DotChat

etap-3

1. Custom Document

- Storage Account
- Blob Storage Container
- Projekt w Document Intelligence Studio
- Trenowanie modelu
- Integracja z czatem
- Testy

2. temat 7: Generowanie obrazów na podstawie opisu

- Model Dall-e
- Konfiguracja dostępu
- Integracja z chatem
- Testy

Repozytorium: github

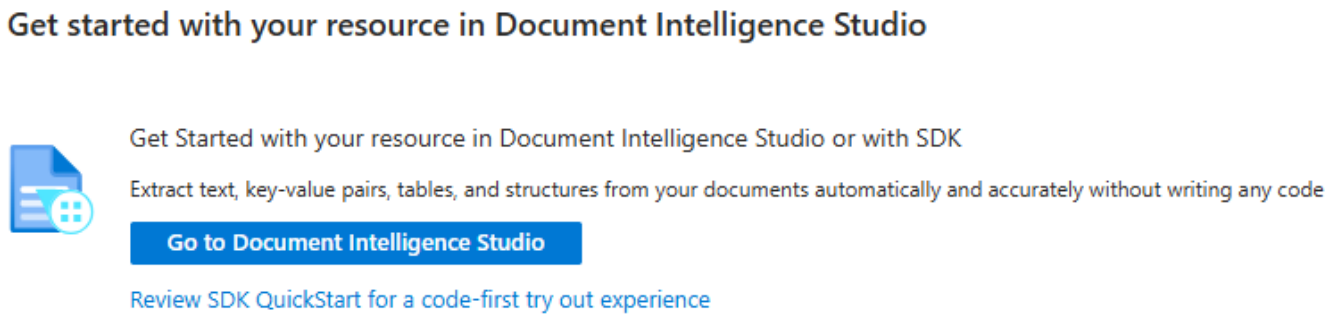
Crediting data sources:

- ExpressExpense.com
- OCR Receipts from Grocery Stores Text Detection - kaggle dataset

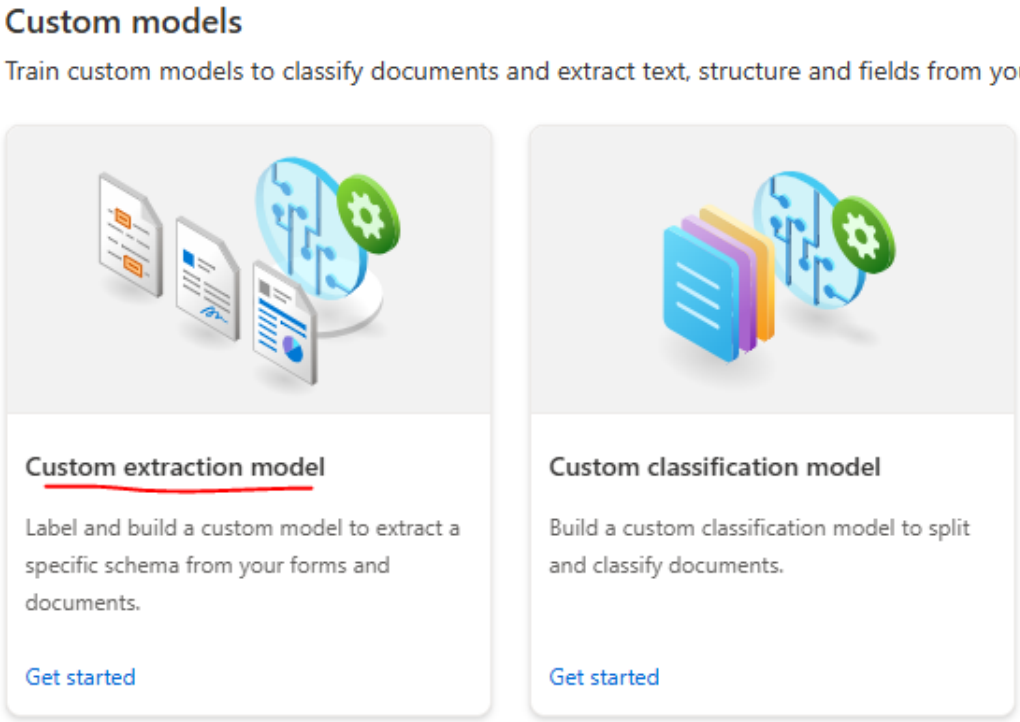
```
:-------------------------------------------------------:
              D O T  C H A T  gpt-4
:-------------------------------------------------------:
 Here are some usefull commands:
  \user <username> - to register your username
  \system <text> - to provide context for the AI assistant
  \save <filename> - to save your chat history in a file
  \clear - to clear the chat history
  \exit - for leaving the chat

  \vision [options] - predicts weather from
  given image with Azure Custom Vision
  \vision img "<path to img>"
  \vision url "<url with img>"

  \summarize [options] - creates summaries of pdf files with OpenAI
  \summarize pdf "<in filename>" to "<out filename>"
  \summarize dir "<source path>" to "<dest path>"
  \summarize ... -v|--verbose - outputs summary to screen

  \receipt <filename> - [in the making]
  \dall-e <description> - [in the making]
  ...
```

1. Custom Document

1. Ze względu na to, że w poprzednim etapie został już utworzony zasób Document Intelligence ten krok został tu pominięty
2. Przejście do `Document Intelligence Studio`



3. Wybranie `Custom extractoin model` na dole strony



Ponieważ projekt wymaga użycia `Blob Storage Container` został utworzony `Storatge Account`

4. Tworzenie `Storage Account`

Home > Create a resource > Marketplace >

Storage account

Microsoft

Storage account

Add to Favorites

Microsoft | Azure Service

★ 4.3 (1883 ratings)

Plan

Storage account

Create

Subscription *

Azure for Students

Resource group *

PUCH-ChatGroup

Create new

Instance details

Storage account name *

puchstorage

Region *

(Europe) West Europe

Deploy to an Azure Extended Zone

Primary service

Azure Blob Storage or Azure Data Lake Storage Gen 2

Performance *

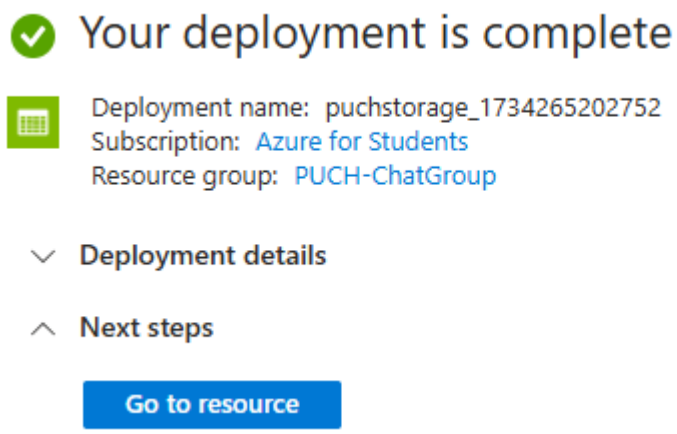
- (●) **Standard:** Recommended for most scenarios (general-purpose v2 account)
- ( ) **Premium:** Recommended for scenarios that require low latency.

Redundancy *

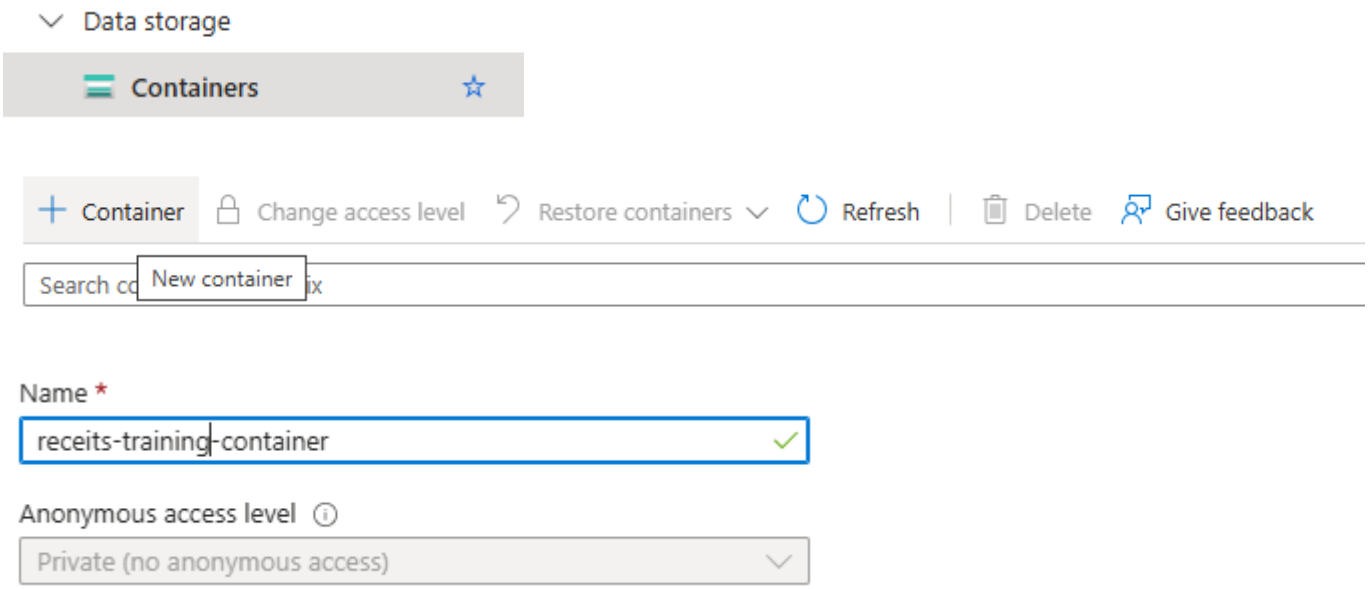
Locally-redundant storage (LRS)

Access tier

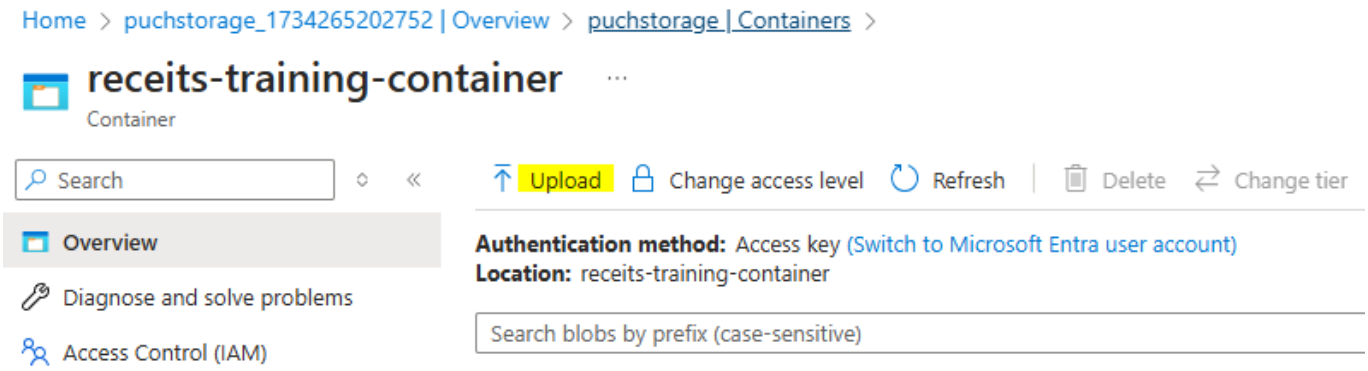
- (●) **Hot:** Optimized for frequently accessed data and everyday usage scenarios
- ( ) **Cool:** Optimized for infrequently accessed data and backup scenarios
- ( ) **Cold:** Optimized for rarely accessed data and backup scenarios



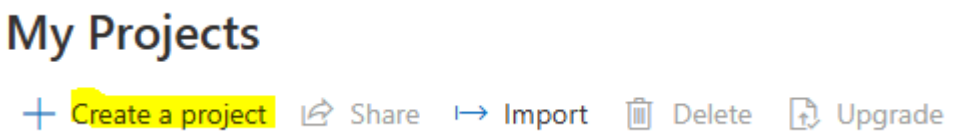
5. Dodanie kontenera do `Storage Account`



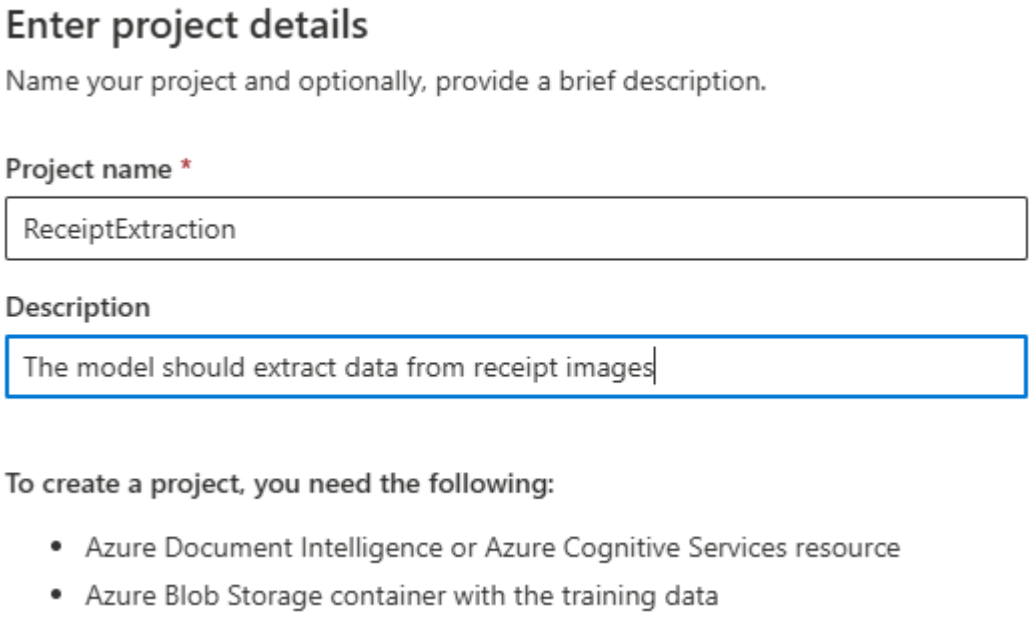
6. Dodanie danych traningowych do kontenera



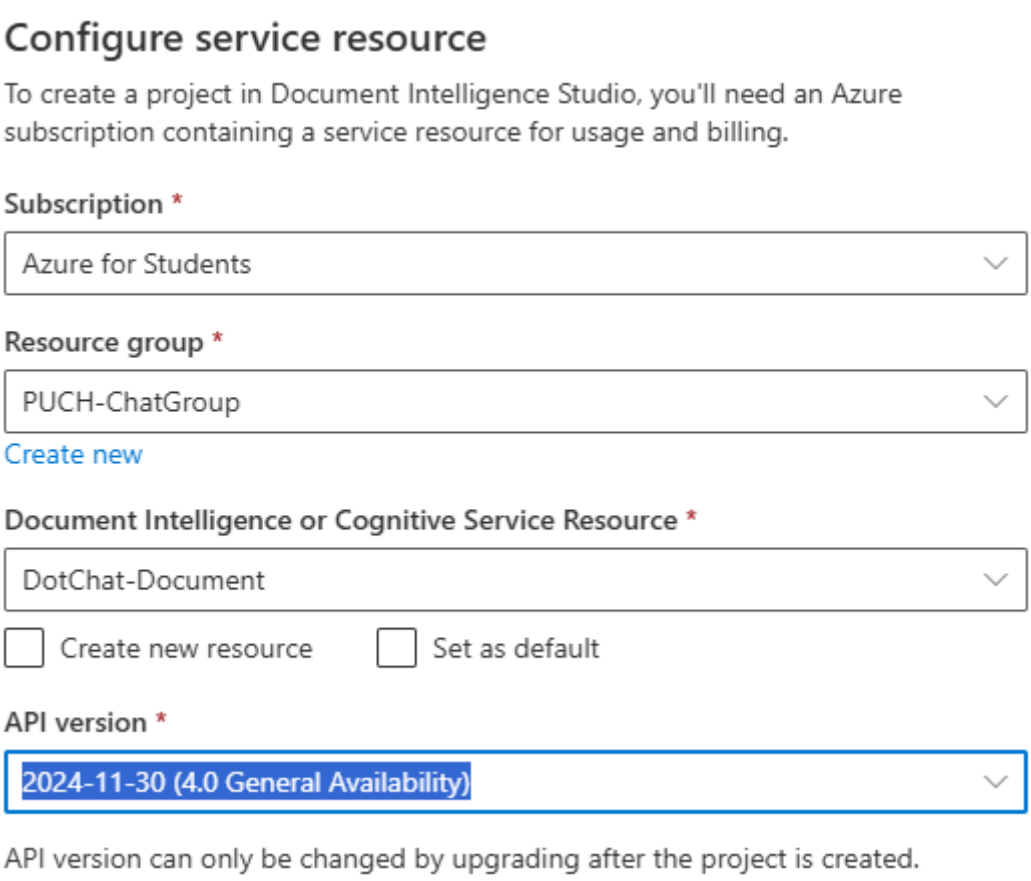
7. Utworzenie projektu w `Document Intelligence Studio`



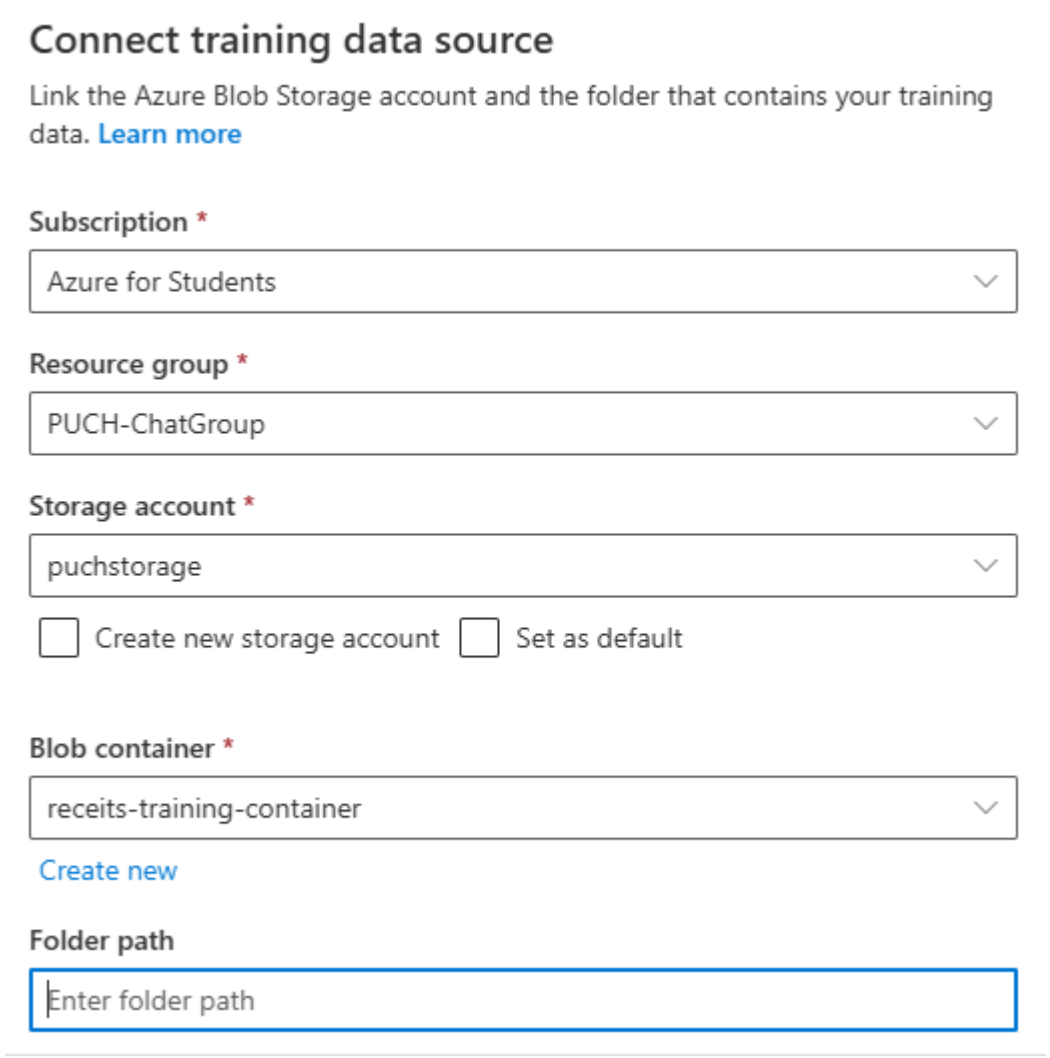
krok 1 w konfiguracji projektu



krok 2 w konfiguracji projektu

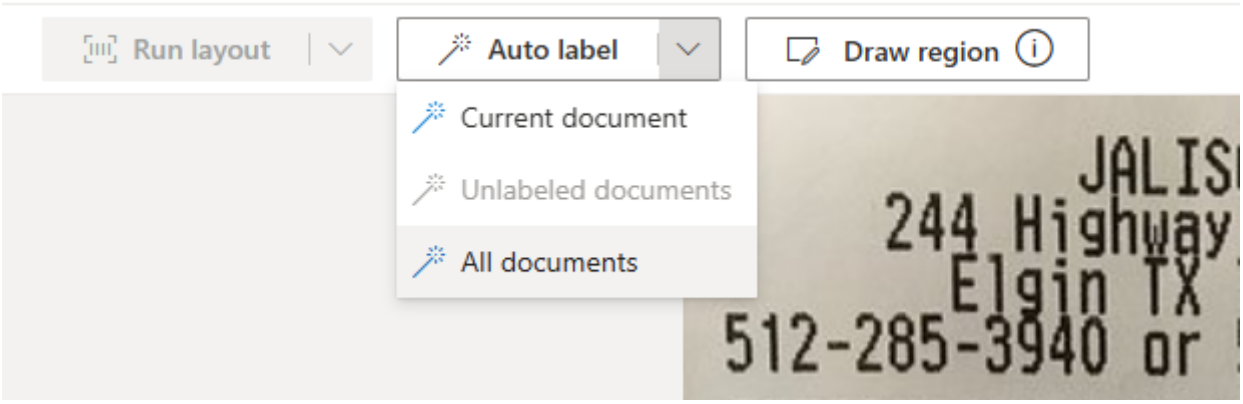


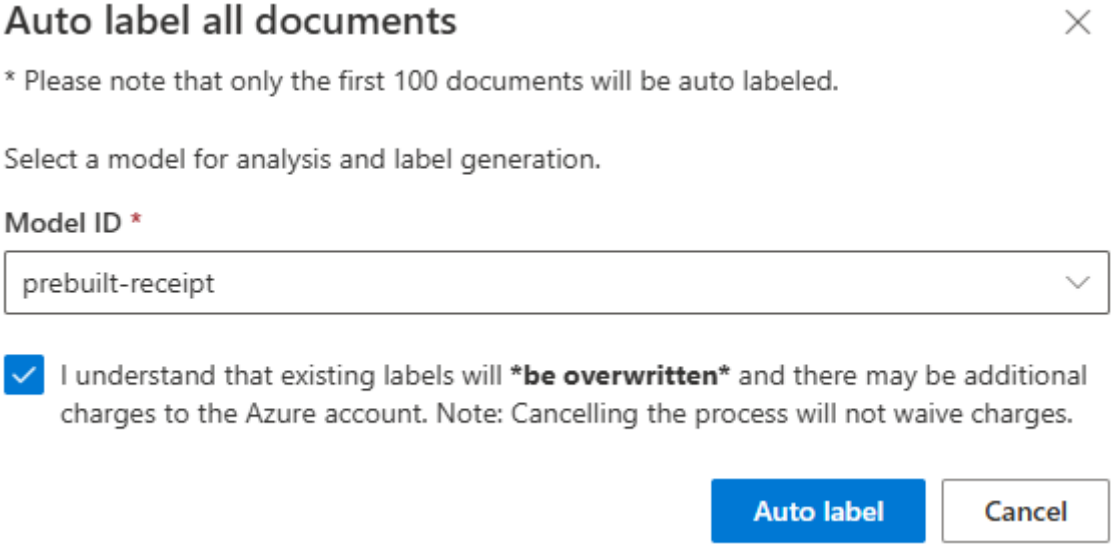
krok 3 konfiguracji



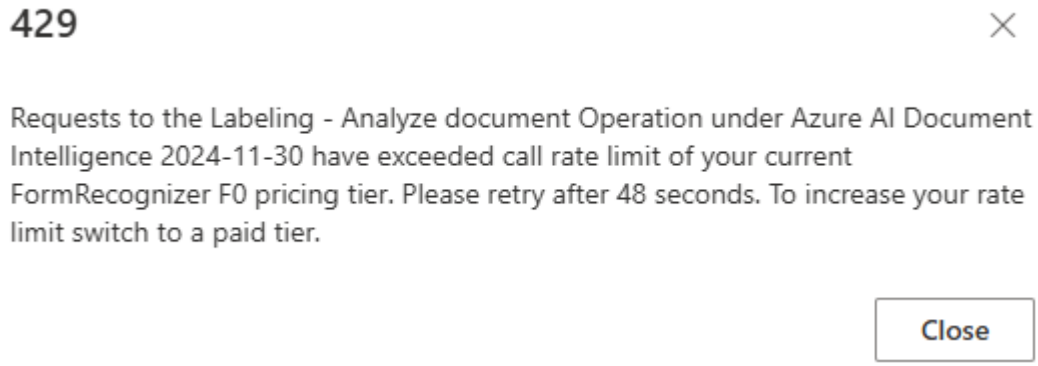
8. Trenowanie modelu

- etykietowanie danych automatyczne



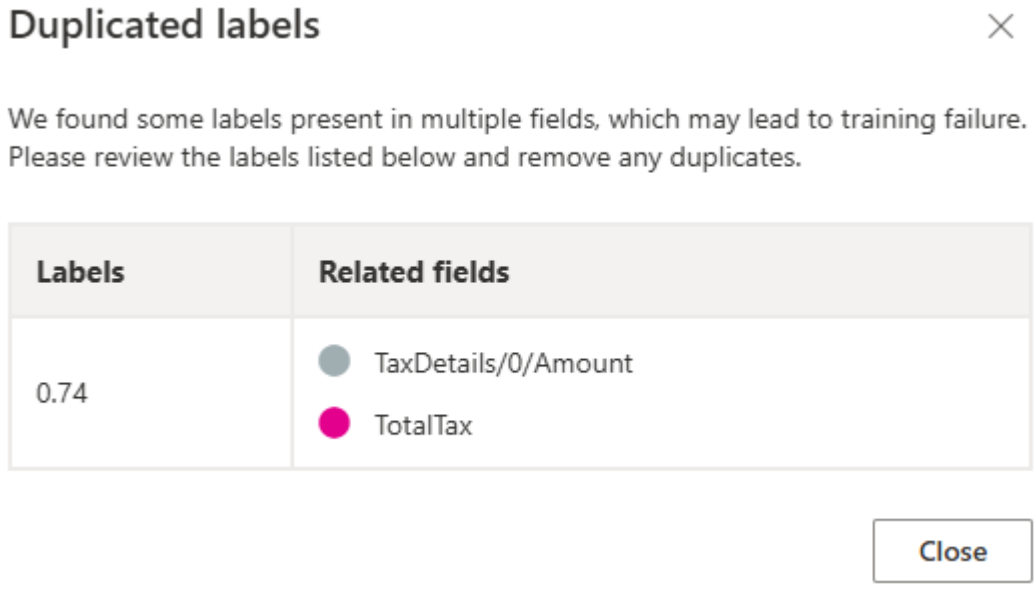


nie było możliwe zaetykietowanie wszystkich obrazów

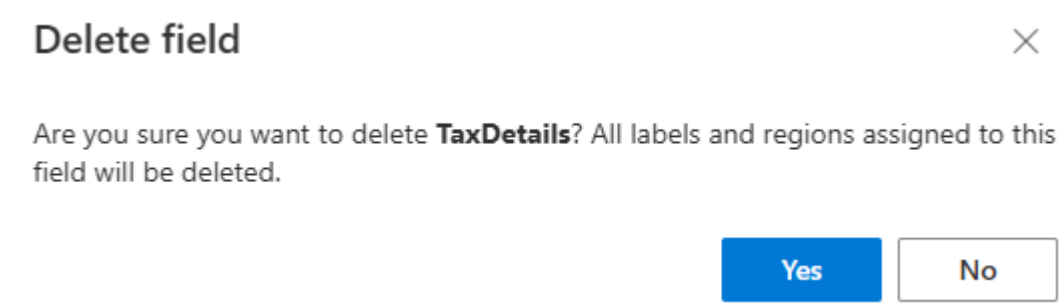


obrazy były etykietowane pojedyńczo

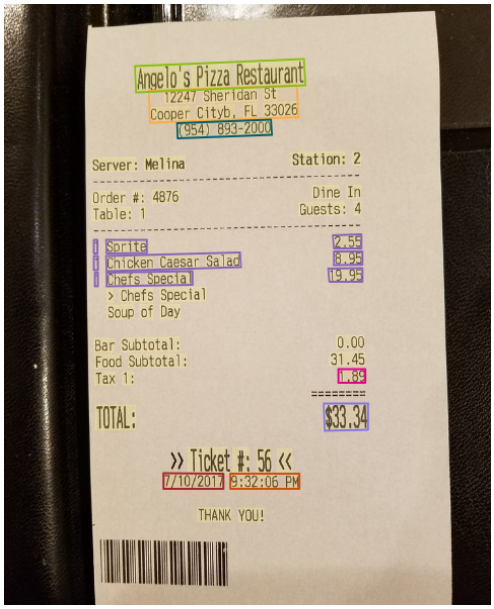
okazjonalnie występowały konfilkty etykiet

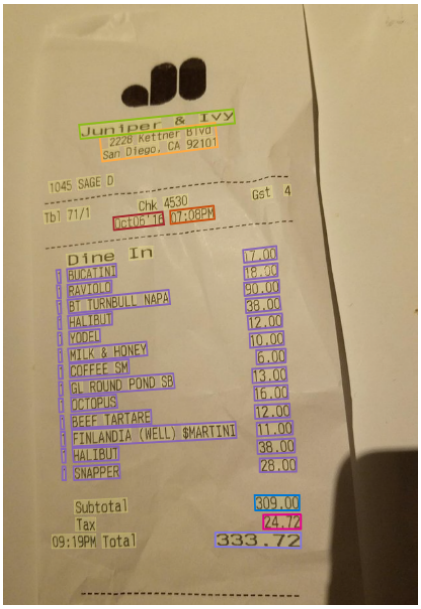


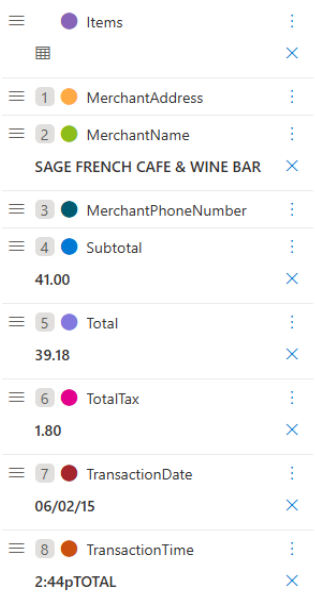
rozwiązywane przez usuwanie jednej z nakładających się etykiet



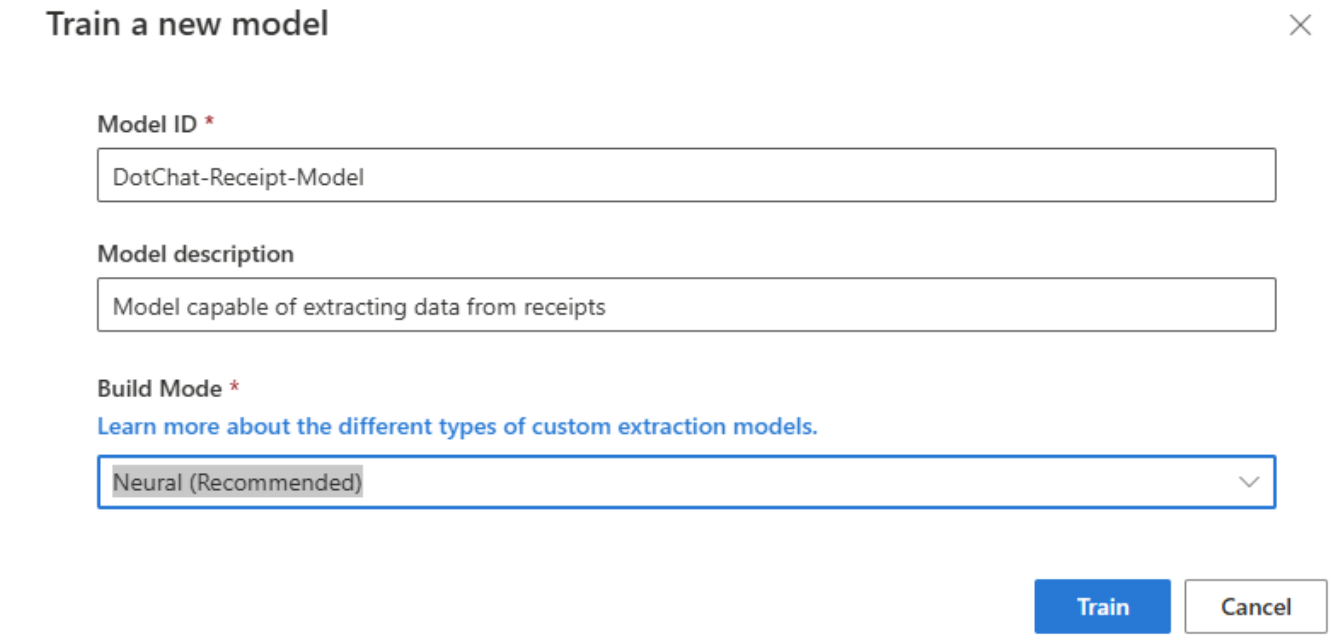
Wyniki etykietowania **Przykładowe Etykiety**







trenowanie modelu



9. Integracja z chatem

- dodanie zależności

```
dotnet add package Azure.AI.FormRecognizer
```

- zapisanie kluczy
  Ze względu wykorzystania zasobu `Document Intelligence` w poprzedniej części projektu, dodany został tylko model Id do pliku `appsettings.json`

```
"AzureDocumentAI":{
  "Endpoint": "<endpoint>",
  "ApiKey": "<key>",
  "Model": "DotChat-Receipt-Model"
}
```

- stworzenie klasy serwisu: `AzureCDIReceiptService`
  Klasa będzie realizowała komunikację z API przez klienta `DocumentAnalysisClient`. Do wyboru będą dwie możliwości zapisu `xlsx` oraz `json`.
  Kluczowymi metodami klasy są:
  - konstruktor - odczytuje wartości klucza, endpointu, modelu z pliku konfiguracji

```
public AzureCDIReceiptService(IConfiguration configuration)
{
  _apiKey = configuration["AzureDocumentAI:ApiKey"] ?? "";
  _endpoint = configuration["AzureDocumentAI:Endpoint"] ?? "";
  _modelId = configuration["AzureDocumentAI:Model"] ?? "";

  var credential = new AzureKeyCredential(_apiKey);
  var uri = new Uri(_endpoint);

  _client = new DocumentAnalysisClient(uri, credential);
}
```

- ExtractOne - zlecająca analizę jednego pliku (obrazka jpg), realizująca wyświetlenie treści i zapis

```
public async Task ExtractOne(
  string sourcePath,
  string destPath,
  SaveMode mode, bool verbose
  )
{
  try
  {
    AnalyzeResult result = await ExtractReceipt(sourcePath);

    if (verbose)
    {
      foreach (AnalyzedDocument document in result.Documents)
```

```
            {
              Console.WriteLine($"Document of type: {document.DocumentType}");
              foreach (KeyValuePair<string, DocumentField> field in document.Fields)
              {
                string fieldName = field.Key;
                DocumentField fieldValue = field.Value;
                Console.WriteLine($"field: {fieldName}");
                Console.WriteLine($"  - value: {fieldValue.Content}");
                Console.WriteLine($"  - confidence: {fieldValue.Confidence} %");

              }
            }
          }
          else
          {
            Console.WriteLine($"Extracted receipt form {sourcePath} to {destPath}");
          }

          if (mode == SaveMode.Json && ValidateDestFilename(ref destPath, mode))
          {
            SaveReceiptAsJson(result, destPath);
          }
        }
        catch (Exception ex)
        {
          Console.WriteLine($"Failed to process receipt: {sourcePath},
{ex.Message}");
        }
      }
```

- ExtractReceipt - realizująca samą komunikację z API

```
      private async Task<AnalyzeResult> ExtractReceipt(string imageFile)
      {
        if (!File.Exists(imageFile))
          throw new ArgumentException($"Path {imageFile} if not valid.");

        using (var imageStream = new FileStream(imageFile, FileMode.Open))
        {
          var operation = await _client.AnalyzeDocumentAsync(
              WaitUntil.Completed,
              _modelId,
              imageStream
          );
          if (operation == null)
            throw new Exception("Error in ExtractReceipt: Analyze operation is
null");
          return operation.Value;
        }
      }
```

- SaveReceiptAsJson - realizująca zapis do pliku `json`

```
    private void SaveReceiptAsJson(AnalyzeResult result, string filename)
    {
      string json = JsonConvert.SerializeObject(result, Formatting.Indented);
      try
      {
        File.WriteAllText(filename, json);
      }
      catch (Exception ex)
      {
        Console.WriteLine($"An error occurred while writing json file:
{ex.Message}");
      }
      Console.WriteLine($"Saved json file: {filename}");
    }
```

- dodanie specjalnej komendy i obiektu `AzureCDIReceiptService` do aplikacji
  Komenda musi być obsłużona w metodzie `run` klasy `Application`

```
  // ... run()
  // ... while(true)
  // ... switch(command)
  case "\\receipt":
      if (words.Length < 6) {
          Console.WriteLine("Not enough arguments provided.");
          break;
      }
      // extracion mode currently unused
      if (!ValidateReceiptCommand(userInput,
      out ExtractionMode eMode, out string sourcePath,
      out AzureDocumentAI.SaveMode receiptSaveMode, out string destPath,
      out bool reseiptVerbose
      )) {
          Console.WriteLine("Failed \receipt command validation.");
          break;
      }
      try {
          await _receiptService.ExtractOne(
              sourcePath, destPath, receiptSaveMode, reseiptVerbose
          );
      } catch (Exception ex) {
          Console.WriteLine(
            $"Error occured while processing \\receipt command: {ex.Message}"
            );
      }
      break;
  // the default case ...
```

Treść komendy musi być zwalidowana w metodzie `ValidateReceiptCommand` klasy `Application`

```
private bool ValidateReceiptCommand(string userInput,
    out ExtractionMode eMode, out string sourcePath,
    out AzureDocumentAI.SaveMode sMode, out string destPath,
    out bool verbose)
{

  sourcePath = string.Empty;
  destPath = string.Empty;
  eMode = ExtractionMode.None;
  sMode = AzureDocumentAI.SaveMode.None;
  verbose = false;

  string pattern = @"\\receipt\s+(-v|--verbose)?\s?(jpg)\s+""([^""]+)""\s+to\s+
(json)\s+""([^""]+)""\s*(-v|--verbose)?\s?";
  Match match = Regex.Match(userInput, pattern, RegexOptions.IgnoreCase);
  if (!match.Success)
  {
      return false;
  }

  // Groups
  // 1, 6) -v, --verbose
  // 2) jpg
  // 3) sourcePath
  // 4) json (only option for now)
  // 5) destPath

    if (!string.IsNullOrEmpty(match.Groups[1].Value) ||
!string.IsNullOrEmpty(match.Groups[6].Value))
    {
        verbose = true;
    }
    if (match.Groups[2].Value == "jpg")
    {
        eMode = ExtractionMode.Jpg;
    }
    if (match.Groups[4].Value == "json")
    {
        sMode = AzureDocumentAI.SaveMode.Json;
    }
    sourcePath = match.Groups[3].Value;
    destPath = match.Groups[5].Value;

    return true;
}
```

- dodanie instrukcji użytkownika

10. Testy

- brak komendy `verbose`, brak wyświetlenia wyniku, ale zapisano plik

```
User: \receipt jpg "..\..\resources\receipts-3\1008-receipt.jpg" to json "..\..\resources\results\1008-receipt-1.json"
Extracted receipt form ..\..\resources\receipts-3\1008-receipt.jpg to ..\..\resources\results\1008-receipt-1.json
Save mode: .json
Saved json file: C:\Users\MS\Desktop\PUCH\Laboratorium 2 AI\AIDotChat\resources\results\1008-receipt-1.json
```


```
{
  "ServiceVersion": "2023-07-31",
  "ModelId": "DotChat-Receipt-Model",
  "Content": "Dona Mercedes Restaurant 1030 1/2 San Fernando Rd San Fernando CA
91341\nVero CENTER L\n1 CHicharon\n$2.25\n3 Pupusa Queso\n$6.75\n1 Platanos
Orden\n$7.75\n1 Diet coke\n$1.50\n2 Quesadilla salvadorena\n$4.00\nSUBTOTAL:
$22.25\nTAX: $2.22\nTOTAL: $24.47\nTIP SUGGESTIONS 18%: $4.40 20%: $4.89 25%:
$6.12\nThank You!",
  "Pages": [
    {
      "Unit": 0,
      "PageNumber": 1,
      "Angle": 0.8636075,
      "Width": 750.0,
      "Height": 1000.0,
      "Spans": [
        {
          "Index": 0,
          "Length": 298
        }
      ],
      "Words": [
        {
          "BoundingPolygon": [
            {
              "IsEmpty": false,
              "X": 190.0,
              "Y": 71.0
            },
            {
              "IsEmpty": false,
              "X": 251.0,
              "Y": 71.0
            },
            {
              "IsEmpty": false,
              "X": 251.0,
              "Y": 87.0
            },
  // ...
```

- komenda `verbose`, wyświetlono wyniki

```
User: \receipt jpg "..\..\resources\receipts-3\1009-receipt.jpg" to json "..\..\resources\results\1009-receipt" --verbose
Document of type: DotChat-Receipt-Model
field: MerchantAddress
  - value: 223 Newport Ave Pawtucket, RI 02861
  - confidence: 40,7 %
field: TotalTax
  - value: $2.28
  - confidence: 83,1 %
field: Items
  - value:
  - confidence: 72,299995 %
field: MerchantName
  - value: Bella Pasta
  - confidence: 59,500004 %
field: Subtotal
  - value: $28.48
  - confidence: 83 %
field: TransactionDate
  - value: 08/09/19 4:28
  - confidence: 61,199997 %
```

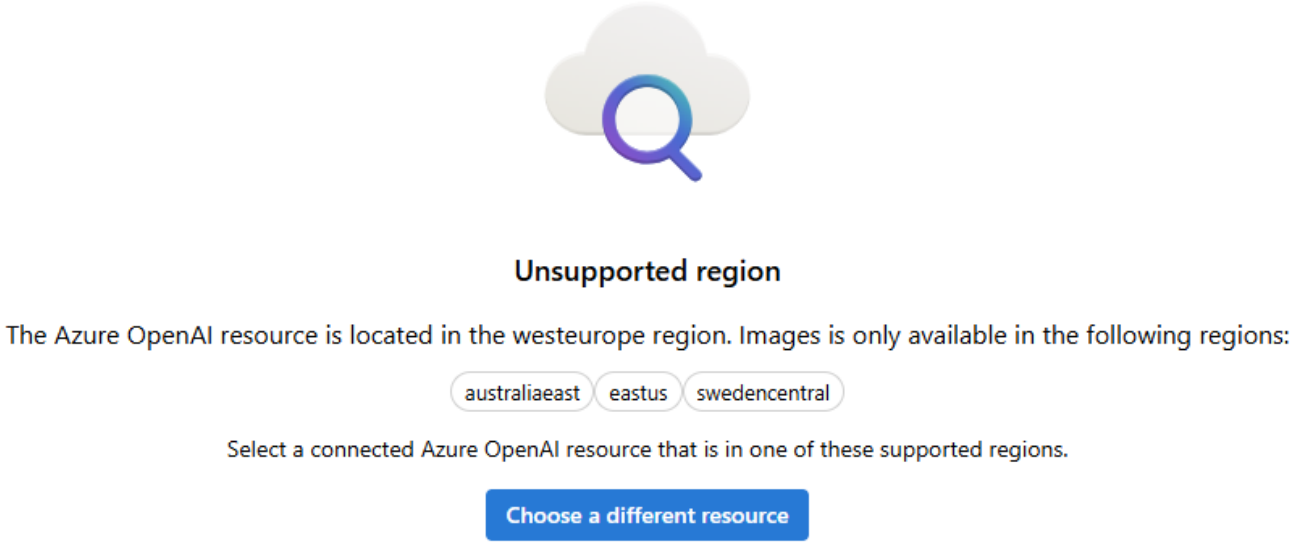
- komenda źle sformatowana, uzyskano informację o błędzie

```
User: \receipt jpg "..\..\resources\receipts-3\1009-receipt.jpg" to json
Not enough arguments provided.
User: \receipt jpg "..\..\resources\receipts-3\1009-receipt.jpg" to json ""
Failed \receipt command validation.
User: \receipt jpg "..\..\resources\receipts-3\1009-receipt.jpg" to json "ok"
Extracted receipt form ..\..\resources\receipts-3\1009-receipt.jpg to ok
Save mode: .json
Saved json file: C:\Users\MS\Desktop\PUCH\Laboratorium 2 AI\AIDotChat\src\console\ok.json
User: \receipt jpg "..\..\resources\receipts-3" to json "..\..\resources\results\test"
Failed to process receipt: ..\..\resources\receipts-3, Path ..\..\resources\receipts-3 if not valid.
User: \receipt jpg "..\..\resources\receipts-3\something" to json "..\..\resources\results\test"
Failed to process receipt: ..\..\resources\receipts-3\something, Path ..\..\resources\receipts-3\something if not valid.
User:
```

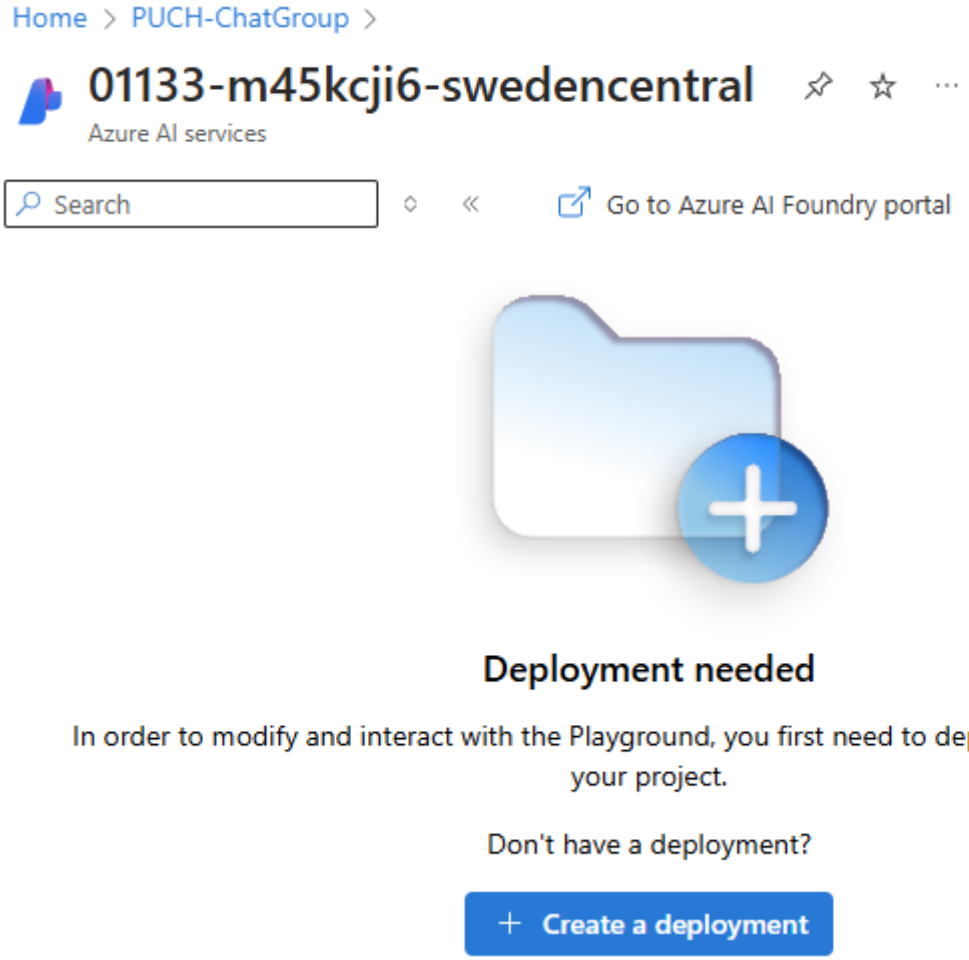
2. Generowanie obrazów na podstawie opisu

1. Uworzenie wdrożenia modelu dall-e

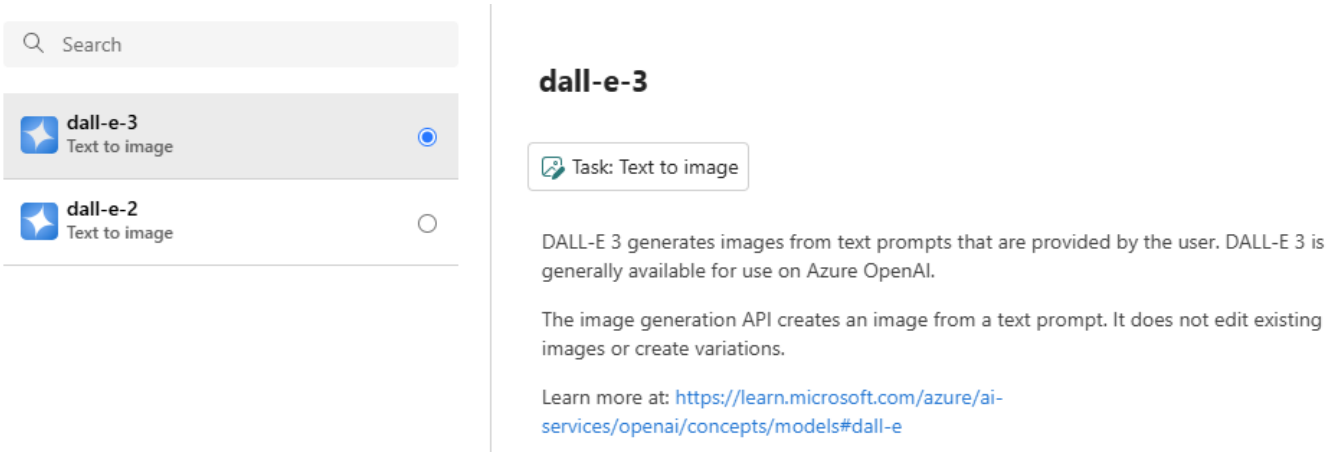
W poprzednim etapie utworzony został zasób `Azure OpenAI` nazwany `ChatDotAI-service`. Po odszukaniu go w grupie zasobów dostaję się do `Azure AI Foundry Portal`. Wybieram `Images` w lewym panelu. Nie jest możliwe utworzenie modelu `dall-e` w regionie West Europe.



Przechodzę do utworzonego wcześniej zasobu typu `Azure AI services` utworzonego w regionie Sweden Central. Dalej do portalu `Azure AI Foundry Portal`>`Images`.



Wybrany model to `dall-e-3`



2. Dodanie konfiguracji

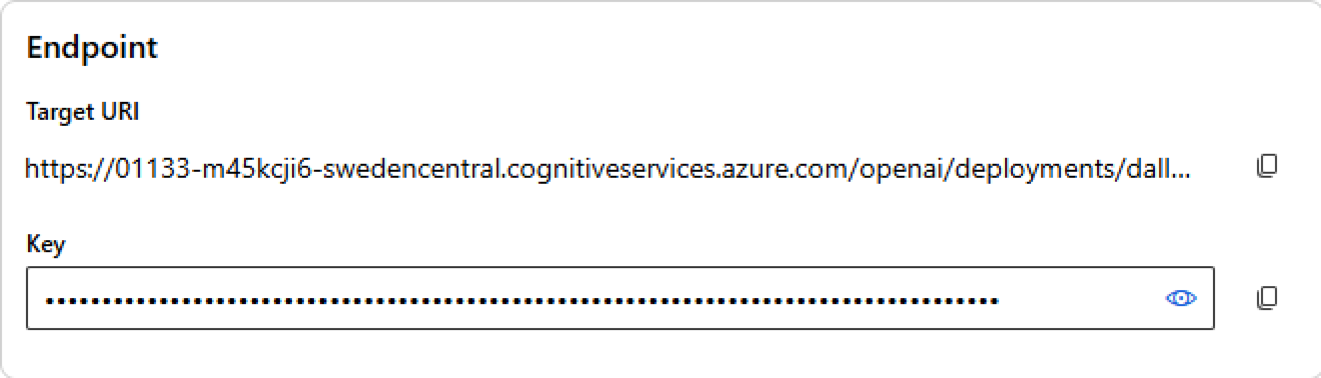
Ponownie nie udało się skorzystać z pakietu `Azure.AI.OpenAI` zgodnie ze wskazówkami zawartymi w learn.microsoft.com, nie zostają odnalezione klasy pakietu takie jak `AzureOpenAIClient`.

Zostanie wykorzystana specyfikacja API opisana tutaj

W `appsettings.json` dodane zastała część odpowiadająca komunikacji z modelem `dall-e-3`:

```
  "AzureOpenAIImage": {
    "Endpoint": "https://<resource
name>.cognitiveservices.azure.com/openai/deployments/dall-e-3/images/generations?
api-version=<version>",
    "ApiKey": "<api key>",
    "Model": "dall-e-3"
  },
```

Wartości odnaleźć można w `Azure AI Foundry` > `Deployments` > `dall-e-3`



3. Integracja z chatem

- Dodana zostaje klasa `OpenAIImageService` obsługująca komunikację z `dall-e-3`
- Utworzone są klasy reprezentacji zapytań i odpowiedzi modelu.

```
class ImageReguest
{
  public required string Prompt { get; set; }
  public required string Size { get; set; }
  public required int N { get; set; }
  public required string Quality { get; set; }
  public required string Style { get; set; }
}
```

- Dodane zostają funkcje pytające użytkownika o dodatkowe ustawienia, tj.: prompt, rozmiar, styl i jakość (parametr N musi być ustawiony na 1)
- Dodane zostają kunkcje realizujące zapytanie do klienta http

```
    // Realizuje główną funkcjonalność
    // Zakłada, że w zmiennej _request zostały ustawione odpowiednie pola
    private async Task<ImageResponse?> MakeRequest()
    {
      if (string.IsNullOrWhiteSpace(_request.Prompt))
      {
```

```
        return null;
      }
      try
      {
        var response = await _httpClient.PostAsJsonAsync(_endpoint, _request);
        var responseBody = await response.Content.ReadAsStringAsync();

        // Console.WriteLine(responseBody.ToString());
        var responseObject = JsonSerializer.Deserialize<ImageResponse>
(responseBody, new JsonSerializerOptions
        {
          PropertyNameCaseInsensitive = true
        });

        if (!response.IsSuccessStatusCode)
        {
          Console.WriteLine($"Http error: {response.StatusCode}");
          Console.WriteLine($"Details: {responseObject}");
        }

        return responseObject;
      }
      catch (Exception ex)
      {
        Console.WriteLine($"Error: {ex.Message}");
      }
      return null;
    }
```

- Dodane zostają funkcja zapisująca pliki obrazów na dysk

```
    private async Task GenerateToFile(ImageResponse imageResponse, GenerationMode
gMode, string destDir)
    {
      if (!ValidateDirectory(destDir))
      {
        return;
      }

      try
      {
        for (int i = 0; i < imageResponse.Data.Count; i++)
        {
          var dataItem = imageResponse.Data[i];
          string filename = $"{_model.ToUpper()}-image-{imageResponse.Created}
{GenerationModeDescription.get(gMode)}";
          string path = Path.Join(destDir, filename);
          if (dataItem.Url != null)
          {

            HttpResponseMessage response = await
_httpClient.GetAsync(dataItem.Url);
```

```
            response.EnsureSuccessStatusCode();
            byte[] image = await response.Content.ReadAsByteArrayAsync();
            await File.WriteAllBytesAsync(path, image);
            Console.WriteLine($"Image downloaded and saved successfully in
{filename}");

          }
          else if (dataItem.Code != null)
          {
            Console.WriteLine($"Image {i}.  generation resulted in error:
{dataItem.Code}");
            Console.WriteLine($"Error message: {dataItem.Message}");
          }

        }
      }
      catch (Exception ex)
      {
        Console.WriteLine($"Error occured: {ex.Message}");
      }
    }
```

- Dodana zostaje funkcja wyświetlająca na ekranie url (dla opcji url)

```
    private void GenerateUrl(ImageResponse imageResponse)
    {
      Console.WriteLine($"{_model.ToUpper()}: Created {imageResponse.Created}");
      for (int i = 0; i < imageResponse.Data.Count; i++)
      {
        var dataItem = imageResponse.Data[i];
        if (dataItem.Url != null)
        {
          Console.WriteLine($"Image {i}: {dataItem.Revised_Prompt}");
          Console.WriteLine($"Url: {dataItem.Url}");
        }
        else if (dataItem.Code != null)
        {
          Console.WriteLine($"Image {i}: generation resulted in error:
{dataItem.Code}");
          Console.WriteLine($"Error message: {dataItem.Message}");
        }
      }
    }
```

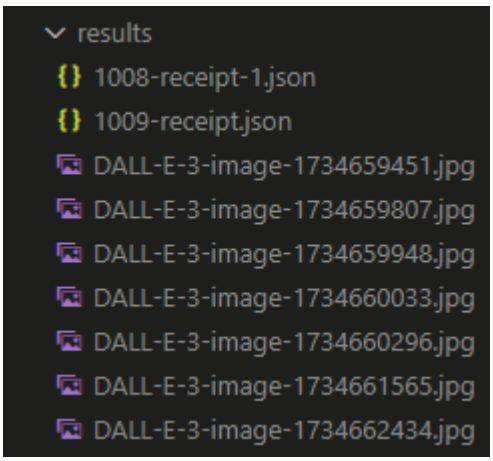
- Dodana zostaje klauzula w switchu metdu run w klasie Application
- Dodana zostaje walidacja komendy
- Usupełniona zostaje instrukcja użytkownika

4. Testowanie

- Opcja zapisu `jpg`

```
User: \dall-e jpg "C:\Users\MS\Desktop\PUCH\Laboratorium 2 AI\AIDotChat\resources\results"
DALL-E-3: Could you describe you desired image? (press double Enter after you're finished)
User: A winter evening,
User: People gather aroud a Christmas tree
User: There are colorfull lights
User:
DALL-E-3: Choose the size options by navigating 🔽 and 🔼 keys, press Enter to select
✅ 1024 x 1024
   1024 x 1792
   1792 x 1024
:-------------------------------------------------------:
   1024 x 1024
   1024 x 1792
✅ 1792 x 1024
:-------------------------------------------------------:
```

```
DALL-E-3: Choose the style options by navigating 🔽 and 🔼 keys, press Enter to select
✅ Vivid
   Natural
:-------------------------------------------------------:
DALL-E-3: Choose the quality options by navigating 🔽 and 🔼 keys, press Enter to select
✅ Standard
   HD
:-------------------------------------------------------:
   Standard
✅ HD
:-------------------------------------------------------:
Image downloaded and saved successfully in DALL-E-3-image-1734662434.jpg
```



- Opcja wyświetlenia `url`

```
User: \dall-e url
DALL-E-3: Could you describe you desired image? (press double Enter after you're finished)
User: A cloudy summer day
User: There is a light breeze
User:
DALL-E-3: Choose the size options by navigating 🔽 and 🔼 keys, press Enter to select
✅ 1024 x 1024
   1024 x 1792
   1792 x 1024
:-------------------------------------------------------:
DALL-E-3: Choose the style options by navigating 🔽 and 🔼 keys, press Enter to select
✅ Vivid
   Natural
:-------------------------------------------------------:
DALL-E-3: Choose the quality options by navigating 🔽 and 🔼 keys, press Enter to select
✅ Standard
   HD
:-------------------------------------------------------:
DALL-E-3: Created 1734663446
Image 0: A serene depiction of a cloudy summer day where a light breeze is visible in the sway
Url: https://dalleprodsec.blob.core.windows.net/private/images/d2673af1-124b-4a4a-bafe-a530b1b
A58%3A34Z&skoid=e52d5ed7-0657-4f62-bc12-7e5dbb260a96&sks=b&skt=2024-12-19T03%3A58%3A34Z&sktid=
User:
```

- Niewłaściwie sformatowane komendy

```
User: \dall-e x y z w
Command wasn't well constructed.
User: \dall-e jpg
Command wasn't well constructed.
User: \dall-e jpg ""
Command wasn't well constructed.
User: \dall-e jpg "x"
DALL-E-3: Could you describe you desired image?
User:
```

- Niektóre z uzyskanych obrazów