowledge base.

Steps for Completion

1. Navigate to the www.qnamaker.ai webpage.

2. Under My knowledge bases, select the UtahTestKB0 knowledge base.

3. Add a QnA pair.

   a. In the Question field, type **When is the best time to visit Southern Utah?**

   b. In the Answer field, type **Spring or fall is best as it gets really hot in the summertime.**

   c. Save and train the knowledge base on the new QnA pair.

4. Test the knowledge base.

   a. Ensure the chat window is clear of text.

   b. Type **When should I visit Southern Utah?**

   c. Send the question.

5. Take a screenshot of the chat window, including the chatbot's response.

6. Save the file as **514-Completed** to your Domain 5 Student folder.

Domain 5
Lesson 2

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Fill-in-the-Blanks

Instructions: While watching Domain 5 Lesson 2, fill in the missing words according to the information presented by the instructor. [References are found in the brackets.]

1. Users can populate a knowledge base using an existing _____ or a file, such as a Word document. [QnA Maker Service]

2. When adding a follow-up prompt, users can _____ a follow-up question to another knowledge base. [QnA Maker Service]

3. The fourth step in creating a knowledge base is _____ the knowledge base, extracting question and answer pairs from online data or local documents. [QnA Maker Service]

4. Users can download an _____ to connect to certain services and add them to bots. [Azure Bot Service]

5. A bot published in _____ mode ensures that updates to the bot occur automatically. [Azure Bot Service]

6. A _____, such as a messaging app, is a method by which users can deploy a bot. [Azure Bot Service]

QnA Maker Service

QnA Maker is a knowledge base builder for bots. A knowledge base is essentially a list of questions and answers utilized by conversational AI pieces.

Apart from questions and answers, users can also add alternative phrasing, follow-up prompts, and chit-chat questions to improve a bot's accuracy or friendliness when conversing with customers.

Purpose

Upon completing this project, you will better understand how to build a knowledge base.

Steps for Completion

1. Navigate to the www.qnamaker.ai webpage.

2. Create a new knowledge base.

3. Create a QnA service named **UtahTestQnA3**

   a. Assign the service to the WorkloadTest resource group.

   b. Set the service to the free pricing tier.

   c. Under Azure Search, set the region to West US and the pricing tier to Free F3.

   d. Set the App Service website location to West US 2 and the App insights location to West US.

   e. Review and create the service.

4. Select Go to resource.

5. Navigate to the QnA Maker portal.

6. Refresh the service.

7. Under Step 2, select Azure subscription 1 as the subscription, UtahTestQnA3 as the service, and English as the language. If you are unable to select an option, refresh the service

8. Under step 3, name the knowledge base **UtahTestKB3**

9. Under step 4, populate the knowledge base by uploading the file **SOUT Travel Visitor QA.docx** from your Domain 5 Student folder.

10. Create the knowledge base.

11. Take a screenshot of the knowledge base page.

12. Save the file as **521-Completed** to your Domain 5 Student folder.

Project Details

Project file
SOUT Travel Visitor QA.docx

Estimated completion time
20-25 minutes

Video reference
Domain 4
   Topic: Azure Services for Conversational AI
      Subtopic: QnA Maker Service

Objectives covered
5 Describe features of conversational AI workloads on Azure
   5.2 Identify Azure services for conversational AI
      5.2.1 Identify capabilities of the QnA Maker service

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Azure Bot Service

The Azure Bot service allows users to build a bot from a knowledge base and delivers a bot for use in an application. Building bots in Azure is a three-step process that involves creating, testing, and deploying the bot.

Purpose

Upon completing this project, you will have a better understanding of how to build a bot service.

Steps for Completion

1. Search within the Azure Portal online for the Bot Services directory.

    a. A search should include the phrase **Bot Services**

2. Create a new web app bot named **UtahTestBot**

    a. Assign the bot to the WorkloadTest resource group.

    b. Create the bot.

3. Select Go to resource.

4. Navigate to the Build section under Bot Management.

5. List three options for building a bot.

    a. _____

    b. _____

    c. _____

6. Navigate to the Channels section under Bot Management.

7. List three channels that can be used to deploy a bot.

    a. _____

    b. _____

    c. _____

Appendix

Azure
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Glossary

Term	Definition
AI	Artificial Intelligence (AI) is a machine learning model's ability to take current data and predict future trends or identify future specific instances of an object based on two major items: data and the algorithms taken to predict the future.
Accountability	The sixth guiding principle for responsible AI. Accountability ensures AI models conform to organizational principles and legal and regulatory standards.
Anomaly Detection Workload	A project created within Azure that uses data to identify anomalies, or outliers, within a machine learning model.
Automated ML UI	The Automated Machine Learning User Interface (Automated ML UI) is a tool used to set up machine learning models for regression or classification. This tool can be used to create a machine learning model without writing code.
Azure Bot Service	A service that builds a bot from a knowledge base and delivers a bot for use in an app.
Azure Machine Learning Designer	A tool used to set up machine learning models for regression or classification.
Azure Machine Learning Studio	A part of Azure Machine Learning that includes low-code and no-code options for model training, deployment, and asset management.
Channels	Methods by which one can deploy a bot.
Chatbot	An AI agent that can carry on a conversation with a human being, usually through an online chat. Chatbots are built using a list of questions and answers that are commonly asked.
Classification Machine Learning Model	A model that predicts the categories to which specific entities will belong or categories for outcomes. Classification machine learning models fall under the supervised category.
Clustering Machine Learning Model	A model that groups items based on their features, rather than assigning data to pre-determined groups.
Cognitive Services	AI services that create models that take action based on something one can see, such as parts of an image or text, or hear, such as speech.
Computer Vision Workload	A machine learning model trained to identify one or more subjects within a video or a series of pictures.
Conversational AI	The technology that allows AI to interact and converse with real humans, often through online bots.
Custom Vision Service	A service that allows one to train an AI model to differentiate among what is seen in pictures. The more images there are to train, the better the results will be for a Custom Vision project.
Data Ingestion	The act of receiving data for an AI model.
Data Preparation	The act of transforming data to be ready to run through an AI model.
Entity Recognition	An NLP workload that can identify a person, location, organization, quantity, or date within text.
Face Service	A service that uses the Face API to detect faces, emotions, and other facial characteristics.
Facial Analysis	A Computer Vision solution that can analyze faces within an image.
Facial Detection	A Computer Vision solution that can detect faces within an image.
Facial Recognition	A Computer Vision solution that can recognize faces within an image.
Fairness	The first guiding principle for responsible AI. Fairness ensures bias is not shown toward or against individuals. AI models should be built to either avoid bias, identify potential areas of bias, or both.
False Negative	An outcome that should be positive but is negative.
False Positive	An outcome that should be negative but is positive.
Feature Engineering	The act of manipulating an existing feature to the needs of a machine learning model.
Feature Selection	The choosing of the columns of data to use in a model.
Features	Data values used to predict labels. Features are used as input for a machine learning model.

Term	Definition
Form Recognizer Service	A service that can detect text on forms and, in some cases, generate key-value pairs.
Image Classification Solution	A Computer Vision solution that trains an AI model to identify and assign part of an image to a category.
Inclusiveness	The fourth guiding principle for responsible AI. Inclusiveness dictates that AI models need to benefit people from all parts of society, regardless of ethnicity, gender, sexual orientation, or mobility.
Key Phrase Extraction	A service that extracts key phrases from text.
Knowledge Mining Workload	A machine learning model trained to identify specific information about data, such as if a message is legitimate or spam.
Label	A numeric outcome within an AI model. Labels are the outputs, specifically output columns within a machine learning model.
Language Modeling	A common NLP workload concept in which a model predicts intents and entities in languages from user input.
LUIS	Language Understanding Service (LUIS) is a service that helps one understand what is said when something is being translated via the analysis of utterances, intents, and entities.
Machine Learning Algorithm	A tool used to help train a model by priority, such as time or accuracy.
Machine Learning Model	A group of data transformed for readiness for predictions, which then uses algorithms, trained and scored, to predict future outcomes.
NLP Workloads	Natural Language Processing (NLP) workloads are tools used for sentiment analysis, entity recognition, key phrase extraction, and document categorization tasks.
Object Detection Solution	A Computer Vision solution that identifies specific objects within images.
Optical Character Recognition Solution	A Computer Vision solution that can utilize extracted text from an image, an app, a search, or a database.
Personal Digital Assistant	A bot that takes written or verbal input and returns one or more results.
Prediction/Forecasting Workload	A workload used to make predictions based on given data. Also known as machine learning.
Privacy and Security	The third guiding principle for responsible AI. As data is used to build AI models, it is important to protect that data as it may be sensitive. Data must be kept private when necessary, and it should always be secured.
QnA Maker Service	The main tool for building knowledge bases, which can build and deploy bots.
Regression Machine Learning	Models that use statistical analysis to predict numeric outcomes based on input data. Regression machine learning models fall under the supervised category.
Reliability and Safety	The second guiding principle for responsible AI. A lack of either reliability or safety can cause bodily harm.
Semantic Segmentation Solution	A Computer Vision solution that colors in pixels of identified objects on images to make those images stand out.
Sentiment Analysis	A tool that measures whether the specified text has positive or negative connotations.
Speech Recognition	A tool that detects and interprets what is spoken.
Speech Service	A service that handles speech-to-text and text-to-speech duties, speaker (voice) recognition, intent recognition, and speech translation.
Speech Synthesis	Generated speech or the artificial production of human speech.
Telephone Voice Menus	A system in which someone speaks and gets a bot to direct a call to an appropriate resource.
Text Analytics Service	A service which performs many tasks, including entity detection and sentiment analysis.

Term	Definition
Training Dataset	A basic dataset in a machine learning model used to train a model to predict an outcome.
Translator Text Service	A service that offers both literal and semantic translations in up to 60 languages. This service works through a Neural Machine Translation (NMT) model, which uses semantics to output a more accurate translation than literal text. Text translations, speech translations, and speech-to-text translations are all available within this service.
Transparency	The fifth guiding principle for responsible AI. Transparency is the act of making known the purpose, limitations, and results of a solution.
True Negative	A match between an actual and predicted negative outcome.
True Positive	A match between an actual and predicted positive outcome.
Validation Dataset	A basic dataset in a machine learning model used to determine the validity of a model's predicted outcomes.

![LearnKey logo] LK LearnKey

Objectives

Azure AI Fundamentals (AI-900) Objectives

Domain 1 Describe Artificial Intelligence Workloads and Considerations	Domain 2 Describe Fundamental Principles of Machine Learning on Azure	Domain 3 Describe Features of Computer Vision Workloads on Azure	Domain 4 Describe Features of Natural Language Processing (NLP) Workloads on Azure	Domain 5 Describe Features of Conversational AI Workloads on Azure
1.1 Identify features of common AI workloads 1.1.1 Identify prediction/forecasting workloads 1.1.2 Identify features of anomaly detection workloads 1.1.3 Identify computer vision workloads 1.1.4 Identify natural language processing or knowledge mining workloads 1.1.5 Identify conversational AI workloads	2.1 Identify common machine learning types 2.1.1 Identify regression machine learning scenarios 2.1.2 Identify classification machine learning scenarios 2.1.3 Identify clustering machine learning scenarios	3.1 Identify common types of computer vision solutions 3.1.1 Identify features of image classification solutions 3.1.2 Identify features of object detection solutions 3.1.3 Identify features of semantic segmentation solutions 3.1.4 Identify features of optical character recognition solutions 3.1.5 Identify features of facial detection, facial recognition, and facial analysis solutions	4.1 Identify features of common NLP Workload Scenarios 4.1.1 Identify features and uses for key phrase extraction 4.1.2 Identify features and uses for entity recognition 4.1.3 Identify features and uses for sentiment analysis 4.1.4 Identify features and uses for language modeling 4.1.5 Identify features and uses for speech recognition and synthesis 4.1.6 Identify features and uses for translation	5.1 Identify common use cases for conversational AI 5.1.1 Identify features and uses for webchat bots 5.1.2 Identify features and uses for telephone voice menus 5.1.3 Identify features and uses for personal digital assistants 5.1.4 Identify common characteristics of conversational AI solutions
1.2 Identify guiding principles for responsible AI 1.2.1 Describe considerations for fairness in an AI solution 1.2.2 Describe considerations for reliability and safety in an AI solution 1.2.3 Describe considerations for privacy and security in an AI solution 1.2.4 Describe considerations for inclusiveness in an AI solution 1.2.5 Describe considerations for transparency in an AI solution 1.2.6 Describe considerations for accountability in an AI solution	2.2 Describe core machine learning concepts 2.2.1 Identify features and labels in a dataset for machine learning 2.2.2 Describe how training and validation datasets are used in machine learning 2.2.3 Describe how machine learning algorithms are used for model training 2.2.4 Select and interpret model evaluation metrics for classification and regression	3.2 Identify Azure tools and services for computer vision tasks 3.2.1 Identify capabilities of the Computer Vision service 3.2.2 Identify capabilities of the Custom Vision service 3.2.3 Identify capabilities of the Face service 3.2.4 Identify capabilities of the Form Recognizer service	4.2 Identify Azure tools and services for NLP workloads 4.2.1 Identify capabilities of the Text Analytics service 4.2.2 Identify capabilities of the Language Understanding Service (LUIS) 4.2.3 Identify capabilities of the Speech service 4.2.4 Identify capabilities of the Translator Text service	5.2 Identify Azure services for conversational AI 5.2.1 Identify capabilities of the QnA Maker service 5.2.2 Identify capabilities of the Azure Bot Service
	2.3 Identify core tasks in creating a machine learning solution 2.3.1 Describe common features of data ingestion and preparation 2.3.2 Describe feature			

Azure AI Fundamentals (AI-900) Objectives

Domain 1 Describe Artificial Intelligence Workloads and Considerations	Domain 2 Describe Fundamental Principles of Machine Learning on Azure	Domain 3 Describe Features of Computer Vision Workloads on Azure	Domain 4 Describe Features of Natural Language Processing (NLP) Workloads on Azure	Domain 5 Describe Features of Conversational AI Workloads on Azure
	engineering and selection 2.3.3 Describe common features of model training and evaluation 2.3.4 Describe common features of model deployment and management			
	2.4 Describe capabilities of no-code machine learning with Azure Machine Learning studio 2.4.1 Automated ML Wizard UI 2.4.2 Azure Machine Learning designer			

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Lesson Plan

Approximately 25 hours of videos, labs, and projects

Domain 1 Lesson Plan

Domain 1 - Artificial Intelligence Workloads and Considerations [approximately 4.5 hours of videos, labs, and projects]				
Lesson	**Lesson Topic and Subtopics**	**Objectives**	**Exercise Labs**	**Workbook Projects and Files**
Pre-Assessment Assessment time - 00:44:00	Artificial Intelligence Workloads and Considerations: Pre-Assessment			
Lesson 1 Video time - 00:05:34 Exercise Lab time - 00:12:00 Workbook time - 00:15:00	**Features of Common AI Workloads Part 1** Course Opener How to Study for this Exam Prediction/Forecasting Workloads Anomaly Detection Workloads	1.1 Identify features of common AI workloads 1.1.1 Identify prediction/forecasting workloads 1.1.2 Identify features of anomaly detection workloads	Algorithms Generating a Forecast Anomaly Detection Model	Prediction/Forecasting Workloads – pg. 8 N/A Anomaly Detection Workloads – pg. 9 N/A
Lesson 2 Video time - 00:03:58 Exercise Lab time - 00:16:00 Workbook time - 00:20:00	**Features of Common AI Workloads Part 2** Computer Vision Workloads NLP and Knowledge Mining Workloads Conversational AI Workloads	1.1.3 Identify computer vision workloads 1.1.4 Identify natural language processing or knowledge mining workloads 1.1.5 Identify conversational AI workloads	Identifying a Subject Knowledge Mining Visualizing Data Creating a Chatbot	Computer Vision Workloads – pg. 12 N/A NLP and Knowledge Mining Workloads – pg. 13 N/A Conversational AI Workloads – pg. 14 N/A
Lesson 3 Video time - 00:07:47 Exercise Lab time - 00:20:00 Workbook time - 00:40:00	**Guiding Principles for Responsible AI** Fairness Reliability and Safety Privacy and Security Inclusiveness Transparency Accountability	1.2 Identify guiding principles for responsible AI 1.2.1 Describe considerations for fairness in an AI solution 1.2.2 Describe considerations for reliability and safety in an AI solution 1.2.3 Describe considerations for privacy and security in an AI solution 1.2.4 Describe considerations for inclusiveness in an AI solution 1.2.5 Describe considerations for transparency in an AI solution 1.2.6 Describe considerations for accountability in an AI solution	Guiding Principle: Fairness Guiding Principle: Reliability Controlling Access Mitigate Social Biases Transparency Examples	Fairness, Reliability, and Safety – pg. 17 N/A Privacy, Security, and Inclusiveness – pg. 18 N/A Transparency and Accountability – pg. 19 N/A
Post-Assessment Assessment time - 01:28:00	Artificial Intelligence Workloads and Considerations: Post-Assessment			

Domain 2 Lesson Plan

Domain 2 - Describe Fundamental Principles of Machine Learning on Azure [approximately 6.5 hours of videos, labs, and projects]				
Lesson	**Lesson Topic and Subtopics**	**Objectives**	**Exercise Labs**	**Workbook Projects and Files**
Pre-Assessment Assessment time - 00:52:00	Fundamental Principles of Machine Learning on Azure: Pre-Assessment			
Lesson 1 Video time - 00:06:49 Exercise Lab time - 00:16:00 Workbook time - 00:25:00	**Common Machine Learning Types** Regression Scenarios Classification Scenarios Clustering Scenarios	2.1.1 Regression Scenarios 2.1.2 Classification Scenarios 2.1.3 Clustering Scenarios	How Data Predicts an Outcome Classification Conditions Understanding Split Data Recognizing Models	Regression Scenarios – pg. 22 N/A Classification Scenarios – pg. 23 N/A Clustering Scenarios – pg. 24 N/A
Lesson 2 Video time - 00:08:01 Exercise Lab time - 00:20:00 Workbook time - 00:35:00	**Core Machine Learning Concepts** Features and Labels Training and Validation Datasets Machine Learning Algorithms Model Evaluation Metrics	2.2.1 Features and Labels 2.2.2 Training and Validation Datasets 2.2.3 Machine Learning Algorithms 2.2.4 Model Evaluation Metrics	Label Column Custom Vision Training Regression Algorithms Selecting a Regression Algorithm Understanding Metrics	Features and Labels – pg. 27 N/A Training and Validation Datasets – pg. 28 N/A Machine Learning Algorithms and Evaluation Metrics– pg. 29 N/A
Lesson 3 Video time - 00:10:13 Exercise Lab time - 00:12:00 Workbook time - 00:40:00	**Core Tasks** Data Ingestion and Preparation Feature Engineering and Selection Model Training and Evaluation Model Deployment and Management	2.3.1 Data Ingestion and Preparation 2.3.2 Feature Engineering and Selection 2.3.3 Model Training and Evaluation 2.3.4 Model Deployment and Management	Excluding Columns Apply SQL Transformation Save a New Dataset	Data Ingestion and Preparation – pg. 32 N/A or Employee Promotion Experiment Feature Engineering and Selection – pg. 33 N/A or Employee Promotion Experiment Model Training and Evaluation – pg. 34 N/A or Employee Promotion Experiment Model Deployment and Management – pg. 35 N/A
Lesson 4 Video time - 00:07:09 Exercise Lab time - 00:16:00 Workbook time - 00:30:00	**No-Code Machine Learning** Automated Machine Learning UI Azure Machine Learning Designer	2.4.1 Automated Machine Learning UI 2.4.2 Azure Machine Learning Designer	Machine Learning UI Configure Automated ML Run Azure Machine Learning Studio Using Pre-Built Modules	Automated Machine Learning UI – pg. 38 N/A Azure Machine Learning Designer – pg. 39 N/A or YouthEducation1
Post-Assessment Assessment time - 01:44:00	Fundamental Principles of Machine Learning on Azure: Post-Assessment			

Domain 3 Lesson Plan

Domain 3 - Features of Computer Vision Workloads on Azure [approximately 4.5 hours of videos, labs, and projects]				
Lesson	**Lesson Topic and Subtopics**	**Objectives**	**Exercise Labs**	**Workbook Projects and Files**
Pre-Assessment Assessment time - 00:36:00	Features of Computer Vision Workloads on Azure: Pre-Assessment			
Lesson 1 Video time - 00:08:42 Exercise Lab time - 00:28:00 Workbook time - 00:35:00	**Computer Vision Solutions** Image Classification Object Detection Semantic Segmentation Optical Character Recognition Facial Detection, Recognition, and Analysis	3.1 Identify common types of computer vision solutions 3.1.1 Identify features of image classification solutions 3.1.2 Identify features of object detection solutions 3.1.3 Identify features of semantic segmentation solutions 3.1.4 Identify features of optical character recognition solutions 3.1.5 Identify features of facial detection, facial recognition, and facial analysis solutions	Image Classification Example Object Detection Example Testing Object Detection Semantic Segmentation Example Testing Optical Character Recognition Creating a Face Service Changing Face Parameters	Image Classification – pg. 42 N/A Object Detection and Semantic Segmentation – pg. 43 N/A Optical Character Recognition – pg. 44 Arches Delicate Arch Sign with Text-Small.jpg Facial Detection, Recognition, and Analysis – pg. 45 Me2-Small.jpg
Lesson 2 Video time - 00:10:42 Exercise Lab time - 00:28:00 Workbook time - 00:50:00	**Computer Vision Task Tools and Services** Computer Vision Custom Vision Face Service Form Recognizer Service	3.2 Identify Azure tools and services for computer vision tasks 3.2.1 Identify capabilities of the Computer Vision service 3.2.2 Identify capabilities of the Custom Vision service 3.2.3 Identify capabilities of the Face service 3.2.4 Identify capabilities of the Form Recognizer service	Computer Vision Examples Computer Vision Features Creating a Custom Vision Project Adding Images Face Service Capabilities Perceived Emotion Recognition Cognitive Services Features	Computer Vision – pg. 48 20140823_154006_Android.jpg Custom Vision – pg. 49 Arches/Arches Delicate Arch Sign with Text-Small.jpg Arches/Arches Delicate Arch-Small.jpg Arches/Arches Double Arch-Small.jpg Arches/Arches Windows Arches-Small.jpg Canyonlands Mesa Arch-Small.jpg Negatives/Canyonlands Cairn-Small.JPG Negatives/Canyonlands Grand View-Small.JPG Negatives/Canyonlands Green River Overlook-Small.JPG Negatives/Canyonlands Neck Spring Trail 2-Small.JPG Negatives/Canyonlands Neck Spring Trail-Small.JPG Negatives/Goblin Valley State Park-Small.JPG Negatives/Little Grand Canyon-Small.JPG Dead Horse Point Fauna-Small.JPG Face Service – pg. 50 Me-Small.jpg Me2-Small.jpg Form Recognizer Service – pg. 51 testreceipt.jpg
Post-Assessment Assessment time - 01:16:00	Features of Computer Vision Workloads on Azure: Post-Assessment			

Domain 4 Lesson Plan

Domain 4 - Features of Natural Language Processing (NLP) Workloads on Azure [approximately 6 hours of videos, labs, and projects]				
Lesson	**Lesson Topic and Subtopics**	**Objectives**	**Exercise Labs**	**Workbook Projects and Files**
Pre-Assessment Assessment time - 00:40:00	Features of Natural Language Processing (NLP) Workloads on Azure: Pre-Assessment			
Lesson 1 Video time - 00:10:54 Exercise Lab time - 00:28:00 Workbook time - 01:20:00	**Common NLP Workload Scenarios** Key Phrase Extraction Entity Recognition Sentiment Analysis Language Modeling Speech Recognition and Synthesis Translation	4.1 Identify features of common NLP Workload Scenarios 4.1.1 Identify features and uses for key phrase extraction 4.1.2 Identify features and uses for entity recognition 4.1.3 Identify features and uses for sentiment analysis 4.1.4 Identify features and uses for language modeling 4.1.5 Identify features and uses for speech recognition and synthesis 4.1.6 Identify features and uses for translation	Interpreting Word Clouds Key Phrase Extraction Model Interpreting Sentiment Scores Using Utterances Speech-To-Text Creating a Custom Translator Project Uploading Language Files	Key Phrase Extraction – pg. 54 N/A Entity Recognition – pg. 55 N/A Sentiment Analysis – pg. 56 SOUT Travel Visitor Comments.docx Language Modeling – pg. 57 N/A Speech Recognition and Synthesis – pg. 58 N/A Translation – pg. 59 SOUT Travel Visitor Comments – Spanish.docx SOUT Travel Visitor Comments – English.docx
Lesson 2 Video time - 00:09:26 Exercise Lab time - 00:20:00 Workbook time - 01:15:00	**Tools and Services for NLP Workloads** Text Analytics Service LUIS Speech Service Text Translation Service	4.2 Identify Azure tools and services for NLP workloads 4.2.1 Identify capabilities of the Text Analytics service 4.2.2 Identify capabilities of the Language Understanding Service (LUIS) 4.2.3 Identify capabilities of the Speech service 4.2.4 Identify capabilities of the Translator Text service	Text Analytics Steps Interpreting Text Analytics Results Training LUIS Creating a Speech Resource Creating a Translator Service	Text Analytics Service – pg. 62 SOUT Travel Visitor Comments - Language.docx LUIS – pg. 63 N/A Speech Service – pg. 64 N/A Text Translation Service – pg. 65 N/A
Post-Assessment Assessment time - 01:24:00	Features of Natural Language Processing (NLP) Workloads on Azure: Post-Assessment			

Domain 5 Lesson Plan

Domain 5 - Features of Conversational AI Workloads on Azure [approximately 3.5 hours of videos, labs, and projects]				
Lesson	**Lesson Topic and Subtopics**	**Objectives**	**Exercise Labs**	**Workbook Projects and Files**
Pre-Assessment Assessment time - 00:24:00	Features of Conversational AI Workloads on Azure: Pre-Assessment			
Lesson 1 Video time - 00:06:06 Exercise Lab time - 00:16:00 Workbook time - 00:50:00	**Use Cases for Conversational AI** Webchat Bots Telephone Voice Menus Personal Digital Assistants Conversational AI Solutions	5.1 Identify common use cases for conversational AI 5.1.1 Identify features and uses for webchat bots 5.1.2 Identify features and uses for telephone voice menus 5.1.3 Identify features and uses for personal digital assistants 5.1.4 Identify common characteristics of conversational AI solutions	Testing a Chatbot Reading Flowcharts Utilizing Personal Digital Assistants Adding a QnA Pair	Webchat Bots – pg. 68 N/A Telephone Voice Menus – pg. 69 N/A Personal Digital Assistants – pg. 70 N/A Conversational AI Solutions – pg. 71 N/A
Lesson 2 Video time - 00:06:43 Exercise Lab time - 00:12:00 Workbook time - 00:45:00	**Azure Services for Conversational AI** QnA Maker Service Azure Bot Service Course Conclusion	5.2 Identify Azure services for conversational AI 5.2.1 Identify capabilities of the QnA Maker service 5.2.2 Identify capabilities of the Azure Bot Service	Knowledge Base Steps Populating a Knowledge Base Building a Web App Bot	QnA Maker Service – pg. 74 SOUT Travel Visitor QA.docx Azure Bot Service – pg. 75 N/A
Post-Assessment Assessment time - 00:48:00	Features of Conversational AI Workloads on Azure: Post-Assessment			