Luxoft
A DXC Technology Company

Microsoft AI

How to develop Intelligent Applications with .NET 9

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Microsoft Certified: Azure Solutions Architect Expert

Expires on November 29, 2023 at 12:59 AM (UTC -0-1:00) • Earned on November 28, 2022

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Agenda

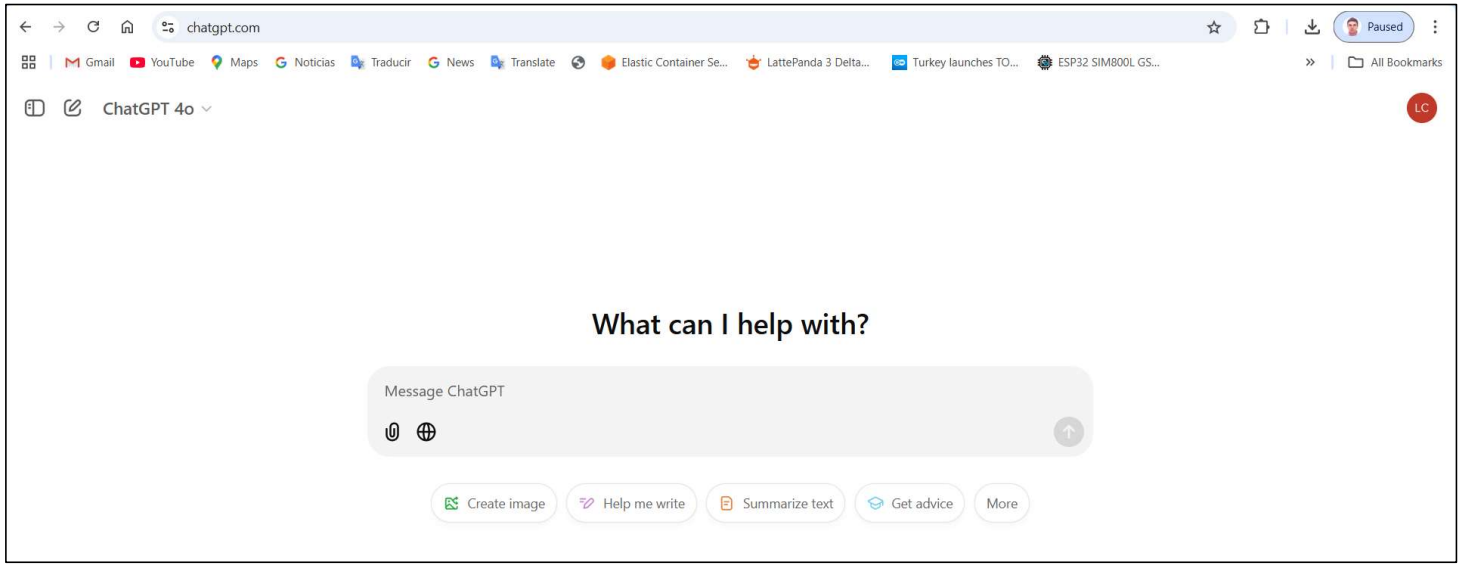
Topic
ChatGPT and ChatGPT APIs
OpenAI for .NET
Azure OpenAI and Azure.AI.OpenAI library
Semantic Kernel
Microsoft.Extensions.AI

What is ChatGPT? https://en.wikipedia.org/wiki/ChatGPT

ChatGPT is a Generative Artificial Intelligence (AI) **chatbot** developed by **OpenAI** and launched in **November 2022**

ChatGPT can generate human-like conversational responses

ChatGPT is built on **OpenAI**'s proprietary series of **Generative Pre-trained Transformer (GPT) Large Language Models (LLMs)**, and is fine-tuned for conversational applications using a combination of supervised learning and reinforcement learning from human feedback. Successive user prompts and replies are considered at each conversation stage as context



https://**chatgpt**.com/

What is GPT (Generative Pre-Trained Transformer)?

A generative pre-trained transformer (**GPT**) is a type of large language model (**LLM**) and a prominent framework for generative artificial intelligence.

It is an **Artificial Neural Network** that is used in **natural language processing by machines**.

It is based on the **Transformer Deep Learning Architecture**, pre-trained on large data sets of unlabeled text, and able to generate novel human-like content.

As of 2023, most **LLMs** had these characteristics and are sometimes referred to broadly as **GPTs**.

https://en.wikipedia.org/wiki/**Generative_pre-trained_transformer**

What is aTransformer (Deep Learning Architecture)?

A **Transformer** is a deep learning architecture developed by researchers at **Google** and based on the multi-head attention mechanism, proposed in the **2017** paper "**Attention Is All You Need**".

Text is **converted** to **numerical** representations called **tokens.**

Each **token** is **converted** into a **vector** via lookup from a word embedding table.

At each **layer**, each **token** is then **contextualized** within the scope of the context window **with other** (unmasked) **tokens** via a parallel multi-head attention mechanism, allowing the **signal** for **key tokens** to be **amplified** and less important tokens to be diminished.

https://en.wikipedia.org/wiki/**Transformer**_(deep_learning_architecture)

What is ChatGPT OpenAI API?

platform.openai.com/docs/api-reference/chat/create

OpenAI Platform | Docs | API reference | Log in | Sign up

Search CTRL K

ENDPOINTS

- Audio
- Chat
  - Create chat completion
  - The chat completion object
  - The chat completion chunk object
- Embeddings
- Fine-tuning
- Batch
- Files
- Uploads
- Images
- Cookbook
- Forum
- Help

Completions

Create chat completion

POST `https://api.openai.com/v1/chat/completions`

Creates a model response for the given chat conversation. Learn more in the text generation, vision, and audio guides.

Request body

messages array Required
A list of messages comprising the conversation so far. Depending on the model you use, different message types (modalities) are supported, like text, images, and audio.
Show possible types

model string Required
ID of the model to use. See the model endpoint compatibility table for details on which models work with the Chat API.

store boolean or null Optional Defaults to false
Whether or not to store the output of this chat completion request for use in our model distillation or evals products.

Default | Image input | Streaming | Functions | Logprobs

Example request — gpt-4o — curl

```
curl https://api.openai.com/v1/chat/completions \
  -H "Content-Type: application/json" \
  -H "Authorization: Bearer $OPENAI_API_KEY" \
  -d '{
    "model": "gpt-4o",
    "messages": [
      {
        "role": "system",
        "content": "You are a helpful assistant."
      },
      {
        "role": "user"
```

Response

```
{
  "id": "chatcmpl-123",
  "object": "chat.completion",
  "created": 1677652288,
  "model": "gpt-4o-mini",
```

https://platform.openai.com/docs/api-reference

What is ChatGPT OpenAI API?

https://api.openai.com/v1/chat/completions

Save

POST https://api.openai.com/v1/chat/completions Send

Params Authorization Headers (11) Body Pre-request Script Tests Settings Cookies

none form-data x-www-form-urlencoded raw binary GraphQL JSON Beautify

```
{
    "model": "gpt-4",
    "messages": [
        {
            "role": "system",
            "content": "You are a helpful assistant."
        },
        {
            "role": "user",
            "content": "Hello!"
        }
    ]
}
```

Body Cookies (2) Headers (25) Test Results Status: 200 OK Time: 1178 ms Size: 1.66 KB Save as example

Pretty Raw Preview Visualize JSON

```
{
  "id": "chatcmpl-8kvR0umdUlKxUTBzVSDdysjc1MyDe",
  "object": "chat.completion",
  "created": 1706194558,
  "model": "gpt-4-0613",
  "choices": [
    {
      "index": 0,
      "message": {
        "role": "assistant",
        "content": "Hello! How can I assist you today?"
```

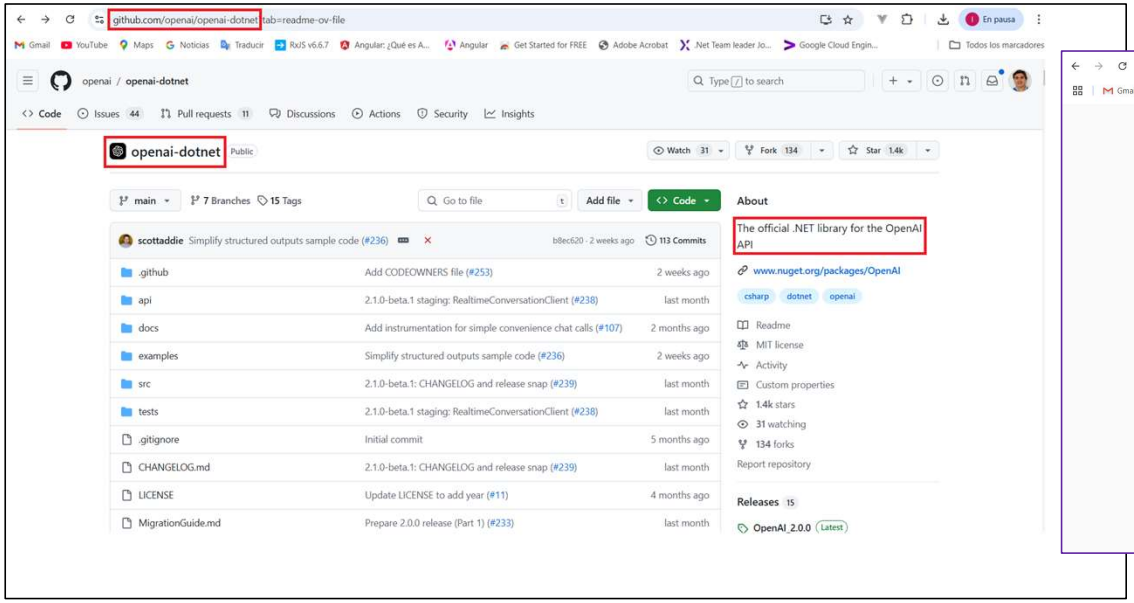
```
//Set the authorization header with the API key
_httpClient.DefaultRequestHeaders
.Add("Authorization", $"Bearer {apiKey}");

//Make the POST request using the configured HttpClient var response =
 await _httpClient.PostAsync(apiUrl, requestContent);
```

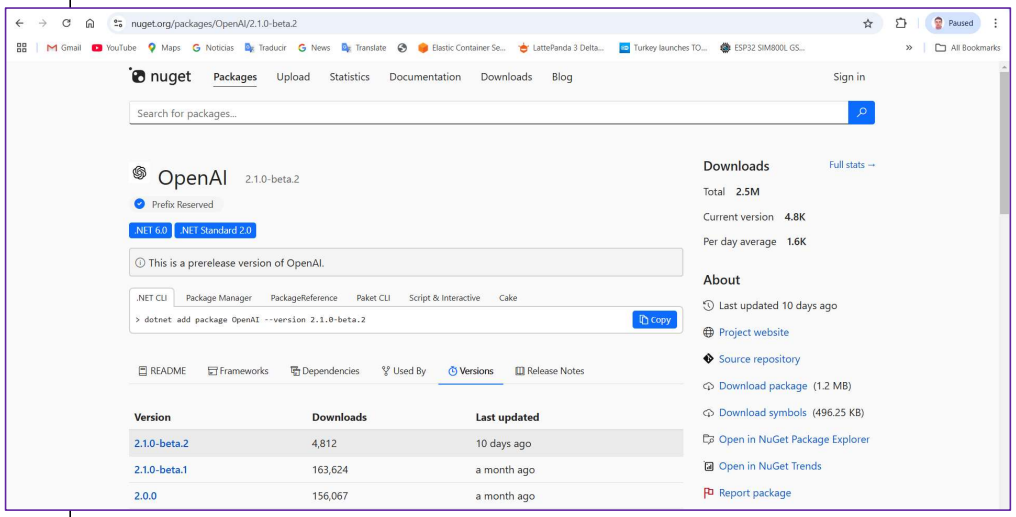
https://github.com/luiscoco/ChatGPT_OpenAI-Sample1-QuickStart

https://github.com/luiscoco/ChatGPT_OpenAI-Sample2-ChatGPT-WebAPI

OpenAI for .NET

The official .NET library for the OpenAI API





https://github.com/openai/openai-dotnet https://www.nuget.org/packages/OpenAI

https://github.com/openai/openai-openapi/blob/master/openapi.yaml

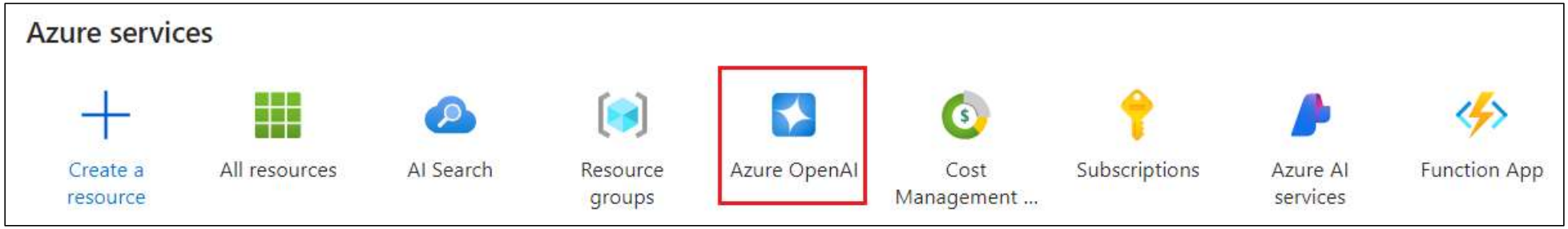
OpenAI for .NET

The official .NET library for the OpenAI API

```
using NUnit.Framework;
using OpenAI.Chat;
using System;

namespace OpenAI.Examples;

public partial class ChatExamples
{
    [Test]
    public void Example01_SimpleChat()
    {
        ChatClient client = new(model: "gpt-4o", apiKey: Environment.GetEnvironmentVariable("OPENAI_API_KEY"));

        ChatCompletion completion = client.CompleteChat("Say 'this is a test.'");

        Console.WriteLine($"[ASSISTANT]: {completion.Content[0].Text}");
    }
}
```

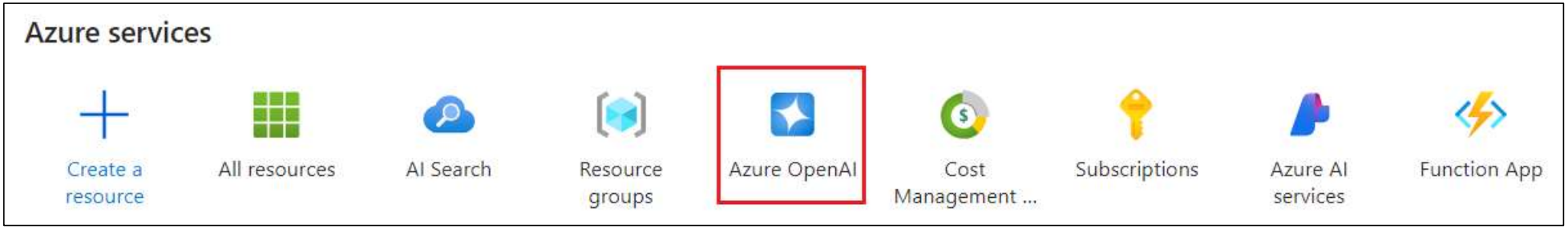
What is Azure OpenAI?

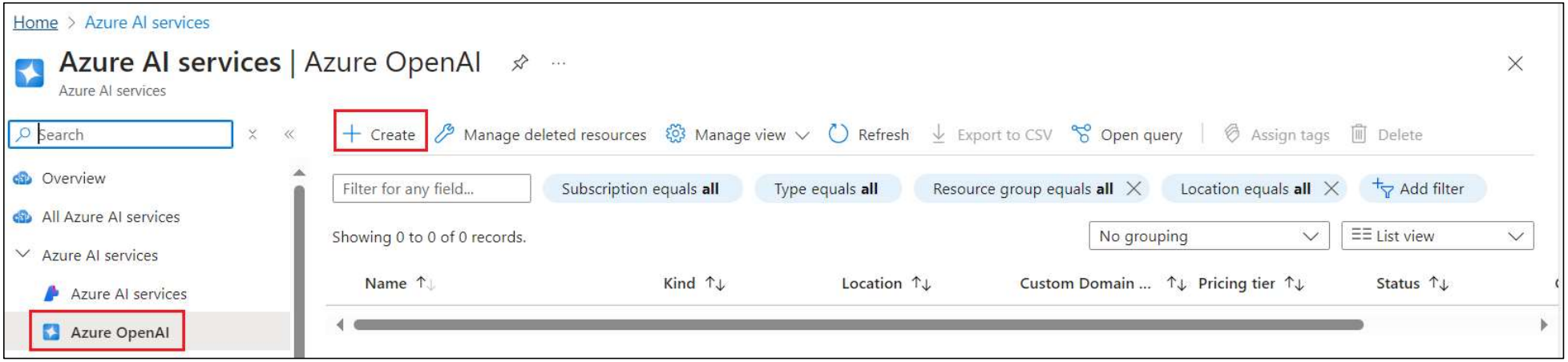
Azure OpenAI Service provides **REST API** access to OpenAI's powerful **LLMs** Large Language Models including o1-preview, o1-mini, GPT-4o, GPT-4o mini, GPT-4 Turbo with Vision, GPT-4, GPT-3.5-Turbo, and Embeddings model series. These models can be easily adapted to your specific task including but not limited to content generation, summarization, image understanding, semantic search, and natural language to code translation. Users can access the service through REST APIs, Python or C# SDK, or in the Azure AI Studio.



https://learn.microsoft.com/en-us/azure/ai-services/openai

Azure OpenAI: How to provision in Azure Portal





https://github.com/luiscoco/Azure_OpenAI_How-to-deploy-GPT-4o

Azure OpenAI: How to provision in Azure Portal

Home > Azure AI services | Azure OpenAI >

Create Azure OpenAI

1 Basics 2 Network 3 Tags 4 Review + submit

Azure OpenAI Service provides access to OpenAI's powerful language models, including all the latest OpenAI models. These models can be easily adapted to your specific tasks, including but not limited to content generation, summarization, image understanding, semantic search, and natural language to code translation. Top use cases include Call Centers, Virtual Assistants, Accessibility, Content Generation, and Code Development. The service also features the Assistants API, Fine Tuning capabilities and many ways to connect your data to the service for conversational experiences. The service can be scaled through Standard (tokens) and Provisioned (PTUs) deployment types.

Learn more

Project Details

Subscription * Subscription 1 (3392e711-a640-4d25-8dc1-112db40f09dd)

Resource group * rg-luiscocoai

Create new

Instance Details

Region West US 3

Name * luxoftaisample

Pricing tier * Standard S0

View full pricing details

Previous Next

Home > Microsoft.CognitiveServicesOpenAI-20241029171327 | Overview > luxoftaisample

luxoftaisample | Model deployments

Azure OpenAI

Search

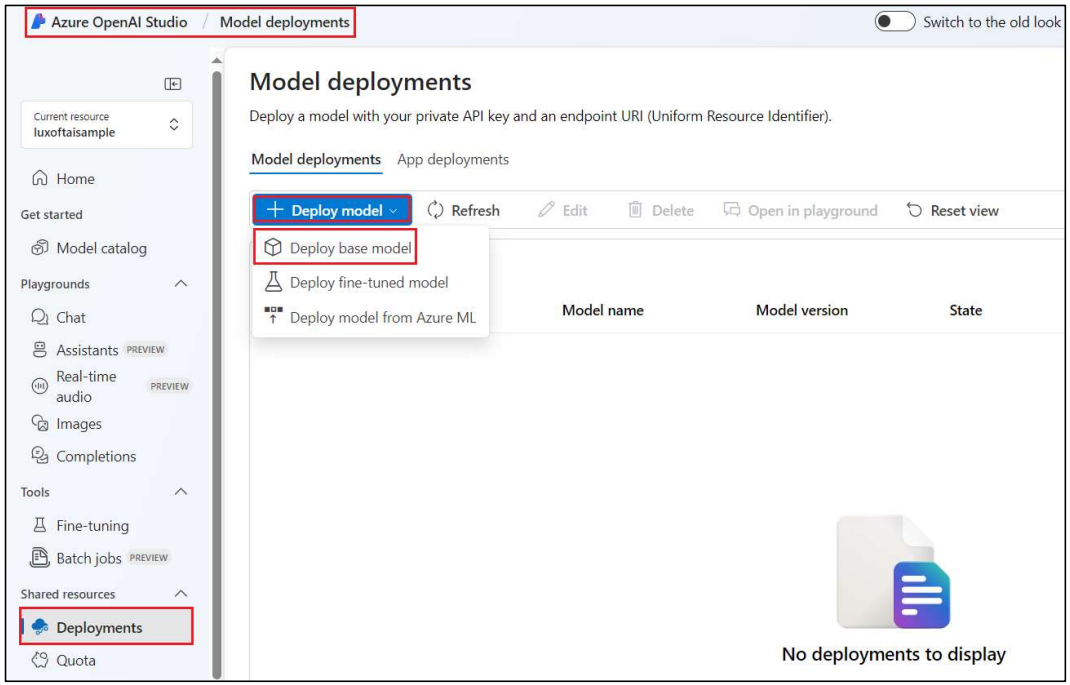
- Overview
- Activity log
- Access control (IAM)
- Tags
- Diagnose and solve problems
- Resource Management
  - Keys and Endpoint
  - Model deployments

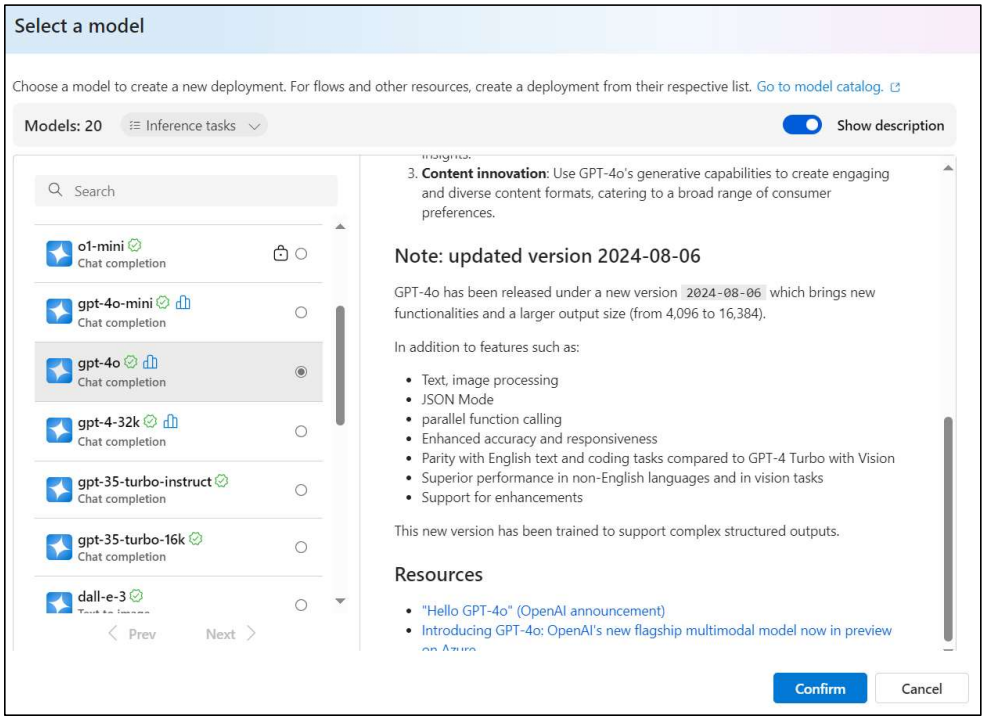
Model deployments features have moved to Azure OpenAI Studio.

Manage Deployments

https://github.com/luiscoco/Azure_OpenAI_How-to-deploy-GPT-4o

Azure OpenAI: How to provision in Azure Portal





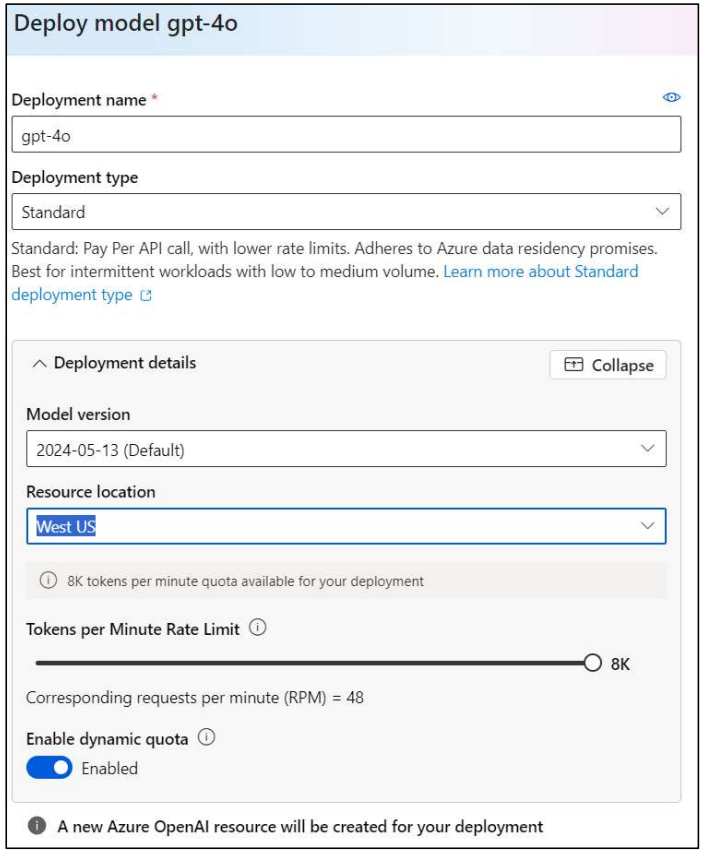
https://github.com/luiscoco/Azure_OpenAI_How-to-deploy-GPT-4o

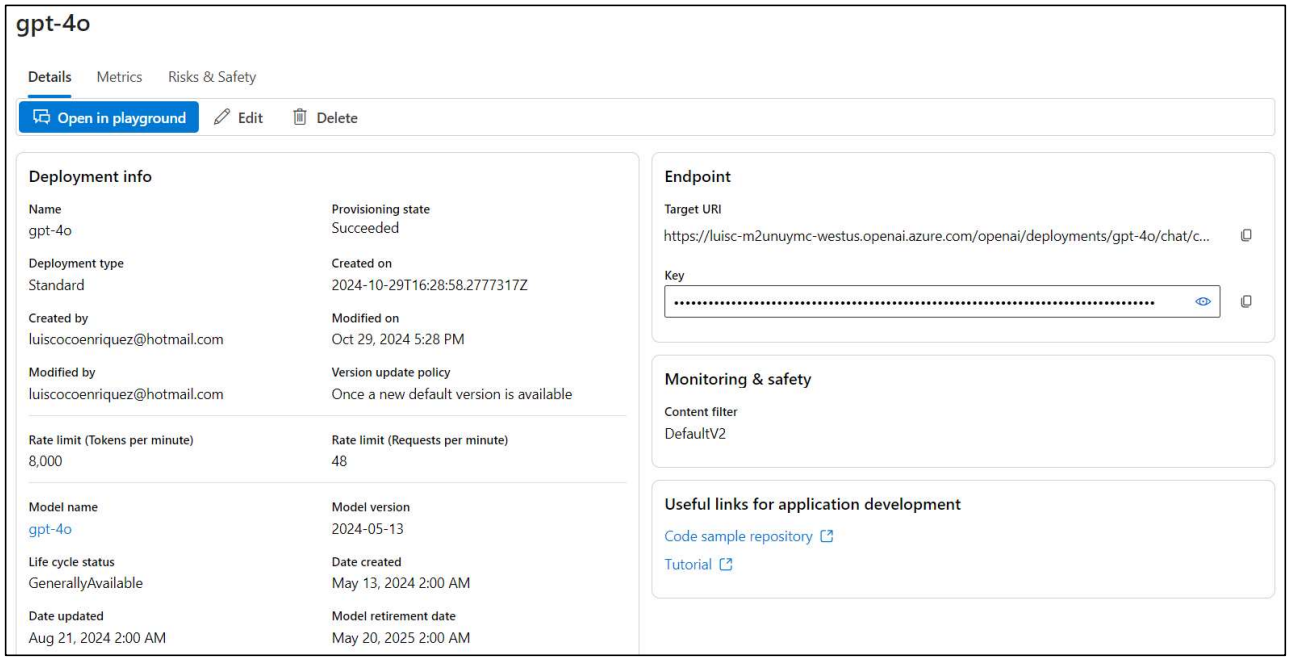
Azure OpenAI Service models

Models	Description
o1-preview and o1-mini	Limited access models, specifically designed to tackle reasoning and problem-solving tasks with increased focus and capability.
GPT-4o & GPT-4o mini & GPT-4 Turbo	The latest most capable Azure OpenAI models with multimodal versions, which can accept both text and images as input.
GPT-4o audio	A GPT-4o model that supports low-latency, "speech in, speech out" conversational interactions.
GPT-4	A set of models that improve on GPT-3.5 and can understand and generate natural language and code.
GPT-3.5	A set of models that improve on GPT-3 and can understand and generate natural language and code.
Embeddings	A set of models that can convert text into numerical vector form to facilitate text similarity.
DALL-E	A series of models that can generate original images from natural language.
Whisper	A series of models in preview that can transcribe and translate speech to text.
Text to speech (Preview)	A series of models in preview that can synthesize text to speech.

https://learn.microsoft.com/en-us/azure/ai-services/openai/concepts/models

Azure OpenAI: How to provision in Azure Portal

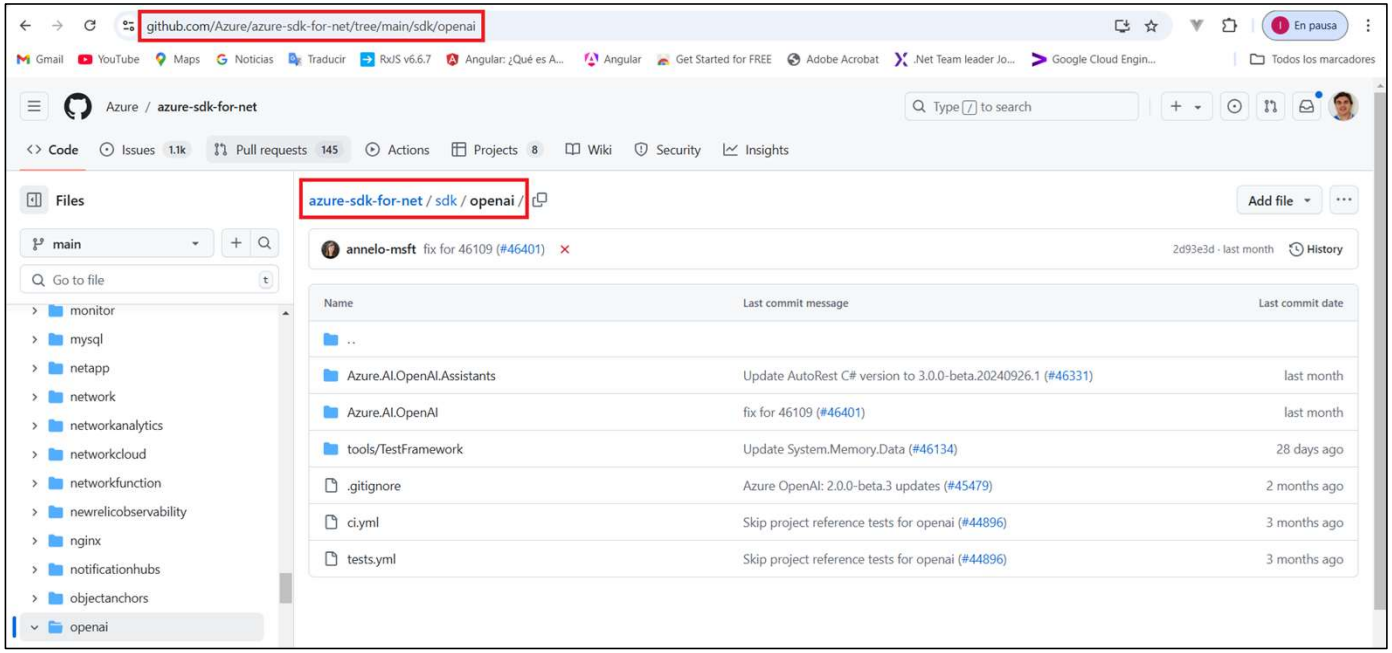




https://github.com/luiscoco/Azure_OpenAI_How-to-deploy-GPT-4o

Azure OpenAI Nuget Packages

https://github.com/Azure/azure-sdk-for-net/tree/main/sdk/openai



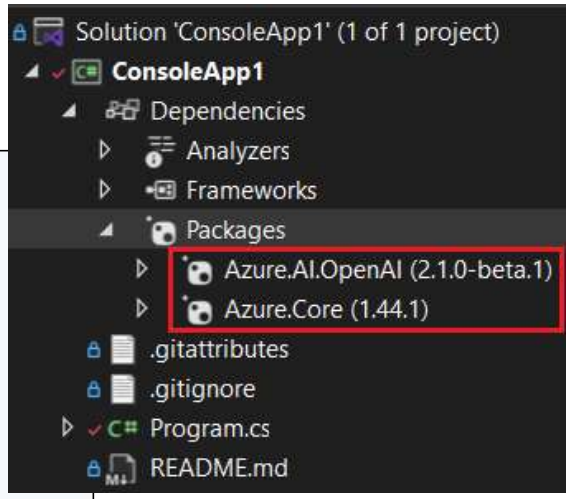
https://www.nuget.org/packages/**Azure.AI.OpenAI**/2.1.0-beta.1
https://www.nuget.org/packages/**Azure.AI.OpenAI.Assistants**/1.0.0-beta.4
https://www.nuget.org/packages/**Aspire.Azure.AI.OpenAI**/9.0.0-preview.4.24511.1
https://www.nuget.org/packages/**Aspire.Hosting.Azure.CognitiveServices**/9.0.0-rc.1.24511.1

Azure OpenAI: How to provision the service with C# SDK

AzureOpenAIClient (Endpoint, Key)

GetChatClient (DeploymentName)

```
using Azure;
using Azure.AI.OpenAI;
using OpenAI.Chat;

class Program
{
    static async Task Main(string[] args)
    {
        var endpoint = new Uri("https://cocoe-m2ae1t7j-swedencentral.openai.azure.com/");
        var credentials = new AzureKeyCredential("1c1ad980b9ae425eb7ae14581fea4fe4");
        var deploymentName = "gpt-4o"; // Ensure this matches your Azure OpenAI deployment name

        var openAIClient = new AzureOpenAIClient(endpoint, credentials);
        var chatClient = openAIClient.GetChatClient(deploymentName);
```



Azure OpenAI: ChatCompletion with gpt-4o model

AI **Completion** Service: You input some text as a prompt. The model generates the completion and attempts to match your context or pattern. Suppose you provide the prompt "As Descartes said, I think, therefore" to the API. For this prompt, Azure OpenAI returns the completion endpoint " I am" with high probability.

```
using Azure;
using Azure.AI.OpenAI;
using static System.Environment;

string endpoint = GetEnvironmentVariable("AZURE_OPENAI_ENDPOINT");
string key = GetEnvironmentVariable("AZURE_OPENAI_API_KEY");

AzureOpenAIClient azureClient = new(
    new Uri(endpoint),
    new AzureKeyCredential(key));

// This must match the custom deployment name you chose for your model
ChatClient chatClient = azureClient.GetChatClient("gpt-35-turbo");

ChatCompletion completion = chatClient.CompleteChat(
    [
        new SystemChatMessage("You are a helpful assistant that talks like a pirate."),
        new UserChatMessage("Does Azure OpenAI support customer managed keys?"),
        new AssistantChatMessage("Yes, customer managed keys are supported by Azure OpenAI
        new UserChatMessage("Do other Azure AI services support this too?")
    ]);

Console.WriteLine($"{completion.Role}: {completion.Content[0].Text}");
```

```
AzureOpenAIClient azureClient = new(
    new Uri("https://your-azure-openai-resource.com"),
    new DefaultAzureCredential());
ChatClient chatClient = azureClient.GetChatClient("my-gpt-35-turbo-deployment");

CollectionResult<StreamingChatCompletionUpdate> completionUpdates = chatClient.CompleteChatStreaming(
    [
        new SystemChatMessage("You are a helpful assistant that talks like a pirate."),
        new UserChatMessage("Hi, can you help me?"),
        new AssistantChatMessage("Arrr! Of course, me hearty! What can I do for ye?"),
        new UserChatMessage("What's the best way to train a parrot?"),
    ]);

foreach (StreamingChatCompletionUpdate completionUpdate in completionUpdates)
{
    foreach (ChatMessageContentPart contentPart in completionUpdate.ContentUpdate)
    {
        Console.Write(contentPart.Text);
    }
}
```

Azure OpenAI: Use Chat Tools (call Functions)

Tools extend chat completions by allowing an assistant to invoke defined functions and other capabilities in the process of fulfilling a chat completions request. To use chat tools, start by defining a function tool.

Function definition

```
static string GetAge()
{
    // Call the location API here.
    return "Luis Coco is 50 years old";
}
```

Tool definition

```
ChatTool getAgeTool = ChatTool.CreateFunctionTool(
    functionName: nameof(GetAge),
    functionDescription: "Provides Luis Coco age"
);
```

Chat Options definition

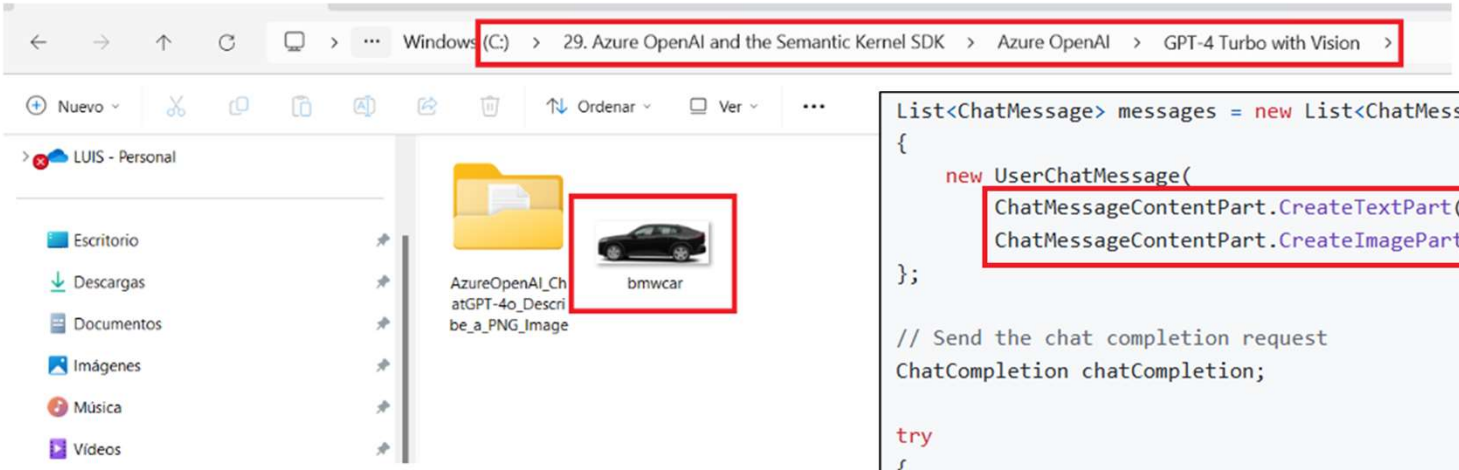
```
ChatCompletionOptions options = new()
{
    Tools = { getAgeTool, getLocationTool },
};

List<ChatMessage> conversationMessages =
[
    new UserChatMessage("Hello"),
    new UserChatMessage("I am Luis Coco, What information do you know about me?"),
];
```

```
ChatCompletion completion = chatClient.CompleteChat(conversationMessages,options);
```

https://github.com/luiscoco/Azure_OpenAI-Use_Chat_Tools-Function_Call
https://github.com/luiscoco/Azure_OpenAI-Use_Chat_Tools-Function_Call-version2

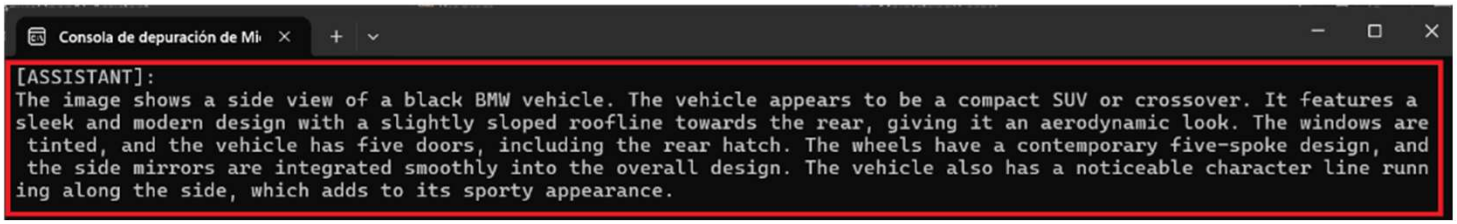
Azure OpenAI: Describe and Image with gpt-4o model

We can provide an image in the prompt when invoking the **gpt-4o** model with the CompleteChat function




```
List<ChatMessage> messages = new List<ChatMessage>
{
    new UserChatMessage(
        ChatMessageContentPart.CreateTextPart("Please describe the following image:"),
        ChatMessageContentPart.CreateImagePart(imageData, "image/png"))
};

// Send the chat completion request
ChatCompletion chatCompletion;

try
{
    chatCompletion = await chatClient.CompleteChatAsync(messages);
}
```

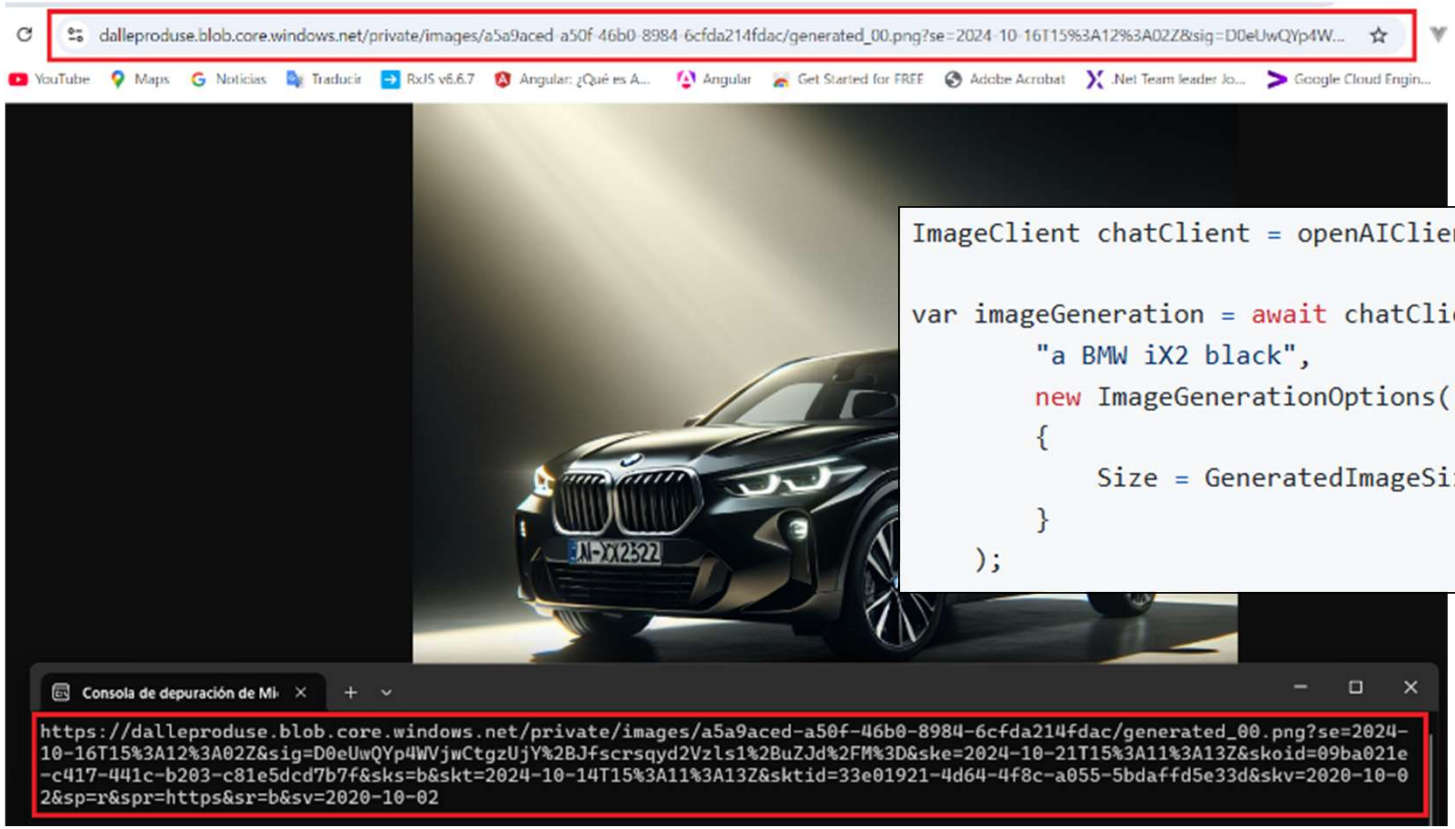
We run the application and see the results



https://github.com/luiscoco/Azure_OpenAI_GPT-4o-How_to_describe_an_Image

Azure OpenAI: Create an Image with DALL-E model

OpenAI's **DALL-E** models generate images based on user-provided text prompts




```
ImageClient chatClient = openAIClient.GetImageClient("dall-e-3");

var imageGeneration = await chatClient.GenerateImageAsync(
        "a BMW iX2 black",
        new ImageGenerationOptions()
        {
            Size = GeneratedImageSize.W1024xH1024
        }
    );
```

https://github.com/luiscoco/Azure_OpenAI-DALL_E_3-How_to_create_an_image

Azure OpenAI: Speech to Text with Whisper model

The **Whisper** model can transcribe human speech in numerous languages, and it can also translate other languages into English.

```
using Azure;
using Azure.AI.OpenAI;
using Azure.Identity; // Required for Passwordless auth

var endpoint = new Uri("https://whisperluismodel.openai.azure.com/");
var credentials = new AzureKeyCredential("58b40a57c13d475184e472aa58dd392d");

var deploymentName = "whisper"; // Default deployment name, update with your own if necessary
var audioFilePath = "C:\\14. Blazor LCE Youtube channel\\file1.mp3";

var openAIClient = new AzureOpenAIClient(endpoint, credentials);

var audioClient = openAIClient.GetAudioClient(deploymentName);

var result = await audioClient.TranscribeAudioAsync(audioFilePath);

Console.WriteLine("Transcribed text:");
foreach (var item in result.Value.Text)
{
    Console.Write(item);
}
```

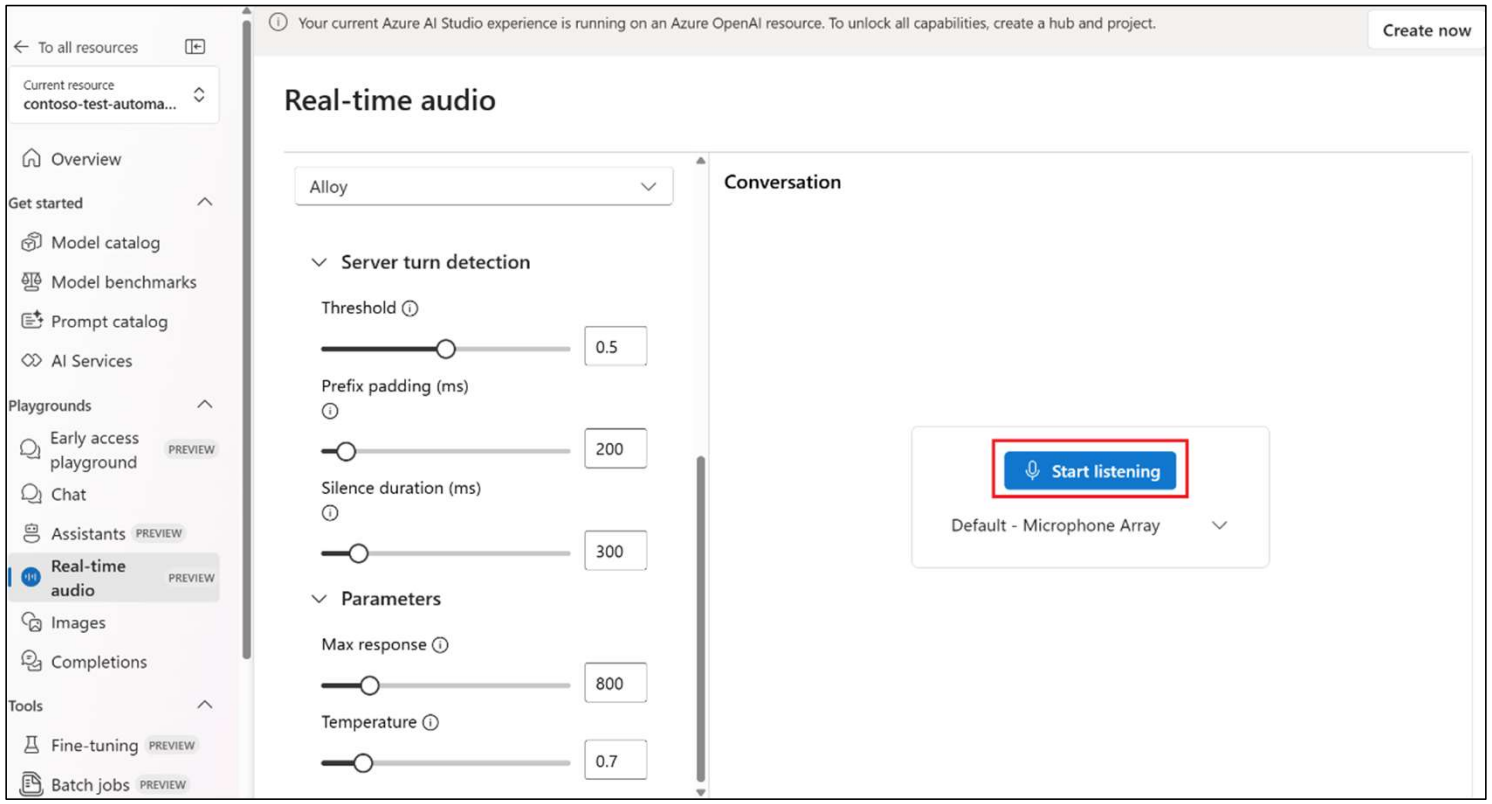
https://github.com/luiscoco/Azure_OpenAI-WhisperModel-Read_a_Text

Azure OpenAI: Read a Text with tts model

```
using Azure;
using Azure.AI.OpenAI;
using Azure.Identity;
using OpenAI.Audio;

var endpoint = new Uri("https://voiceaimodel.openai.azure.com");
var credentials = new AzureKeyCredential("71df94595ffa4b8ba3f3b39de2d80ae9");

var deploymentName = "tts";
string speechFilePath = "C:\\Autónomo\\speech_output.wav";

var openAIClient = new AzureOpenAIClient(endpoint, credentials);

var audioClient = openAIClient.GetAudioClient(deploymentName);

var result = await audioClient.GenerateSpeechAsync("Hello World",GeneratedSpeechVoice.Echo);

Console.WriteLine($"Streaming response to {speechFilePath}");

Directory.CreateDirectory(Path.GetDirectoryName(speechFilePath));

await File.WriteAllBytesAsync(speechFilePath, result.Value.ToArray());

Console.WriteLine("Finished streaming");
```

https://github.com/luiscoco/Azure_OpenAI-tts-TextToSpeech

Azure OpenAI: Realtime Speech with gpt-4o-realtime-preview model

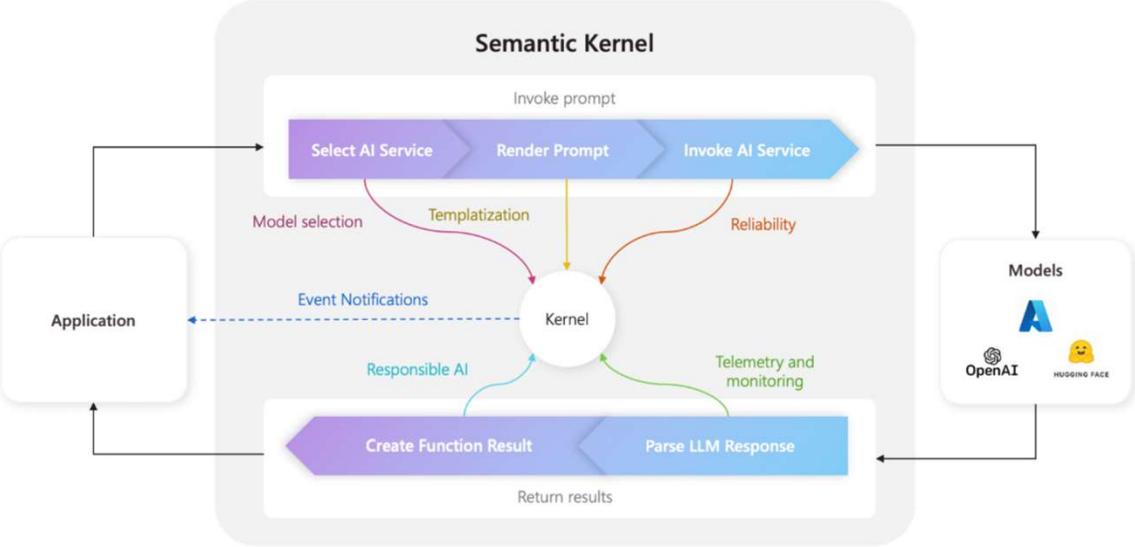


https://learn.microsoft.com/en-us/azure/ai-services/openai/realtime-audio-quickstart

What is Microsoft Semantic Kernel?

Semantic Kernel (SK) is a lightweight **SDK** enabling integration of **AI Large Language Models (LLMs)** with conventional programming languages.

The SK extensible programming model combines natural language **semantic functions**, traditional code **native functions**, and **embeddings-based memory** unlocking new potential and adding value to applications with AI



https://github.com/microsoft/semantic-kernel

Semantic Kernel: build Kernel and invoke ChatCompletion

OpenAI service

```
using Microsoft.SemanticKernel;

var builder = Kernel.CreateBuilder();

builder.AddOpenAIChatCompletion(
    modelId: "gpt-4o",
    apiKey: "API-KEY");

Kernel kernel = builder.Build();
```

https://platform.openai.com/api-keys

Azure OpenAI service

```
using Microsoft.SemanticKernel;

var builder = Kernel.CreateBuilder();

builder.AddAzureOpenAIChatCompletion("gpt-4o",
    "https://luiscocoaiservice.openai.azure.com/",
    "4ETF2yj9Aq7YwZuqgkIe1xs0xWp3ulcuOhmZI9t6Vu4jH0JMaGuqJQQJ99AJACMsfrFXJ3w3AAABACOG0GFg",
    "gpt-4o");

var kernel = builder.Build();
```

```
// Example 1. Invoke the kernel with a prompt and display the result
Console.WriteLine(await kernel.InvokePromptAsync("What color is the sky?"));
Console.WriteLine();

// Example 2. Invoke the kernel with a templated prompt and display the result
KernelArguments arguments = new() { { "topic", "sea" } };
Console.WriteLine(await kernel.InvokePromptAsync("What color is the {{$topic}}?", arguments));
Console.WriteLine();

// Example 3. Invoke the kernel with a templated prompt and stream the results to the display
await foreach (var update in
    kernel.InvokePromptStreamingAsync("What color is the {{$topic}}? Provide a detailed explanation.", arguments))
{
    Console.Write(update);
}
```

https://github.com/luiscoco/Curso_Aprende_Blazor-MicrosoftSemanticKernel-GetStart

Semantic Kernel: Chatbot with Ollama

```
using Microsoft.SemanticKernel;
using System;
using System.ClientModel.Primitives;

var endpoint = new Uri("http://localhost:11434");
var modelId = "phi3:latest";
#pragma warning disable SKEXP0010
var kernelBuilder = Kernel.CreateBuilder()
    .AddVolatileVectorStore()
    .AddOpenAIChatCompletion(modelId: modelId, apiKey: null,
endpoint: endpoint);
#pragma warning restore SKEXP0010
var kernel = kernelBuilder.Build();

const string skPrompt = @"
JamicanFoodBot can give you recommendations on Jamaican Food
cuisine and recipes.
It can give explicit instructions on how to cook these dishes. It
will provide you ingredients, measurements, and cook time.

{{ $history }}
User: {{ $userInput }}
JamicanFoodBot:";

var chatFunction = kernel.CreateFunctionFromPrompt(skPrompt);
var history = "";
var arguments = new KernelArguments
{
    ["history"] = history
};
```

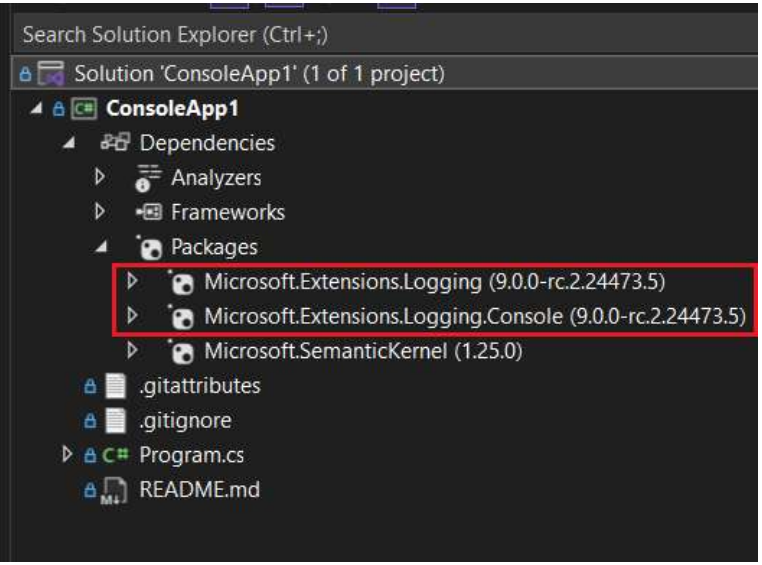
```
while (true)
{
    Console.Write("Tell me what kind of food you are in the mood
for: ");
    var userInput = Console.ReadLine();
    if (userInput.Equals("quit",
StringComparison.OrdinalIgnoreCase))
    {
        Console.WriteLine("Goodbye!");
        break;
    }
    arguments["userInput"] = userInput;
    Console.Write("JamaicanFoodBot: ");
    await foreach (var chunk in
kernel.InvokeStreamingAsync(chatFunction, arguments))
    {
        Console.Write(chunk);
        history += chunk;
    }
    history += $"\nUser: {userInput}\n";
    arguments["history"] = history;
    Console.WriteLine();
    Console.WriteLine("Conversation history:");
    Console.WriteLine(history);
}
```

https://github.com/luiscoco/Curso_Aprende_Blazor-MicrosoftSemanticKernel-Chatbot_Ollama

Semantic Kernel: Logging

Azure OpenAI service

```
using Microsoft.SemanticKernel;
using Microsoft.Extensions.Logging;
using Microsoft.Extensions.DependencyInjection;

var builder = Kernel.CreateBuilder();

builder.AddAzureOpenAIChatCompletion("gpt-4o",
    "https://luiscocoaiservice.openai.azure.com/",
    "",
    "gpt-4o");

builder.Services.AddLogging(c => c.AddConsole().SetMinimumLevel(LogLevel.Trace))

var kernel = builder.Build();

// Example 1. Invoke the kernel with a prompt and display the result
Console.WriteLine(await kernel.InvokePromptAsync("What color is the sky?"));
Console.WriteLine();
```



https://github.com/luiscoco/Curso_Aprende_Blazor-MicrosoftSemanticKernel-Logging

Semantic Kernel: Templated Prompt

```
using Microsoft.SemanticKernel;
using Microsoft.SemanticKernel.Connectors.OpenAI;

var builder = Kernel.CreateBuilder();

builder.AddOpenAIChatCompletion(
    modelId: "gpt-4o",
    apiKey: "API-KEY");

Kernel kernel = builder.Build();

KernelArguments arguments;

// Example 4. Invoke the kernel with a templated prompt and execution settings
arguments = new(new OpenAIPromptExecutionSettings { MaxTokens = 500, Temperature = 0.5 }) { { "topic", "dogs" } };
Console.WriteLine(await kernel.InvokePromptAsync("Tell me a story about {{$topic}}", arguments));

// Example 5. Invoke the kernel with a templated prompt and execution settings configured to return JSON
#pragma warning disable SKEXP0010
arguments = new(new OpenAIPromptExecutionSettings { ResponseFormat = "json_object" }) { { "topic", "chocolate" } };
Console.WriteLine(await kernel.InvokePromptAsync("Create a recipe for a {{$topic}} cake in JSON format", arguments));
```

https://github.com/luiscoco/Curso_Aprende_Blazor-MicrosoftSemanticKernel-GetStart

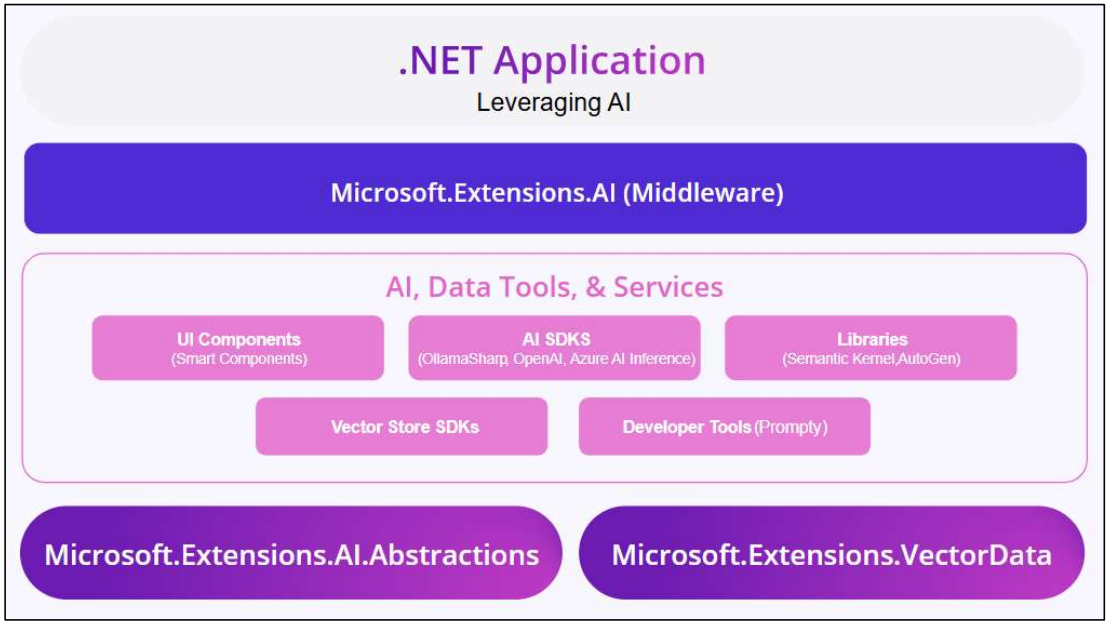
Semantic Kernel: Plugin

```
using Microsoft.SemanticKernel;
using Microsoft.SemanticKernel.Connectors.OpenAI;
using System.ComponentModel;
using System.Reflection;
using System.Text.Json.Serialization;

var builder = Kernel.CreateBuilder();

builder.AddAzureOpenAIChatCompletion("gpt-4o",
    "https://luiscocoaiservice.openai.azure.com/",
    "4ETF2yj9Aq7YwZuqgkIe1xs0xWp3ulcuOhmZI9t6Vu4jH0JMaGuqJQQJ99AJACMsfrFXJ3w3AAABACOG0GFg",
    "gpt-4o");

builder.Plugins.AddFromType<TimeInformation>();

var kernel = builder.Build();

// Example 1. Invoke the kernel with a prompt that asks the AI for information it cannot provide and may hallucinate
Console.WriteLine(await kernel.InvokePromptAsync("How many days until Christmas?"));

//// Example 2. Invoke the kernel with a templated prompt that invokes a plugin and display the result
Console.WriteLine(await kernel.InvokePromptAsync("The current time is {{TimeInformation.GetCurrentUtcTime}}. How many days until Christmas?"));

#pragma warning disable
// Example 3. Invoke the kernel with a prompt and allow the AI to automatically invoke functions
OpenAIPromptExecutionSettings settings = new() { FunctionChoiceBehavior = FunctionChoiceBehavior.Auto() };
Console.WriteLine(await kernel.InvokePromptAsync("How many days until Christmas? Explain your thinking.", new(settings)));

1 reference
public class TimeInformation
{
    [KernelFunction]
    [Description("Retrieves the current time in UTC.")]
    0 references
    public string GetCurrentUtcTime() => DateTime.UtcNow.ToString("R");
}
```

https://github.com/luiscoco/Curso_Aprende_Blazor-MicrosoftSemanticKernel-Plugin-Sample1

What is Microsoft.Extensions.AI?

These libraries provide a unified layer of **C# common abstractions** and **standard middleware implementation** for interacting with AI services



For example, the `IChatClient` interface allows consumption of language models, whether hosted remotely or running locally. Any .NET package providing an AI client can implement this interface, enabling seamless integration with consuming .NET code.

Copy

```
IChatClient client =
    environment.IsDevelopment ?
    new OllamaChatClient(...) :
    new AzureAIInferenceChatClient(...);
```

Then, regardless of the provider you're using, you can send requests as follows:

Copy

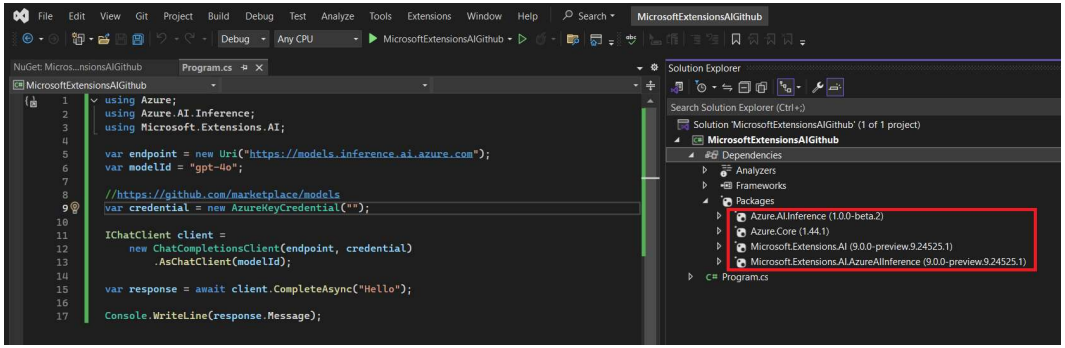
```
var response = await chatClient.CompleteAsync(
      "Translate the following text into Pig Latin: I love .NET and AI");

Console.WriteLine(response.Message);
```

https://devblogs.microsoft.com/dotnet/introducing-microsoft-extensions-ai-preview

Microsoft.Extensions.AI: Azure AI Inference (Github Models)

Install the **Microsoft.Extensions.AI.AzureAIInference** NuGet package

```
using Azure;
using Azure.AI.Inference;
using Microsoft.Extensions.AI;

IChatClient client =
    new ChatCompletionsClient(
        endpoint: new Uri("https://models.inference.ai.azure.com"),
        new AzureKeyCredential(Environment.GetEnvironmentVariable("GH_TOKEN")))
        .AsChatClient("Phi-3.5-MoE-instruct");

var response = await client.CompleteAsync("What is AI?");

Console.WriteLine(response.Message);
```



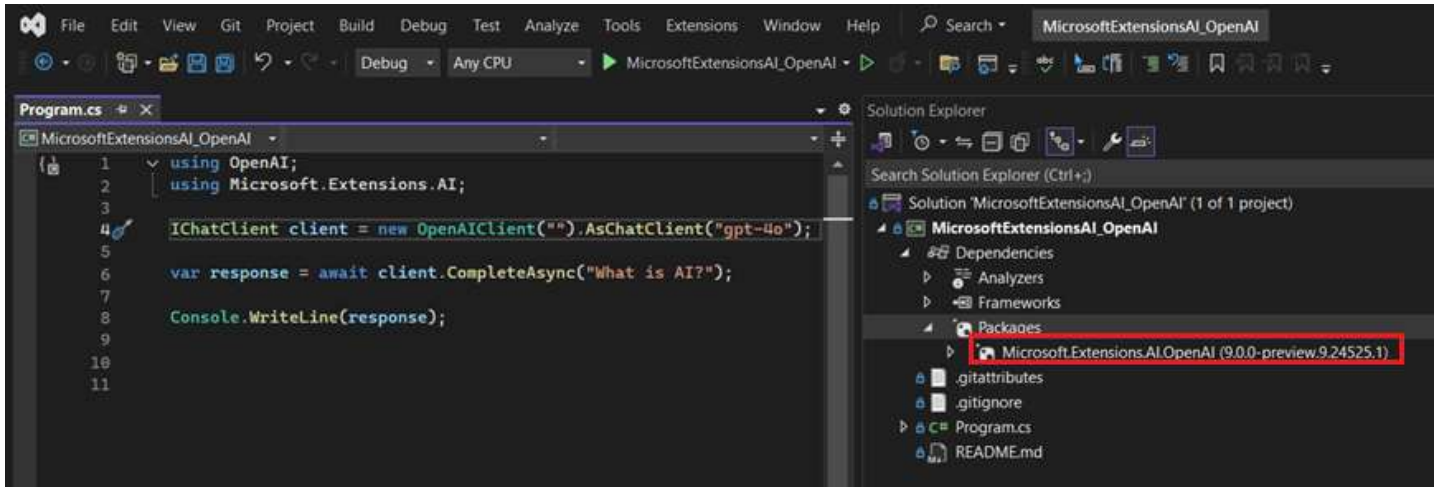
https://github.com/luiscoco/microsoft-extensions-ai-github_ai_model

https://github.com/marketplace/models

Microsoft.Extensions.AI: OpenAI

Install the **Microsoft.Extensions.AI.OpenAI** NuGet package

```
using OpenAI;
using Microsoft.Extensions.AI;

IChatClient client =
    new OpenAIClient(Environment.GetEnvironmentVariable("OPENAI_API_KEY"))
        .AsChatClient(modelId: "gpt-4o-mini");

var response = await client.CompleteAsync("What is AI?");

Console.WriteLine(response.Message);
```

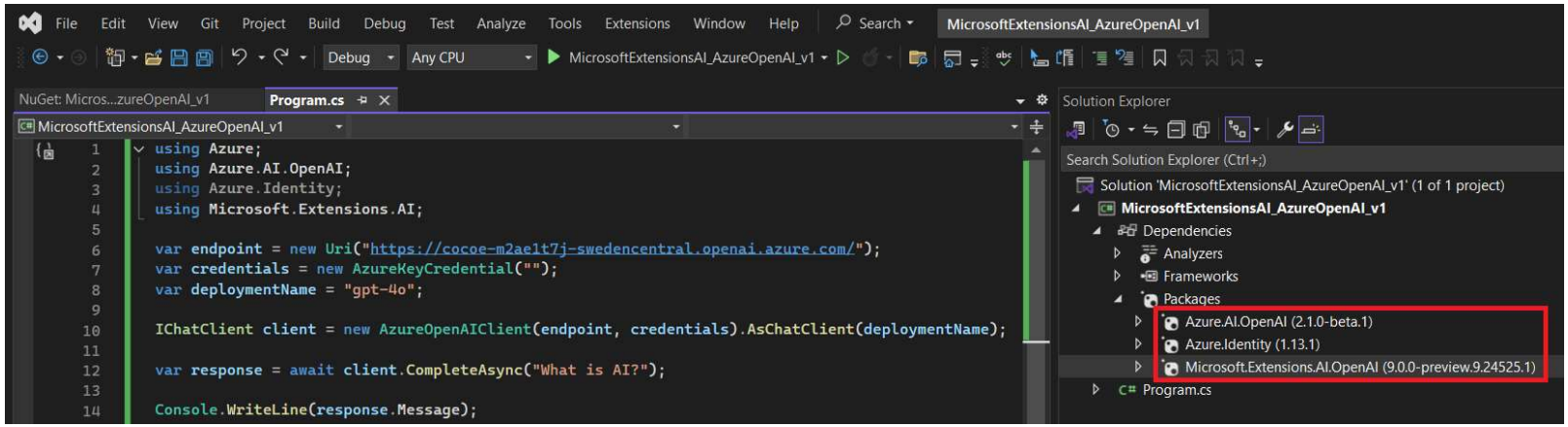


https://platform.openai.com/api-keys https://github.com/luiscoco/microsoft-extensions-ai-OpenAI

Microsoft.Extensions.AI: Azure OpenAI

Install the **Microsoft.Extensions.AI.OpenAI**, **Azure.AI.OpenAI**, and **Azure.Identity** NuGet packages

```
using Azure.AI.OpenAI;
using Azure.Identity;
using Microsoft.Extensions.AI;

IChatClient client =
    new AzureOpenAIClient(
        new Uri(Environment.GetEnvironmentVariable("AZURE_OPENAI_ENDPOINT")),
        new DefaultAzureCredential())
            .AsChatClient(modelId: "gpt-4o-mini");

var response = await client.CompleteAsync("What is AI?");

Console.WriteLine(response.Message);
```

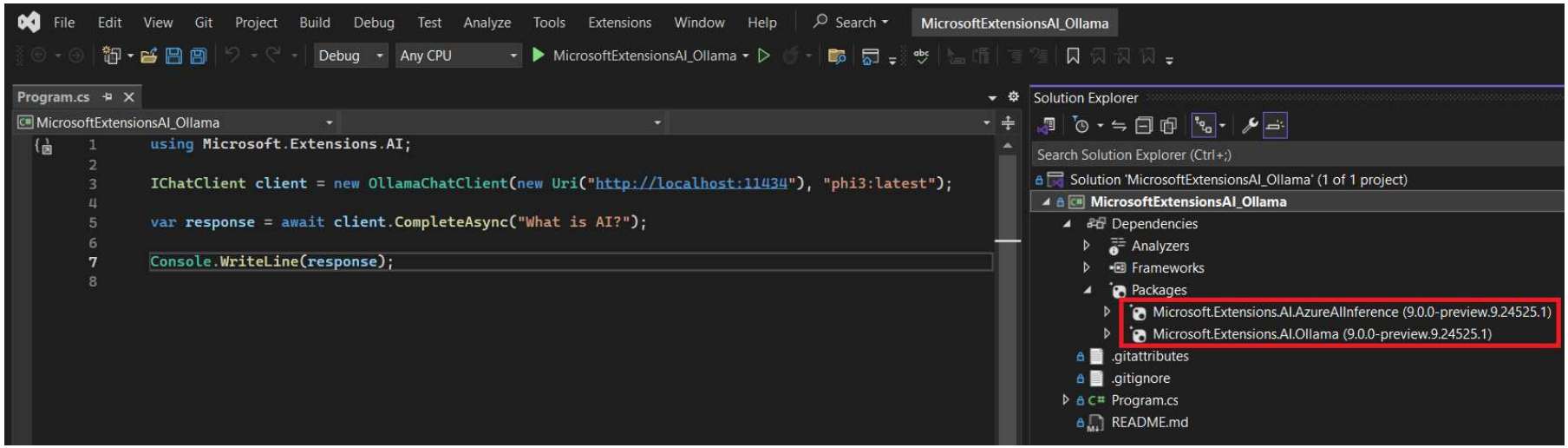


https://github.com/luiscoco/microsoft-extensions-ai-AzureOpenAI

Microsoft.Extensions.AI: Ollama

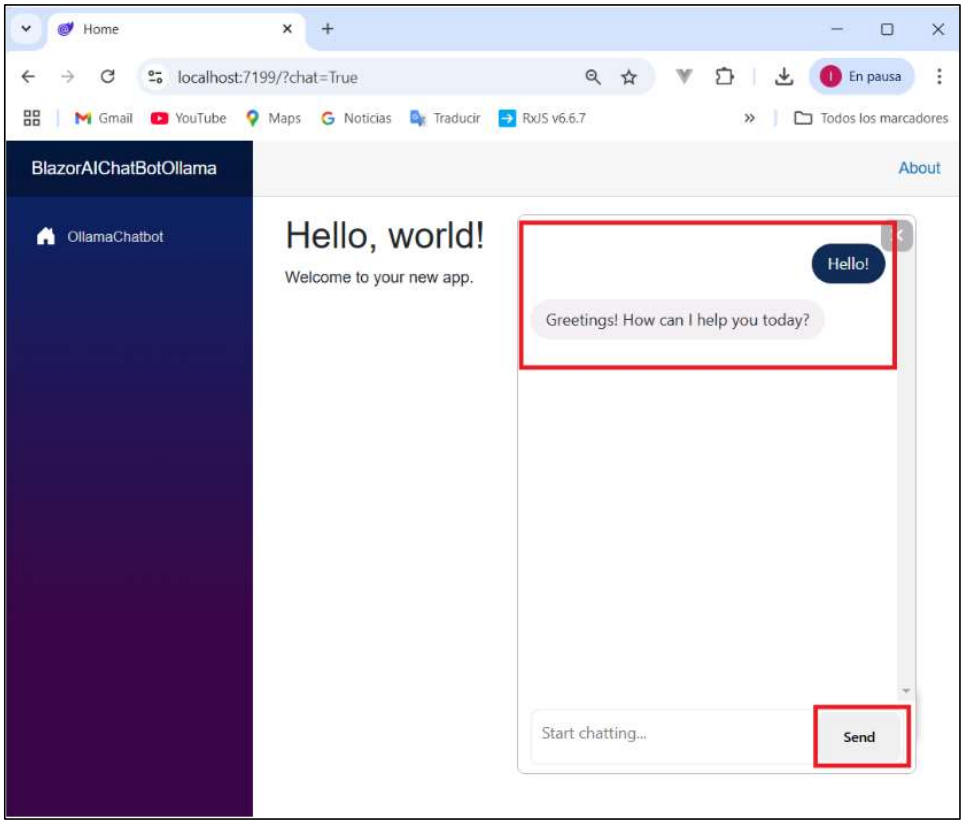
Install the **Microsoft.Extensions.AI.Ollama** NuGet package

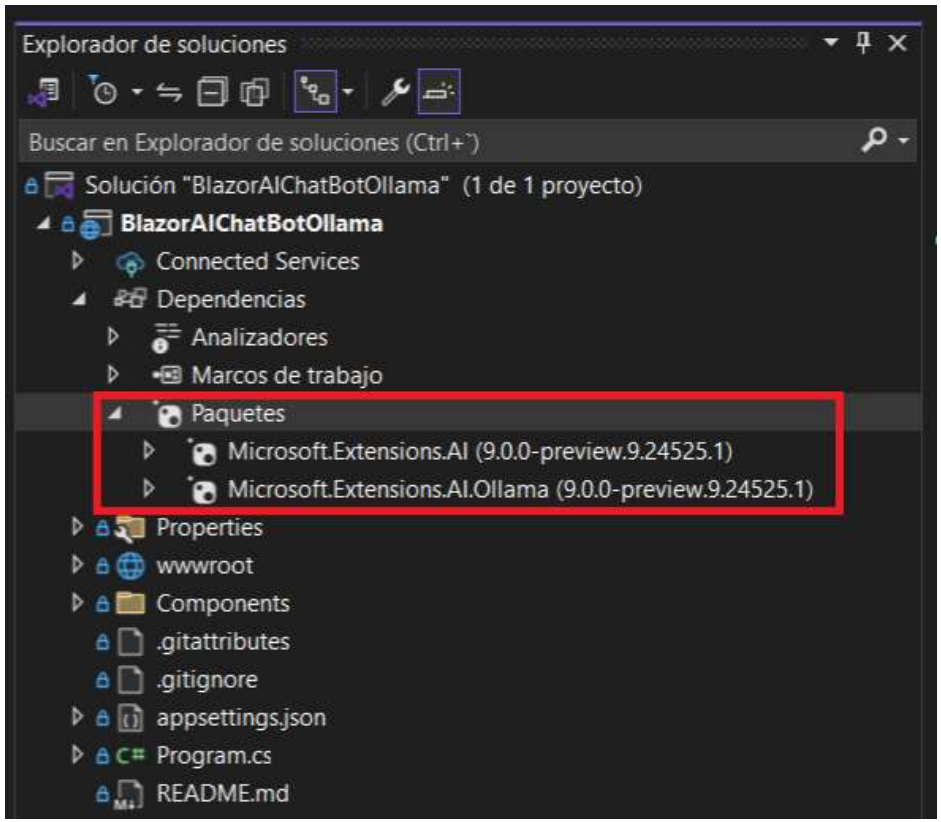
```
using Microsoft.Extensions.AI;

IChatClient client =
    new OllamaChatClient(new Uri("http://localhost:11434/"), "llama3.1");

var response = await client.CompleteAsync("What is AI?");

Console.WriteLine(response.Message);
```



https://github.com/luiscoco/microsoft-extensions-ai-Ollama

Microsoft.Extensions.AI: Blazor Web App with Ollama Chatbot

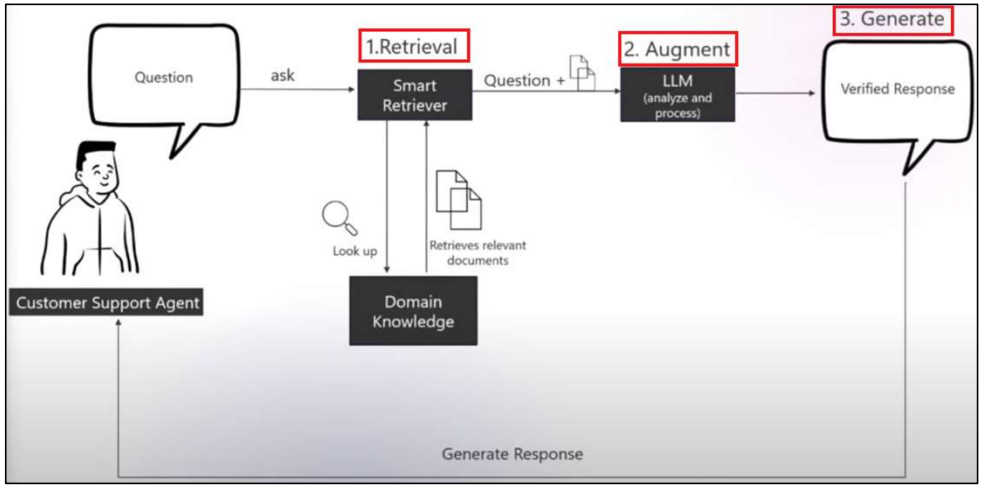




https://github.com/luiscoco/microsoft-extensions-ai-sample-BlazorAIChatBot_with_Ollama

RAG (Retrieval Augmented Generation)

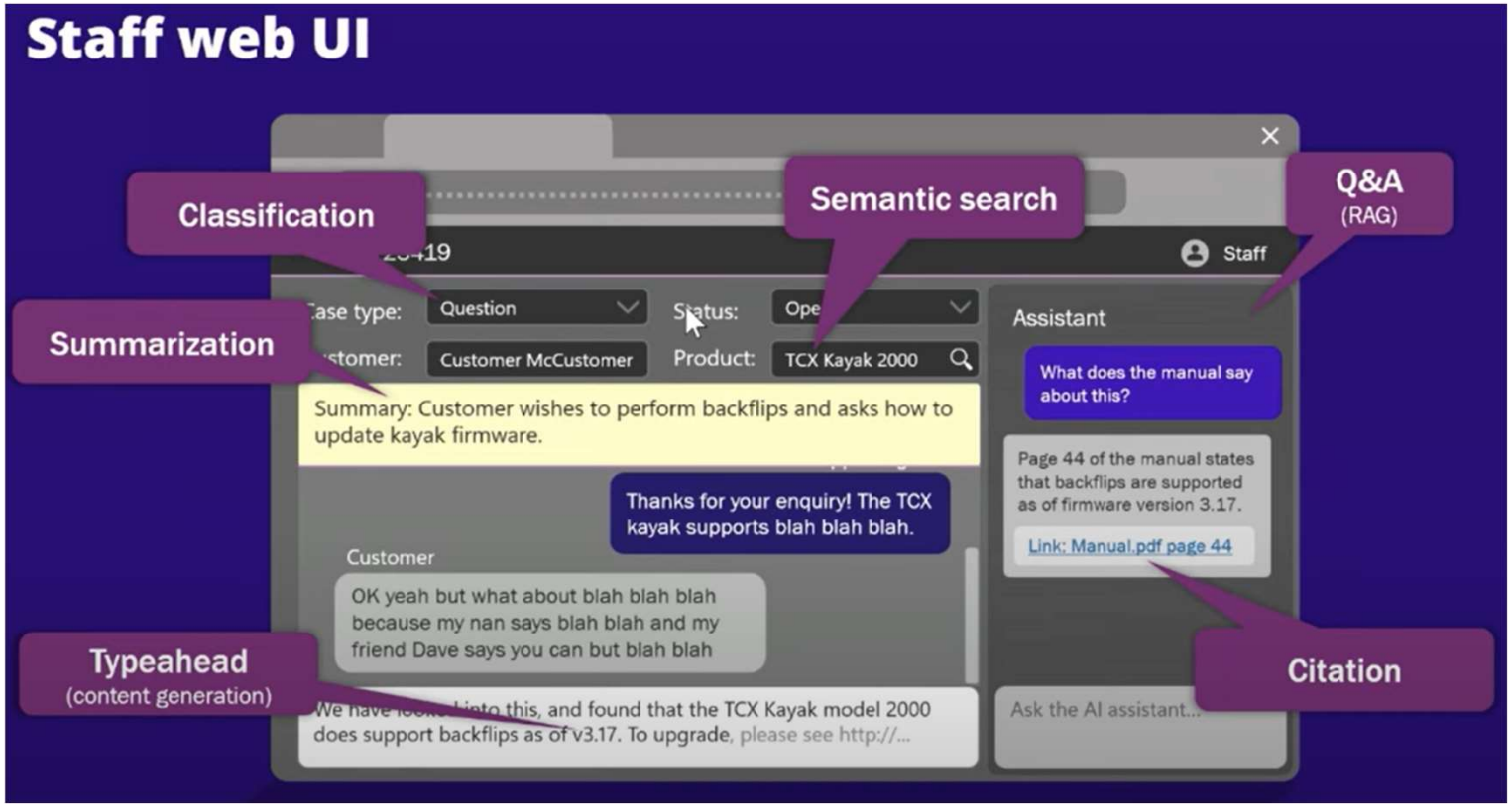
RAG is an AI technique that combines retrieval-based and generative models to improve information relevance and accuracy in responses. In RAG, a retrieval model **first searches** a large **database** or set of **documents** to find relevant information based on the user's query. Then, a **generative model** (like GPT) **uses the retrieved information** to produce a coherent, context-aware response. This approach helps the AI provide responses that are both **accurate** and **grounded** in relevant data sources, making it particularly useful for tasks requiring specific or factual information.



Efficiently **Searching PDF Content with AI**: Leveraging LLMs and RAG for Enhanced Retrieval

https://github.com/microsoft/AzureDataRetrievalAugmentedGenerationSamples

eShopsupport [Youtube video]



https://github.com/dotnet/eShopSupport

https://github.com/luiscoco/Curso_Aprende_Blazor-Nivel_Intermedio-AI_eShopSupport-Assistant_Fixed-With-Azure_OpenAI

https://github.com/luiscoco/Curso_Aprende_Blazor-Nivel_Intermedio-AI_DataGenerator

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