



Designing and Implementing a Microsoft Azure AI Solution

Course AI-102T00: 4 days; Instructor-Led

Introduction

AI-102 Designing and Implementing an Azure AI Solution is intended for software developers wanting to build AI infused applications that leverage Azure AI Services, Azure AI Search, and Azure OpenAI. The course will use C# or Python as the programming language.

Audience

Software engineers concerned with building, managing and deploying AI solutions that leverage Azure AI Services, Azure AI Search, and Azure OpenAI. They are familiar with C# or Python and have knowledge on using REST-based APIs to build computer vision, language analysis, knowledge mining, intelligent search, and generative AI solutions on Azure.

Job role: AI Engineer

Preparation for exam: [AI-102](#)

Prerequisites

Before attending this course, students must have:

- Knowledge of Microsoft Azure and ability to navigate the Azure portal
- Knowledge of either C# or Python
- Familiarity with JSON and REST programming semantics

To gain C# or Python skills, complete the free [Take your first steps with C#](#) or [Take your first steps with Python](#) learning path before attending the course.

If you are new to artificial intelligence, and want an overview of AI capabilities on Azure, consider completing the Azure AI Fundamentals certification before taking this one.

Course Outline

Module 1: Get started with Azure AI Services

Azure AI Services is a collection of services that are building blocks of AI functionality you can integrate into your applications. In this learning path, you'll learn how to provision, secure, monitor, and deploy Azure AI Services resources and use them to build intelligent solutions.

Module 1-1: Prepare to develop AI solutions on Azure

As an aspiring Azure AI Engineer, you should understand core concepts and principles of AI development, and the capabilities of Azure services used in AI solutions.

Lessons

- Define artificial intelligence
- Understand AI-related terms
- Understand considerations for AI Engineers
- Understand considerations for responsible AI
- Understand capabilities of Azure Machine Learning
- Understand capabilities of Azure Cognitive Services
- Understand capabilities of the Azure Bot Service
- Understand capabilities of Azure Cognitive Search

Module 1-2: Create and consume Azure AI services

Azure AI services enable developers to easily add AI capabilities into their applications. Learn how to create and consume these services.

Lessons

- Provision an Azure AI services resource
- Identify endpoints and keys
- Use a REST API
- Use an SDK
- Exercise - Use Azure AI services

Module 1-3: Secure Azure AI services

Securing Azure AI services can help prevent data loss and privacy violations for user data that may be a part of the solution.

Lessons

- Consider authentication
- Implement network security
- Exercise - Manage Cognitive Services Security

Module 1-4: Monitor Azure AI services

Azure AI services enable you to integrate artificial intelligence into your applications and services. It's important to be able to monitor Azure AI Services in order to track utilization, determine trends, and detect and troubleshoot issues.

Lessons

- Monitor cost
- Create alerts
- View metrics
- Manage diagnostic logging
- Exercise - Monitor Azure AI services

Module 1-5: Deploy Azure AI services in containers

Learn about Container support in Azure AI services allowing the use of APIs available in Azure and enable flexibility in where to deploy and host the services with Docker containers.

Lessons

- Introduction
- Understand containers
- Use Azure AI services containers
- Exercise - Use a container

Module 2: Create computer vision solutions with Azure AI Vision

Computer vision is an area of artificial intelligence that deals with visual perception. Azure AI Vision includes multiple services that support common computer vision scenarios.

Module 2-1: Analyze images

With the Azure AI Vision service, you can use pre-trained models to analyze images and extract insights and information from them.

Lessons

- Introduction
- Provision an Azure AI Vision resource
- Analyze an image
- Generate a smart-cropped thumbnail and remove background

- Exercise - Analyze images with Azure AI Vision

Module 2-2: Image classification with custom Azure AI Vision models

Classify images by training a custom model with Azure AI Vision.

Lessons

- Understand custom model types
- Create a custom project
- Label and train a custom model
- Exercise - Classify images with an Azure AI Vision custom model

Module 2-3: Detect, analyze, and recognize faces

The ability for applications to detect human faces, analyze facial features and emotions, and identify individuals is a key artificial intelligence capability.

Lessons

- Identify options for face detection analysis and identification
- Understand considerations for face analysis
- Detect faces with the Azure AI Vision service
- Understand capabilities of the face service
- Compare and match detected faces
- Implement facial recognition
- Exercise - Detect, analyze, and identify faces

Module 2-4: Read Text in images and documents with the Azure AI Vision Service

Azure's AI Vision service uses algorithms to process images and return information. This module teaches you how to use the Image Analysis API for optical character recognition (OCR).

Lessons

- Explore Azure AI Vision options for reading text
- Use the Read API
- Exercise - Read text in images

Module 2-5: Analyze video

Azure Video Indexer is a service to extract insights from video, including face identification, text recognition, object labels, scene segmentations, and more.

Lessons

- Understand Azure Video Indexer capabilities
- Extract custom insights
- Use Video Analyzer widgets and APIs
- Exercise - Analyze video

Module 3: Develop natural language processing solutions with Azure AI Services

Natural language processing (NLP) solutions use language models to interpret the semantic meaning of written or spoken language. You can use the Language Understanding service to build language models for your applications.

Module 3-1: Analyze text with Azure AI Language

The Azure AI Language service enables you to create intelligent apps and services that extract semantic information from text.

Lessons

- Provision an Azure AI Language resource
- Detect language

- Extract key phrases
- Analyze sentiment
- Extract entities
- Extract linked entities
- Exercise - Analyze text

Module 3-2: Create question answering solutions with Azure AI Language

The question answering capability of the Azure AI Language service makes it easy to build applications in which users ask questions using natural language and receive appropriate answers.

Lessons

- Understand question answering
- Compare question answering to Azure AI Language understanding
- Create a knowledge base
- Implement multi-turn conversation
- Test and publish a knowledge base
- Use a knowledge base
- Improve question answering performance
- Exercise - Create a question answering solution

Module 3-3: Build a conversational language understanding model

The Azure AI Language conversational language understanding service (CLU) enables you to train a model that apps can use to extract meaning from natural language.

Lessons

- Understand prebuilt capabilities of the Azure AI Language service
- Understand resources for building a conversational language understanding model
- Define intents, utterances, and entities
- Use patterns to differentiate similar utterances
- Use pre-built entity components
- Train, test, publish, and review a conversational language understanding model
- Exercise - Build an Azure AI services conversational language understanding model

Module 3-4: Create a custom text classification solution

The Azure AI Language service enables processing of natural language to use in your own app. Learn how to build a custom text classification project.

Lessons

- Understand types of classification projects
- Understand how to build text classification projects
- Exercise - Classify text

Module 3-5: Custom named entity recognition

Build a custom entity recognition solution to extract entities from unstructured documents

Lessons

- Understand custom named entity recognition
- Label your data
- Train and evaluate your model
- Exercise - Extract custom entities

Module 3-6: Translate text with Azure AI Translator service

The Translator service enables you to create intelligent apps and services that can translate text between languages.

Lessons

- Provision an Azure AI Translator resource

- Understand language detection, translation, and transliteration
- Specify translation options
- Define custom translations
- Exercise - Translate text with the Azure AI Translator service

Module 3-7: Create speech-enabled apps with Azure AI services

The Azure AI Speech service enables you to build speech-enabled applications. This module focuses on using the speech-to-text and text to speech APIs, which enable you to create apps that are capable of speech recognition and speech synthesis.

Lessons

- Provision an Azure AI Translator resource
- Understand language detection, translation, and transliteration
- Specify translation options
- Define custom translations
- Exercise - Translate text with the Azure AI Translator service

Module 3-8: Translate speech with the Azure AI Speech service

Translation of speech builds on speech recognition by recognizing and transcribing spoken input in a specified language, and returning translations of the transcription in one or more other languages.

Lessons

- Provision an Azure resource for speech translation
- Translate speech to text
- Synthesize translations
- Exercise - Translate speech

Module 4: Implement knowledge mining with Azure AI Search

Do you have information locked up in structured and unstructured data sources? Using Azure AI Search, you can extract key insights from this data, and enable applications to search and analyze them.

Module 4-1: Create an Azure AI Search solution

Unlock the hidden insights in your data with Azure AI Search.

Lessons

- Manage capacity
- Understand search components
- Understand the indexing process
- Search an index
- Apply filtering and sorting
- Enhance the index
- Exercise - Create a search solution

Module 4-2: Create a custom skill for Azure AI Search

Use the power of artificial intelligence to enrich your data and find new insights.

Lessons

- Create a custom skill
- Add a custom skill to a skillset
- Exercise - Implement a custom skill

Module 4-3: Create a knowledge store with Azure AI Search

Persist the output from an Azure AI Search enrichment pipeline for independent analysis or downstream processing.

Lessons

- Define projections
- Define a knowledge store
- Exercise - Create a knowledge store

Module 4-4: Enrich your data with Azure AI Language

Azure AI Language gives you the power of Natural Language Processing (NLP) to automatically understand and analyze text. You can use that power to enhance your search solutions.

Lessons

- Explore the available features of Azure AI Language
- Enrich a search index in Azure AI Search with custom classes and Azure AI Language
- Exercise: Enrich a search index in Azure AI Search with custom classes

Module 4-5: Implement advanced search features in Azure AI Search

Use more advanced features of Azure AI Search to improve your existing search solutions. Learn how to change the ranking on documents, boost terms, and allow searching in multiple languages.

Lessons

- Improve the ranking of a document with term boosting
- Improve the relevance of results by adding scoring profiles
- Improve an index with analyzers and tokenized terms
- Enhance an index to include multiple languages
- Improve search experience by ordering results by distance from a given reference point
- Exercise: Implement enhancements to search results

Module 4-6: Build an Azure Machine Learning custom skill for Azure AI Search

Custom skills allow you to enhance datasets as they pass through the enrichment pipeline. Azure Machine Learning can build custom models for regression or classification to enrich your search indexes.

Lessons

- Understand how to use a custom Azure Machine Learning skillset
- Enrich a search index using an Azure Machine Learning model
- Exercise: Enrich a search index using Azure Machine Learning model

Module 4-7: Search data outside the Azure platform in Azure AI Search using Azure Data Factory

Use Azure Data Factory to add data that resides inside or outside the Azure platform into your search indexes.

Lessons

- Index data from external data sources using Azure Data Factory
- Index any data using the Azure AI Search push API
- Exercise: Add to an index using the push API

Module 4-8: Maintain an Azure AI Search solution

Maintain the performance, cost, and reliability of your Azure AI Search solutions.

Lessons

- Manage security of an Azure AI Search solution
- Optimize performance of an Azure AI Search solution
- Manage costs of an Azure AI Search solution
- Improve reliability of an Azure AI Search solution
- Monitor an Azure AI Search solution

- Debug search issues using the Azure portal
- Exercise - Debug search issues

Module 4-9: Perform search re-ranking with semantic ranking in Azure AI Search

Learn how to perform L2 ranking with semantic ranker in Azure AI Search.

Lessons

- What is semantic ranking?
- Set up semantic ranking
- Exercise - Use semantic ranking on an index

Module 4-10: Perform vector search and retrieval in Azure AI Search

Learn how to perform vector search and retrieval in Azure AI Search.

Lessons

- What is vector search?
- Prepare your search
- Understand embedding
- Exercise - Use the REST API to run vector search queries

Module 5: Use prebuilt Form Recognizer models

In this learning path, discover how Azure AI Document Intelligence solutions can enable you to capture data from typed or hand-written forms. Learn how to build a solution for your custom form types and integrate that solution into an Azure Cognitive Search pipeline. You'll learn how to:

- Design a solution that analyzes your business forms by using Azure AI Document Intelligence.
- Create a solution that analyzes common documents by using Document Intelligence.
- Create a solution that analyses different custom form types by using Document Intelligence.
- Include an Azure AI Document Intelligence service as a custom skill in an Azure AI Search pipeline.

Module 5-1: Plan an Azure AI Document Intelligence solution

Learn how to use Azure AI Document Intelligence to build solutions that analyze forms and output data for storage or further processing.

Lessons

- Understand AI Document Intelligence
- Plan Azure AI Document Intelligence resources
- Choose a model type

Module 5-2: Use prebuilt Form Recognizer models

Learn what data you can analyze by choosing prebuilt Forms Analyzer models and how to deploy these models in a Document intelligence solution.

Lessons

- Understand prebuilt models
- Use the General Document, Read, and Layout models
- Use financial, ID, and tax models
- Exercise - Analyze a document using Azure AI Document Intelligence

Module 5-3: Extract data from forms with Azure Document Intelligence

Document intelligence uses machine learning technology to identify and extract key-value pairs and table data from form documents with accuracy, at scale. This module teaches you how to use the Azure Document intelligence cognitive service.

Lessons

- What is Azure Document Intelligence?

- Get started with Azure Document Intelligence
- Train custom models
- Use Azure Document Intelligence models
- Use the Azure Document Intelligence Studio
- Exercise - Extract data from custom forms

Module 5-4: Create a composed Document intelligence model

Learn how to assemble custom models into composed solutions that can analyze different types of your own documents.

Lessons

- Understand composed models
- Assemble composed models
- Exercise: Create a composed model

Module 5-5: Build a Document intelligence custom skill for Azure AI search

Learn how to use an Azure Document Intelligence solution as a custom skill to enrich content in an Azure AI Search pipeline.

Lessons

- Understand Azure AI Search enrichment pipelines
- Build an Azure AI Document Intelligence custom skill
- Exercise: Build and deploy an Azure AI Document Intelligence custom skill

Module 6: Develop Generative AI solutions with Azure OpenAI Service

Azure OpenAI Service provides access to OpenAI's powerful large language models such as ChatGPT, GPT, Codex, and Embeddings models. These models enable various natural language processing (NLP) solutions to understand, converse, and generate content. Users can access the service through REST APIs, SDKs, and Azure OpenAI Studio.

Module 6-1: Get started with Azure OpenAI Service

This module provides engineers with the skills to begin building an Azure OpenAI Service solution.

Lessons

- Access Azure OpenAI Service
- Use Azure AI Studio
- Explore types of generative AI models
- Deploy generative AI models
- Use prompts to get completions from models
- Test models in Azure AI Studio's playground
- Exercise - Get started with Azure OpenAI Service

Module 6-2: Build natural language solutions with Azure OpenAI Service

This module provides engineers with the skills to begin building apps that integrate with the Azure OpenAI Service.

Lessons

- Integrate Azure OpenAI into your app
- Use Azure OpenAI REST API
- Use Azure OpenAI SDK
- Exercise - Integrate Azure OpenAI into your app

Module 6-3: Apply prompt engineering with Azure OpenAI Service

Prompt engineering in Azure OpenAI is a technique that involves designing prompts for natural language processing models. This process improves accuracy and relevancy in responses, optimizing the performance of the model.

Lessons

- Understand prompt engineering
- Write more effective prompts
- Provide context to improve accuracy
- Exercise - Utilize prompt engineering in your application

Module 6-4: Generate code with Azure OpenAI Service

This module shows engineers how to use the Azure OpenAI Service to generate and improve code.

Lessons

- Construct code from natural language
- Complete code and assist the development process
- Fix bugs and improve your code
- Exercise - Generate and improve code with Azure OpenAI Service

Module 6-5: Generate images with Azure OpenAI Service

The Azure OpenAI service includes the DALL-E model, which you can use to generate original images based on natural language prompts.

Lessons

- What is DALL-E?
- Explore DALL-E in Azure OpenAI Studio
- Use the Azure OpenAI REST API to consume DALL-E models
- Exercise - Generate images with a DALL-E model

Module 6-6: Implement Retrieval Augmented Generation (RAG) with Azure OpenAI Service

Use the Azure OpenAI on your data allows developers to implement RAG with supported AI chat models to reference specific sources of data to ground the response.

Lessons

- Understand Retrieval Augmented Generation (RAG) with Azure OpenAI Service
- Add your own data source
- Chat with your model using your own data
- Exercise - Add your data for RAG with Azure OpenAI Service

Module 6-7: Fundamentals of Responsible Generative AI

Generative AI enables amazing creative solutions, but must be implemented responsibly to minimize the risk of harmful content generation.

Lessons

- Plan a responsible generative AI solution
- Identify potential harms
- Measure potential harms
- Mitigate potential harms
- Operate a responsible generative AI solution
- Exercise - Explore content filters in Azure OpenAI