**AI-102 - Azure AI Engineer Study Guide**

*Skills measured as of October 31, 2024. Please check for exam updates regularly if you plan to take the exam in the next few months.*

[Study guide for Exam AI-102: Designing and Implementing a Microsoft Azure AI Solution | Microsoft Learn](https://learn.microsoft.com/en-us/credentials/certifications/resources/study-guides/ai-102)

**Plan and manage an Azure AI solution (15–20%)**

**Select the appropriate Azure AI service**

* Select the appropriate service for a computer vision solution
* Select the appropriate service for a natural language processing solution
* Select the appropriate service for a speech solution
* Select the appropriate service for a generative AI solution
* Select the appropriate service for a document intelligence solution
* Select the appropriate service for a knowledge mining solution

**Plan, create and deploy an Azure AI service**

* Plan for a solution that meets Responsible AI principles
  + [Responsible AI Tools and Practices | Microsoft AI](https://www.microsoft.com/en-gb/ai/tools-practices)
* Create an Azure AI resource
* Determine a default endpoint for a service
* Integrate Azure AI services into a continuous integration and continuous delivery (CI/CD) pipeline
* Plan and implement a container deployment
  + [Use Azure AI containers on-premises - Azure AI services | Microsoft Learn](https://learn.microsoft.com/en-us/azure/ai-services/cognitive-services-container-support)

**Manage, monitor, and secure an Azure AI service**

* Configure diagnostic logging
* Monitor an Azure AI resource
* Manage costs for Azure AI services
* Manage account keys
* Protect account keys by using Azure Key Vault
* Manage authentication for an Azure AI Service resource

Optional materials:

* + - [Using Managed Identities to Access Azure Resources Securely | by Vaibhav Gujral | Medium](https://blog.vaibhavgujral.com/using-managed-identities-to-access-azure-resources-securely-03fb97cfa6f0)
* Manage private communications

Optional materials:

* + - [Configure Virtual Networks for Azure AI services - Azure AI services | Microsoft Learn](https://learn.microsoft.com/en-us/azure/ai-services/cognitive-services-virtual-networks?tabs=portal)
    - [Create a private endpoint for a secure connection - Azure AI Search | Microsoft Learn](https://learn.microsoft.com/en-us/azure/search/service-create-private-endpoint)

**Implement content moderation solutions (10–15%)**

**Create solutions for content delivery**

* Implement a text moderation solution with Azure AI Content Safety
* Implement an image moderation solution with Azure AI Content Safety

**Implement computer vision solutions (15–20%)**

**Analyze images**

* Select visual features to meet image processing requirements
* Detect objects in images and generate image tags
* Include image analysis features in an image processing request
* Interpret image processing responses
* Extract text from images using Azure AI Vision
* Convert handwritten text using Azure AI Vision

**Implement custom computer vision models by using Azure AI Vision**

* Choose between image classification and object detection models
* Label images
* Train a custom image model, including image classification and object detection
* Evaluate custom vision model metrics

[Quickstart: Build an image classification model with the Custom Vision portal - Azure AI services | Microsoft Learn](https://learn.microsoft.com/en-us/azure/ai-services/custom-vision-service/getting-started-build-a-classifier#evaluate-the-classifier)

* Publish a custom vision model
* Consume a custom vision model

**Analyze videos**

* Use Azure AI Video Indexer to extract insights from a video or live stream
* Use Azure AI Vision Spatial Analysis to detect presence and movement of people in video

**Implement natural language processing solutions (30–35%)**

**Analyze text by using Azure AI Language**

* Extract key phrases
* Extract entities
* Determine sentiment of text
* Detect the language used in text
* Detect personally identifiable information (PII) in text

**Process speech by using Azure AI Speech**

* Implement text-to-speech
* Implement speech-to-text
* Improve text-to-speech by using Speech Synthesis Markup Language (SSML)
* Implement custom speech solutions
* Implement intent recognition
* Implement keyword recognition

**Translate language**

* Translate text and documents by using the Azure AI Translator service
* Implement custom translation, including training, improving, and publishing a custom model
* Translate speech-to-speech by using the Azure AI Speech service
* Translate speech-to-text by using the Azure AI Speech service
* Translate to multiple languages simultaneously

**Implement and manage a language understanding model by using Azure AI Language**

* Create intents and add utterances
* Create entities
* Train, evaluate, deploy, and test a language understanding model
* Optimize a language understanding model
* Consume a language model from a client application
* Backup and recover language understanding models

**Create a custom question answering solution by using Azure AI Language**

* Create a custom question answering project
* Add question-and-answer pairs manually
* Import sources
* Train and test a knowledge base
* Publish a knowledge base
* Create a multi-turn conversation
* Add alternate phrasing
* Add chit-chat to a knowledge base
* Export a knowledge base
* Create a multi-language question answering solution

**Implement knowledge mining and document intelligence solutions (10–15%)**

**Implement an Azure AI Search solution**

* Provision an Azure AI Search resource
* Create data sources
* Create an index
* Define a skillset
* Implement custom skills and include them in a skillset
* Create and run an indexer
* Query an index, including syntax, sorting, filtering, and wildcards
* Manage Knowledge Store projections, including file, object, and table projections

**Implement an Azure AI Document Intelligence solution**

* Provision a Document Intelligence resource
* Use prebuilt models to extract data from documents
* Implement a custom document intelligence model
* Train, test, and publish a custom document intelligence model
* Create a composed document intelligence model
* Implement a document intelligence model as a custom Azure AI Search skill

**Implement generative AI solutions (10–15%)**

**Use Azure OpenAI Service to generate content**

* Provision an Azure OpenAI Service resource
* Select and deploy an Azure OpenAI model
* Submit prompts to generate natural language
* Submit prompts to generate code
* Use the DALL-E model to generate images
* Use Azure OpenAI APIs to submit prompts and receive responses
* Use large multimodal models in Azure OpenAI

**Optimize generative AI**

* Configure parameters to control generative behavior
* Apply prompt engineering techniques to improve responses
* Use your own data with an Azure OpenAI model
* Fine-tune an Azure OpenAI model

**Additional resources**

* [**microsoft/ML-For-Beginners: 12 weeks, 26 lessons, 52 quizzes, classic Machine Learning for all**](https://github.com/microsoft/ML-For-Beginners?tab=readme-ov-file)
* [**A Beginner’s Guide to Tokens, Vectors, and Embeddings in NLP | by Sascha Metzger | Medium**](https://medium.com/@saschametzger/what-are-tokens-vectors-and-embeddings-how-do-you-create-them-e2a3e698e037)
* [**Azure OpenAI Image Token Calculator**](https://jamesmcroft.github.io/openai-image-token-calculator/)
* [**Azure-Samples/azure-openai-rag-workshop: Create your own ChatGPT with Retrieval-Augmented-Generation workshop**](https://github.com/Azure-Samples/azure-openai-rag-workshop)
* [**Mean Average Precision (mAP) Explained | Built In**](https://builtin.com/articles/mean-average-precision)
* [**Azure updates | Microsoft Azure**](https://azure.microsoft.com/en-gb/updates/?product=cognitive-services&searchterms=vision) **Product Updates**
* [**Microsoft AI Literacy Starting Guide**](https://cdn-dynmedia-1.microsoft.com/is/content/microsoftcorp/microsoft/final/en-us/microsoft-product-and-services/security/pdf/microsoft-ai-literacy-starting-guide-jan-2025-477720.pdf)