



Hands-on Azure Cognitive Services

Reza Salehi

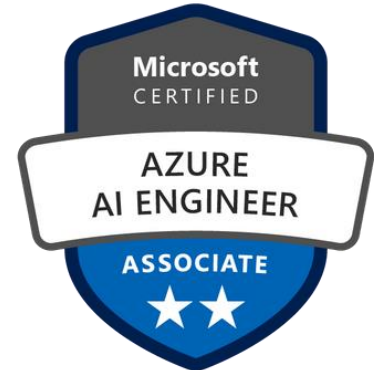


Reza Salehi

Cloud Consultant and Trainer



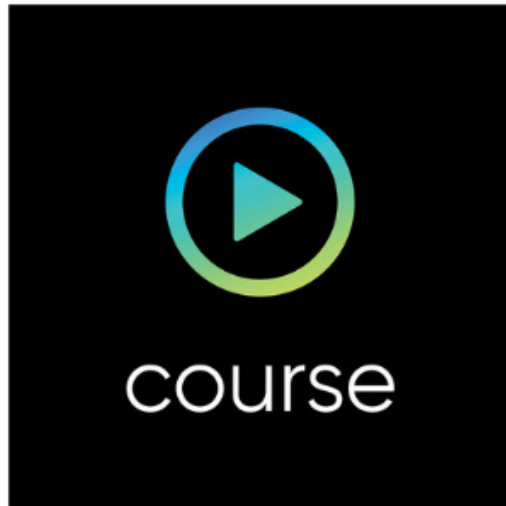
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Microsoft Azure Fundamentals (AZ-900) Certification Course

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TIME TO COMPLETE:
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LEVEL:
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Azure Cookbook

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O'REILLY®

Azure Cookbook

Recipes to Create and Maintain Cloud Solutions in Azure



Reza Salehi

Overview



Azure Cognitive Services

Speech

Improve customer experiences with [Cognitive Service for Speech](#)

[Speech to text](#)

Transcribe audible speech into readable, searchable text.

[Text to speech](#)

Convert text to lifelike speech for more natural interfaces.

[Speech translation](#)

Integrate real-time speech translation into your apps.

[Speaker recognition](#)

Identify and verify the people speaking based on audio.

Language

Vision

Decision

Azure OpenAI Service



Speech

Speech

Language

Vision

Decision

Azure OpenAI Service

Improve customer experiences with [Cognitive Service for Speech](#)

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Language

Understand conversations and unstructured text with [Cognitive Service for Language](#)

[Entity recognition](#)

Speech

Identify commonly-used and domain-specific terms.

Language

[Sentiment analysis](#)

Automatically detect sentiments and opinions from text.

Vision

[Question Answering](#)

Decision

Distill information into easy-to-navigate questions and answers.

[Conversational language understanding](#)

Azure OpenAI Service

Enable your apps to interact with users through natural language.

[Translator](#)

Translate more than 100 languages and dialects.



Vision

Speech

Language

Vision

Decision

Azure OpenAI Service

Identify and analyze content within images and videos

[Azure Cognitive Services for Vision](#)

Identify and analyze content within images and videos.

[Custom Vision](#)

Customize image recognition to fit your business needs.



Decision

Make smarter decisions faster

[Anomaly Detector](#)

Speech

Identify potential problems early on.

[Content Safety](#)

Language

Detect potentially offensive or unwanted content.

[Personalizer](#)

Vision

Decision

Create rich, personalized experiences for every user.

Azure OpenAI Service



Azure OpenAI Services

Dynamic language models to power your apps

[OpenAI Service](#)

Speech

Apply advanced coding and language models to a variety of use cases.

Language

Vision

Decision

Azure OpenAI Service

Azure Cognitive Services

- Speech to text
- Text to speech
- Speech translation
- Speaker recognition
- Entity recognition
- Sentiment analysis
- Question Answering
- Conversational language understanding
- Translator
- Azure Cognitive Services for Vision
- Custom Vision
- Anomaly Detector
- Content Safety
- Personalizer
- OpenAI Service





By the End of This Course

You will understand Azure Cognitive Services APIs and their use cases.



What are Azure Cognitive Services?



What are Azure Cognitive Services?

- Services available to help developers build intelligent applications.
- “Cognitive Services brings AI within reach of every developer and data scientist.”



What are Azure Cognitive Services?

- Services available to help developers build intelligent applications.
- Without having direct ML, AI or data science skills or knowledge.
- Easily provisioned and consumed.



Find the Cats



Creating Your Own ML Model

1. Collect training datasets; 1000+ cat and not-cat photos
2. Cleanup the collected training data
3. Choose the right ML model for your usecase
4. Train the model and verify the result
5. Deploy the read-to-use model to your application
6. Start using the model with the data in question



Using Cognitive Services Models

1. Provision an Azure Computer Vision service
2. Start using the service with the data in question
 - a. Microsoft has trained the models for you
 - b. These models can be customized if needed



Create a resource

Home

Dashboard

All services

★ FAVORITES

Azure Active Directory

Subscriptions

Resource groups

Policy

Virtual machines

Virtual networks

Storage accounts

Key vaults

Function App

Azure Synapse Analytics

Azure Cosmos DB

Resource Graph Explorer

Stream Analytics jobs

Cost Management

All services | AI + Machine Learning

All

Favorites

Recents

Recommended

Categories

AI + machine learning

Analytics

Compute

Containers

Databases

DevOps

General

Hybrid + multicloud

Identity

Integration

Internet of Things

Management and governance

Filter services

Applied AI

Applied AI services

Cognitive Search

Immersive readers

Azure Video Indexer

Bot Services

Form recognizers

Metrics advisors

Cognitive Services

Anomaly detectors

Cognitive services multi-service account

Content moderators

Face APIs

Azure OpenAI

Speech services

Cognitive Services

Computer vision

Custom vision

Language

Personalizers

Translators

+ Create a resource

Home

Dashboard

All services

★ FAVORITES

Azure Active Directory

Subscriptions

Resource groups

Policy

Virtual machines

Virtual networks

Storage accounts

Key vaults

Function App

Azure Synapse Analytics

Azure Cosmos DB

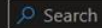
Resource Graph Explorer

All services >



Cognitive Services

Cognitive Services



Search



Overview



All Cognitive Services

Azure OpenAI



Azure OpenAI

Speech



Speech service

Language



Language service



Translator

Language understanding
(classic)

QnA maker (classic)

Vision



Computer vision

Looking for Applied AI services? [Open applied AI services.](#)

Build smarter apps and services

Cognitive Services brings AI within reach of every developer—without requiring machine-learning expertise. All it takes is an API call to embed the ability to see, hear, speak, search, understand, and accelerate decision-making into your apps. [Learn more](#)

Azure OpenAI

Perform a wide variety of natural language tasks.



Azure OpenAI account

Perform a wide variety of natural language tasks.



Create



View

Speech

Integrate speech into apps and services

Authenticate Requests to Azure Cognitive Services

1. Ocp-Apim-Subscription-Key
2. Authorization



Azure Cognitive Services

Vision

Azure Cognitive Service for Vision



Azure Cognitive Service for Vision

“Azure Cognitive Service for Vision is a unified service that offers innovative computer vision capabilities. Give your apps the ability to **analyze images**, **read text**, and **detect faces** with prebuilt image tagging, text extraction with optical character recognition (OCR), and responsible facial recognition. Incorporate vision features into your projects with no machine learning experience required.”

Microsoft



Cognitive Services Vision APIs

1. Image analysis
2. Spatial analysis
3. Optical character recognition (OCR)
4. Facial recognition



Image Analysis



Image Analysis



Image Analysis



Even though I'm making notes
at an angle, I can still get
the correct words recognized.



Image Analysis



Even though I'm making notes
at an angle, I can still get
the correct words recognized.



Image Analysis



Even though I'm making notes
at an angle, I can still get
the correct words recognized.



Image Analysis

1. Image classification & identification



Image Analysis

1. Image classification & identification

a. Scene and activity recognition



FEATURE NAME:	VALUE
Objects	[{ "rectangle": { "x": 78, "y": 268, "w": 44, "h": 62 }, "object": "building", "confidence": 0.653 }, { "rectangle": { "x": 384, "y": 51, "w": 66, "h": 312 }, "object": "building", "confidence": 0.737 }, { "rectangle": { "x": 39, "y": 315, "w": 107, "h": 128 }, "object": "building", "confidence": 0.543 }, { "rectangle": { "x": 246, "y": 263, "w": 61, "h": 198 }, "object": "building", "confidence": 0.694 }, { "rectangle": { "x": 473, "y": 297, "w": 127, "h": 165 }, "object": "building", "confidence": 0.847 }]
Tags	[{ "name": "sky", "confidence": 0.9986011 }, { "name": "outdoor", "confidence": 0.9967468 }, { "name": "tower", "confidence": 0.979019642 }, { "name": "building", "confidence": 0.9587357 }, { "name": "city", "confidence": 0.9352679 }, { "name": "cloud", "confidence": 0.8818442 }, { "name": "black and white",



Image Analysis

1. Image classification & identification
 - a. Scene and activity recognition
 - b. Celebrity and landmark recognition



```
{
  "categories": [
    {
      "name": "people_",
      "score": 0.86328125,
      "detail": {
        "celebrities": [
          {
            "name": "Satya Nadella",
            "faceRectangle": {
              "left": 240,
              "top": 294,
              "width": 135,
              "height": 135
            },
            "confidence": 0.99984323978424072
          }
        ],
        "landmarks": null
      }
    },
    {
      "name": "person",
      "confidence": 0.99956607818603516
    }
  ],
  "adult": null,
  "tags": [
  ]
}
```



Image Analysis

1. Image classification & identification
 - a. Scene and activity recognition
 - b. Celebrity and landmark recognition
2. Optical character recognition (OCR)

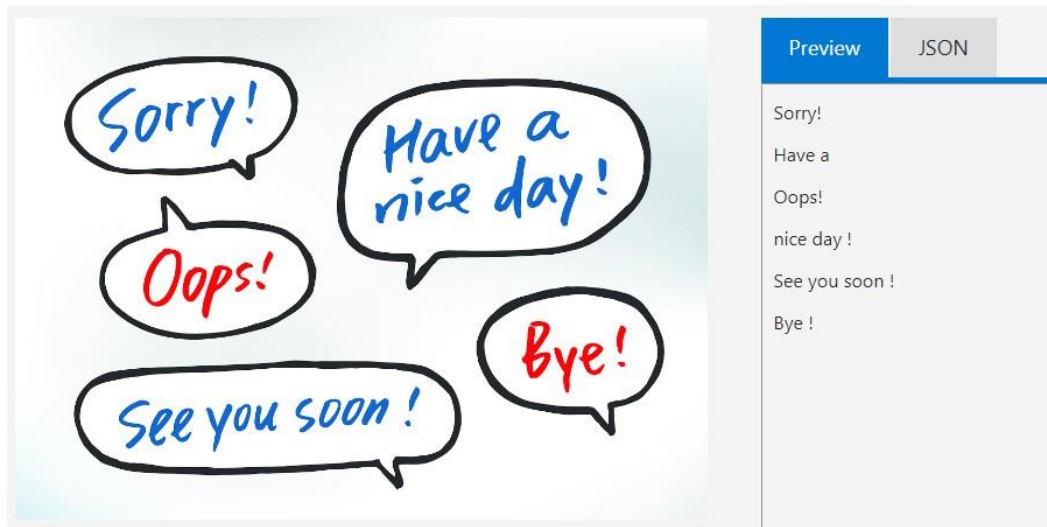


Image Analysis

1. Image classification & identification
 - a. Scene and activity recognition
 - b. Celebrity and landmark recognition
2. Optical character recognition (OCR)
 - a. Printed
 - b. Handwritten



Image Analysis

1. Image classification & identification
 - a. Scene and activity recognition
 - b. Celebrity and landmark recognition
2. Optical character recognition (OCR)
 - a. Printed
 - b. Handwritten
3. Generate smart thumbnails



Thumbnails



Thumbnails





Face



Face

Sample image 1



Detected attributes

JSON

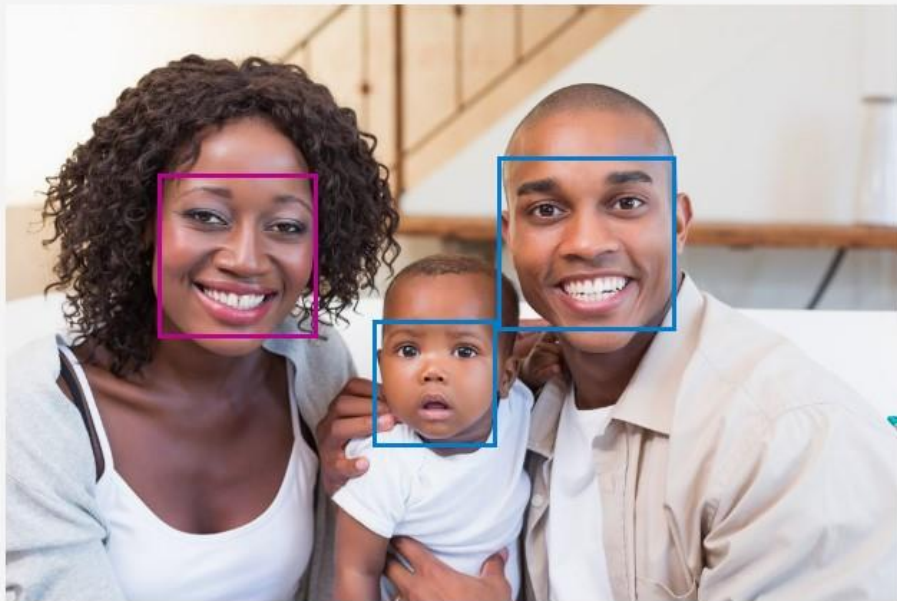
```
[
  {
    "faceRectangle": {
      "top": 186,
      "left": 470,
      "width": 141,
      "height": 201
    },
    "faceLandmarks": {
      "pupilLeft": {
        "x": 510.5,
        "y": 256.4
      },
      "pupilRight": {
        "x": 574.7,
        "y": 263.7
      },
      "noseTip": {
        "x": 538.1,
        "y": 301.7
      },
      "mouthLeft": {
        "x": 502.2,
        "y": 325
      },
      "mouthRight": {
        "x": 568.7,
        "y": 331.8
      }
    }
  }
]
```

Face

1. Face detection
2. Identity verification
3. Face grouping
4. Similar face search



Face Detection



```
Detection result:
JSON:
[
  {
    "faceId": "53bd0a34-6384-4b6d-8193-14fa38feeca4",
    "faceRectangle": {
      "top": 169,
      "left": 553,
      "width": 195,
      "height": 195
    },
    "faceAttributes": {
      "hair": {
        "bald": 0.81,
        "invisible": false,
        "hairColor": []
      },
      "smile": 1.0,
      "headPose": {
        "pitch": 0.3,
        "roll": -4.6,
        "yaw": -6.7
      },
      "gender": "male",
      "age": 25.0,
      "facialHair": {
        "moustache": 0.4,
        "beard": 0.1
      }
    }
  }
]
```



Custom Vision



Custom Vision

Easily create a customized model to **classify** images or **detect** objects for your unique use case.



Custom Vision

Easily create a customized model to **classify** images for your unique use case.



Custom Vision

Easily create a customized model to **classify** images for your unique use case.



Sugar Maple



Japanese Maple



Custom Vision

Easily create a customized model to **classify** images for your unique use case.



Custom Vision

Easily create a customized model to classify images for your unique use case.



Elliptical Galaxies



Spiral Galaxies



Irregular Galaxies



Custom Vision: Detection

Easily create a customized model to detect objects in images for your unique use case.



Moon





Custom Vision

Provisioning steps:

1. Upload Images
2. Train
3. Test
4. Deploy
5. Active learning





Break



Azure Cognitive Services

Decision

Cognitive Services Decision APIs

- Anomaly Detector
- Content Safety
- Personalizer

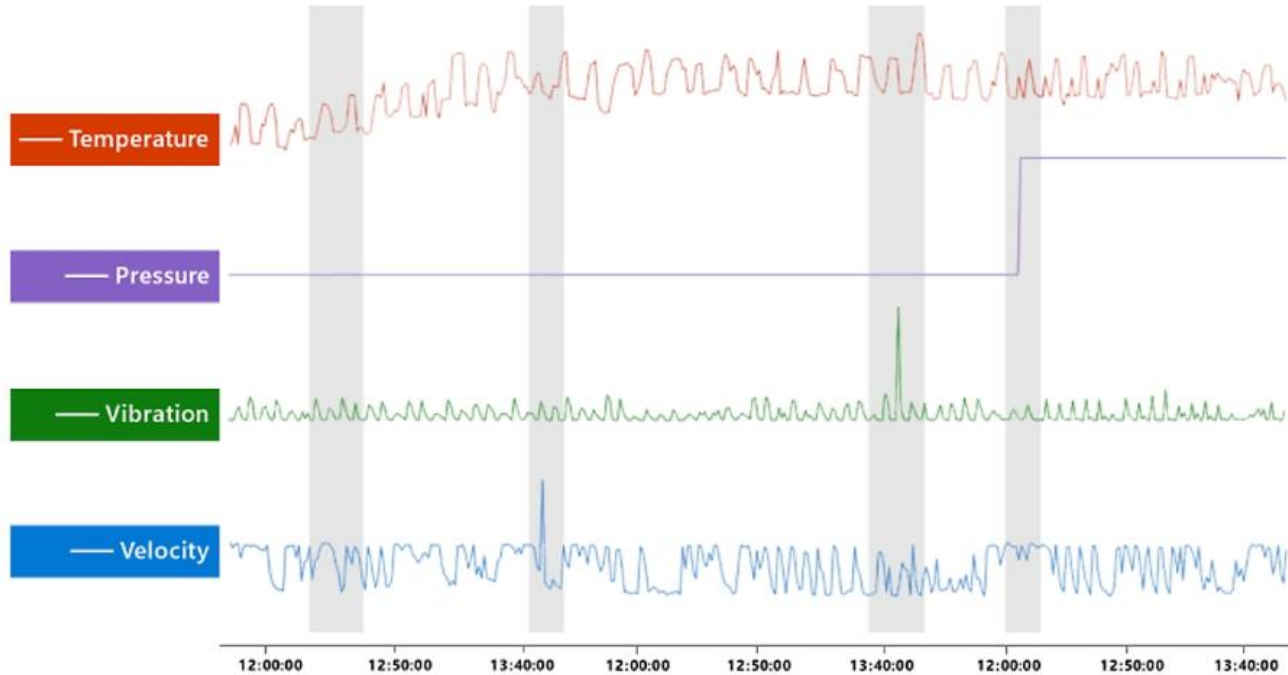


Anomaly Detector

“Foresee problems before they occur with an Azure AI anomaly detection service.”



Anomaly Detector



Anomaly Detector

“Monitor and detect anomalies in your time series data with little machine learning (ML) knowledge, either batch validation or real-time inference.”



Anomaly Detector

Monitor and detect anomalies in your time series data:

- Monitor business health in real-time
- Detect cyber attacks in real-time
- Detect industrial data abnormalities (power plants, IoT, etc.)



Content Safety





Content Safety

- Azure AI Content Safety
 - Moderate text content
 - Moderate image content
 - Monitor online activity



Content Safety Studio

“Azure AI Content Safety Studio is an online tool designed to handle potentially offensive, risky, or undesirable content using cutting-edge content moderation ML models. “



Azure Cognitive Services

Speech

Cognitive Services Speech APIs



Cognitive Services Speech APIs

Convert spoken language into text or produce natural sounding speech from text.



Cognitive Services Speech APIs

- Speech to text
- Text to speech
- Speech translation
- Speaker recognition



Speech Services

- Speech-to-text transcription

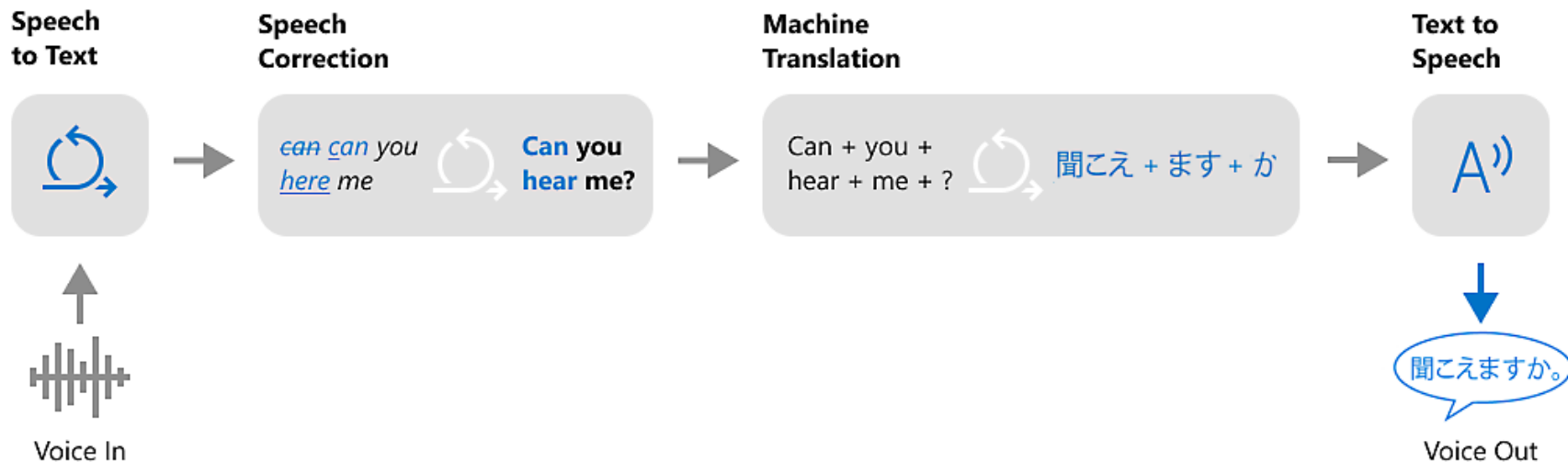


Speech Services

- Speech-to-text transcription
 - Voice assistant
 - Translation
 - Conversation/call center transcription
 - ...
- Natural text-to-speech
 - With customizable voice fonts, SSML

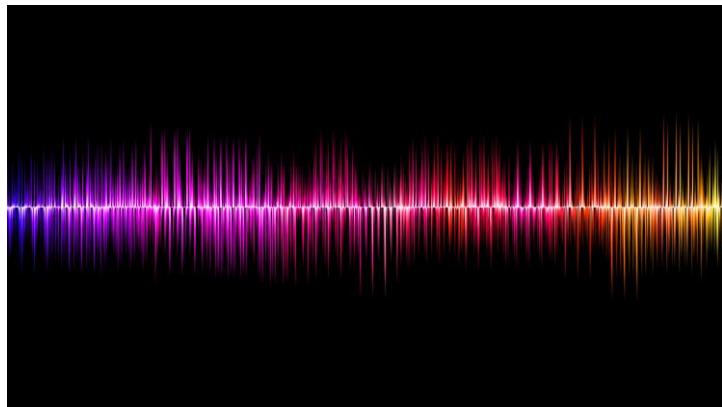


Speech Translation



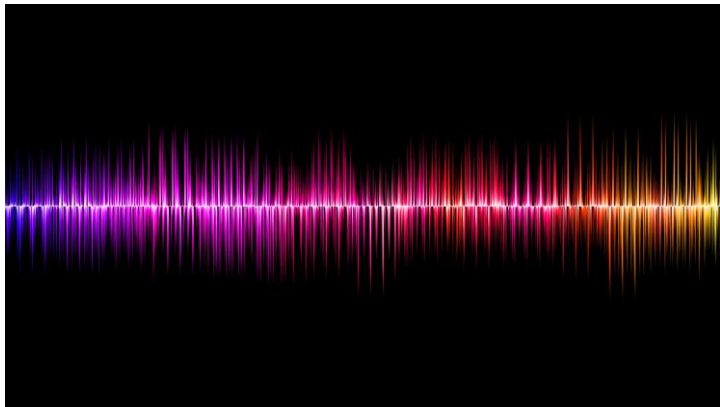
Speaker Recognition

- Speaker recognition



Speaker Recognition

- Speaker verification



Speaker Recognition

- Speaker recognition
- Speaker identification



Text JSON

President Jimmy Carter

is the one identified speaking in the selected audio.

▶ Audio 1

▶ Audio 2

▶ Audio 3

▶ Audio 4

▶ Audio 5

□ Stop





Break



Azure Cognitive Services

Language

Cognitive Services Language

Helps your app to understand the meaning of unstructured text.





Cognitive Services Language

- Entity recognition
- Sentiment analysis
- Question Answering
- Conversational language understanding
- Translator



Entity Recognition

I had a wonderful trip to Seattle last week and even visited the Space Needle 2 times!

Analyze

Analyzed text

JSON

LANGUAGES:

English (confidence: 100 %)

KEY PHRASES:

week, Space Needle, wonderful trip, Seattle, times

SENTIMENT:

84 %

NAMED ENTITIES:

Seattle [Location]
last week [DateTime-DateRange]
Space Needle [Location]
Space Needle [Organization]
2 [Quantity-Number]

LINKED ENTITIES:

I had a wonderful trip to [Seattle](#) last week and even visited



Sentiment Analysis

I had a wonderful trip to Seattle last week and even visited the Space Needle 2 times!

Analyze

Analyzed text

JSON

LANGUAGES:	English (confidence: 100 %)
KEY PHRASES:	week, Space Needle, wonderful trip, Seattle, times
SENTIMENT:	<div><div>84 %</div></div>
NAMED ENTITIES:	Seattle [Location] last week [DateTime-DateRange] Space Needle [Location] Space Needle [Organization] 2 [Quantity-Number]
LINKED ENTITIES:	I had a wonderful trip to Seattle last week and even visited



Translator

- Language detection
- Text translation
- Text transliteration
- Customizable translation (industry specific)
 - Using unstructured documentation such as manuals



Question Answering

- Creates a conversational, Q&A layer **over your data**.
- QnA extraction from unstructured text:
 - FAQ documents
 - Product manuals
 - URLs, PDF, Word, Excel, CSV
- Manually add questions and answers.
- Integration with the Azure Bot service
- Azure Language Studio



Question Answering

- Getting started



Conversational Language Understanding



Conversational Language Understanding

Enables contextual language understanding

- Turn off the living room light
- Read my calendar

Great for creating voice assistants



Azure Cognitive Services

OpenAI Services

OpenAI Services





OpenAI Services

“Apply large language models and generative AI to a variety of use cases.”





OpenAI Services

Introduction to Azure OpenAI Service



OpenAI Models

Model family	Description
GPT-4	A set of models that improve on GPT-3.5 and can understand as well as generate natural language and code.
GPT-3	A series of models that can understand and generate natural language. This includes the new ChatGPT model.
DALL-E	A series of models that can generate original images from natural language.
Codex	A series of models that can understand and generate code, including translating natural language to code.
Embeddings	A set of models that can understand and use embeddings. An embedding is a special format of data representation that can be easily utilized by machine learning models and algorithms. The embedding is an information dense representation of the semantic meaning of a piece of text. Currently, we offer three families of Embeddings models for different functionalities: similarity, text search, and code search.



Azure Applied AI Services

Azure Applied AI Services

- AI services for common business processes.



Azure Applied AI Services

CONVERSATIONS



[Azure Bot Service](#)

Create bots and connect them across channels.

DOCUMENTS



[Azure Form Recognizer](#)

Turn documents into usable data at a fraction of the time and cost.

SEARCH



[Azure Cognitive Search](#)

Bring AI-powered cloud search to your mobile and web apps.

MONITORING



[Azure Metrics Advisor](#)

Proactively monitor metrics and diagnose issues.

VIDEOS



[Azure Video Indexer](#)

Easily extract meaningful insights from audio and video files using media AI.

ACCESSIBILITY



[Azure Immersive Reader](#)

Help users read and comprehend text.

Exam AI-102

Designing and Implementing a Microsoft Azure AI Solution

Exam AI-102

Schedule exam

Exam AI-102: Designing and Implementing a Microsoft Azure AI Solution

Languages: English, Japanese, Chinese (Simplified), Korean, German, French, Spanish, Portuguese (Brazil), Arabic (Saudi Arabia), Russian, Chinese (Traditional), Italian, Indonesian (Indonesia)

Retirement date: none

This exam measures your ability to accomplish the following technical tasks: plan and manage an Azure AI solution; implement image and video processing solutions; implement natural language processing solutions; implement knowledge mining solutions; and implement conversational AI solutions.

Schedule exam >

Take a free practice assessment

Test your skills with practice questions to help you prepare for the exam. [Learn more about practice assessments.](#)

United States

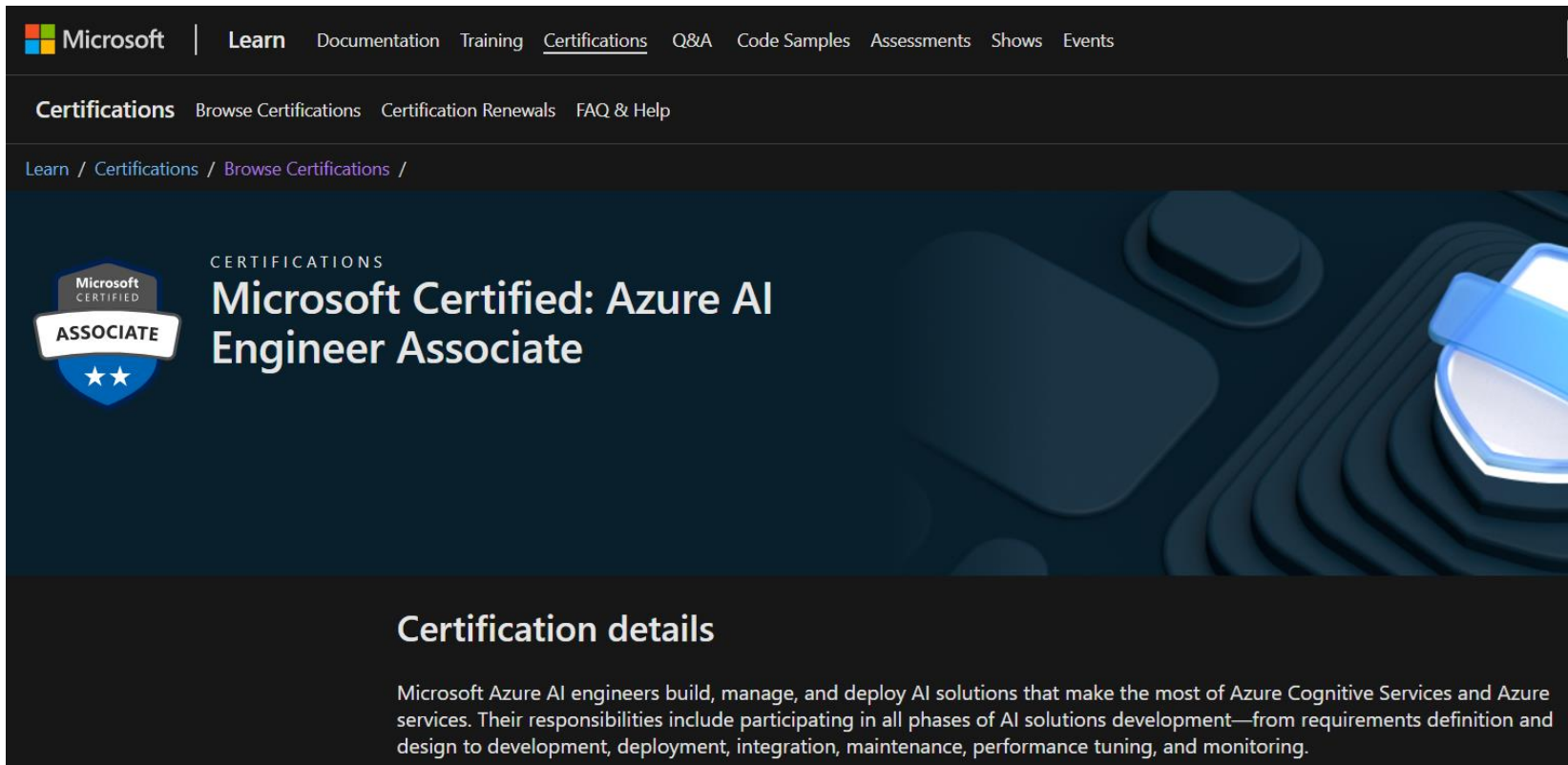
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Exam AI-102




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 **CERTIFICATIONS**
Microsoft Certified: Azure AI Engineer Associate

Certification details

Microsoft Azure AI engineers build, manage, and deploy AI solutions that make the most of Azure Cognitive Services and Azure services. Their responsibilities include participating in all phases of AI solutions development—from requirements definition and design to development, deployment, integration, maintenance, performance tuning, and monitoring.





Course Resources

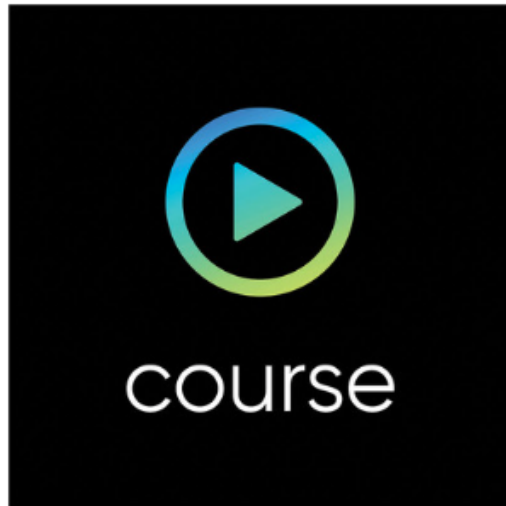
<https://github.com/zaalion/oreilly-cognitive-services>



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Azure Cookbook

Recipes to Create and Maintain Cloud Solutions in Azure



Reza Salehi

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Thank you!

Reza Salehi

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