MLS 3: Computer Vision workloads on Azure

Agenda

- Analyze images in Vision Studio
- Detect faces in Vision Studio
- Read text in Vision Studio
- Extract data in Document Intelligence Studio
- Explore an Azure AI Search index

Analyze images in Vision Studio

Ground Rule : Important

Ground rules for setting up Azure AI services resource and Vision Studio:

- Utilize one resource group for all your tasks. **Multiple resource groups should not be created.**
- Select **Region** = East US
- **Pricing tier**: Standard S0
- **Allow 10 to 15 minutes** for the resource to become fully operational following its creation before incorporating it into Vision Studio.
- For Vision Studio access, employ the **credentials found within the "Access" section** to complete the Microsoft Login process.
- It is advised to create and use a **single resource for all future tasks** within the program. Creating multiple resources may lead to lab-related problems.

Azure AI services resource

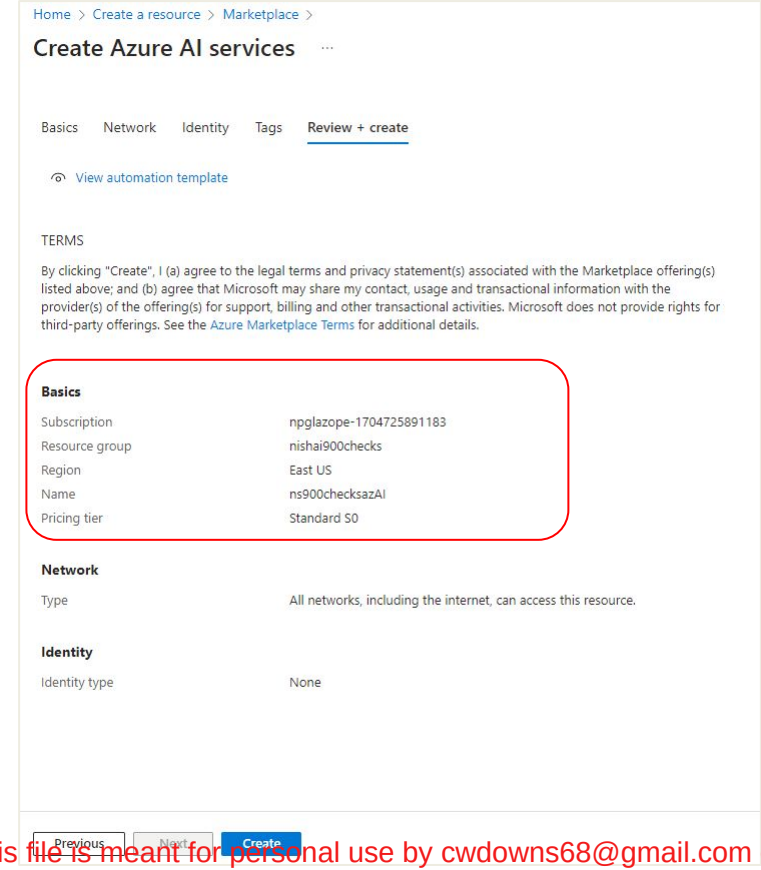
Steps to perform:

Click the “＋Create” a resource button and search for Azure AI services. Select create an Azure AI services.
You will be taken to a page to create an Azure AI services resource. Configure it with the following settings:

- Subscription: Your Azure subscription.
- Resource group: Select or create a resource group with a unique name.
- Region: East US.
- Name: Enter a unique name.
- Pricing tier: Standard S0.
- By checking this box I acknowledge that I have read and understood all the terms below: Selected.

Select Review + create then Create and wait for deployment to complete.

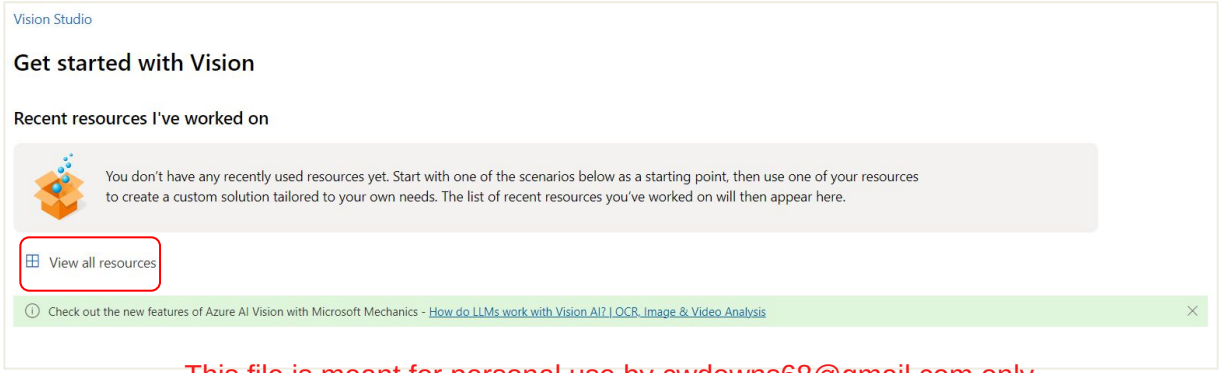
Azure AI services resource



Connect to Vision Studio

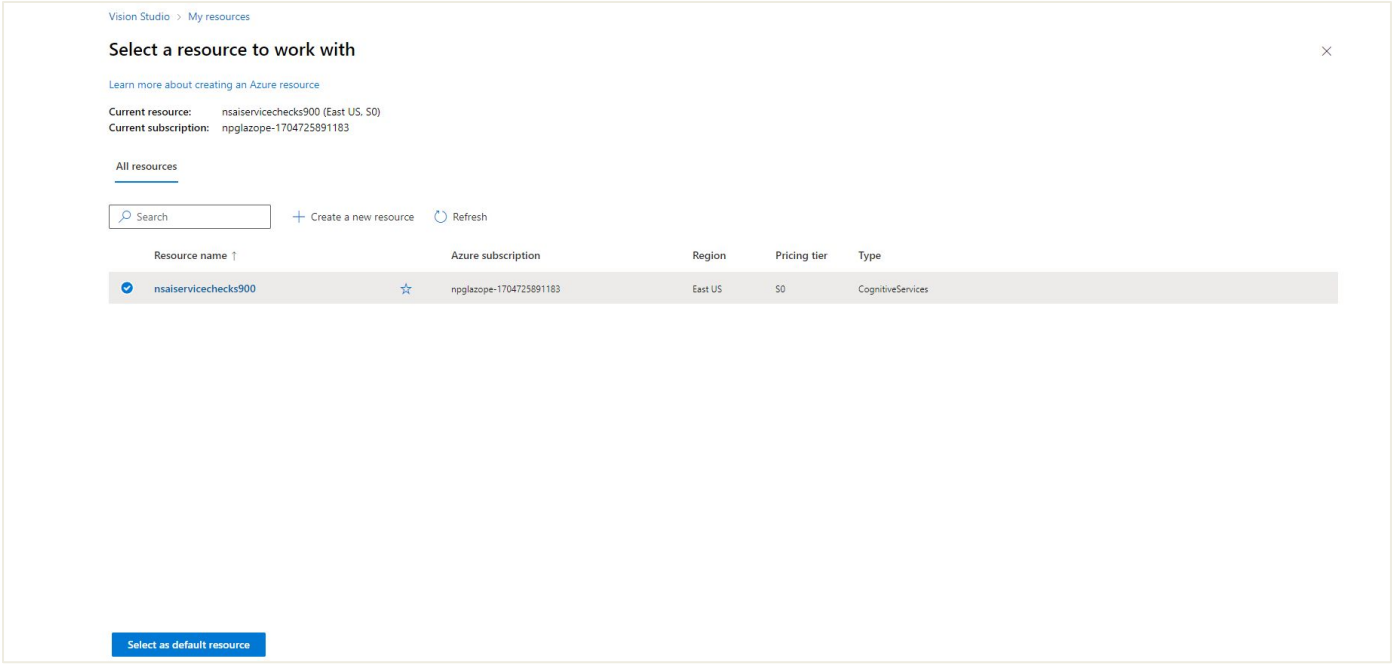
Next, connect the Computer Vision service resource you provisioned above to Vision Studio.

- In another browser tab, navigate to Vision Studio.
- Sign in with your account and making sure you are using the same credentials present in the **Access section** of the labs.
- On the Select a resource to work with page, hover your mouse cursor over the resource you created above in the list and then check the box to the left of the resource name, then select Select as default resource.



Connect to Vision Studio

- Close the settings page by selecting the “x” at the top right of the screen.



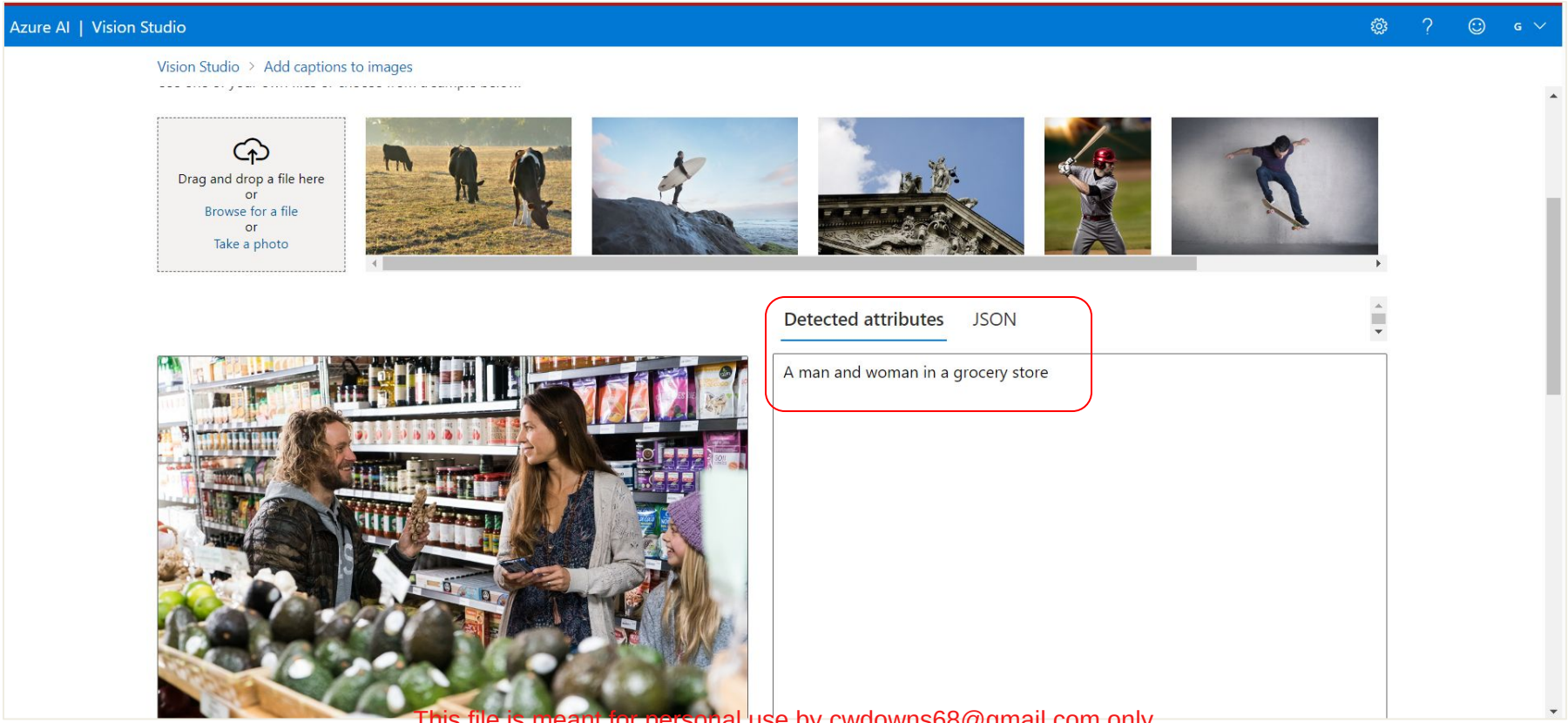
Generate captions for an image

Now you are ready to use Vision Studio to analyze images taken by a camera in the Northwind Traders store.

Let's look at the image captioning functionality of Azure AI Vision.

- On the Getting started with Vision landing page, select the **Image analysis tab** and then select the **Add captions to images** tile.
- Under the Try It Out subheading, acknowledge the resource usage policy by reading and checking the box.
- Select https://aka.ms/mslearn-images-for-analysis to download image-analysis.zip.
- Upload the store-camera-4.jpg image by dragging it to the Drag and drop files here box, or by browsing to it on your file system.
- Observe the generated caption text, visible in the Detected attributes panel to the right of the image.
- The Caption functionality provides a single, human-readable English sentence describing the image's content.

Generate captions for an image



Generate captions for an image

- Next, use the same image to **perform Dense captioning**. Return to the Vision Studio home page, and as you did before, select the **Image analysis tab**, then select the **Dense captioning tile**.

Generate captions for an image

- The Dense Captions feature differs from the Caption capability in that it provides multiple human-readable captions for an image, one describing the image's content and others, each covering the essential objects detected in the picture. Each detected object includes a bounding box, which defines the pixel coordinates within the image associated with the object.
- Hover over one of the captions in the Detected attributes list and observe what happens within the image. Move your mouse cursor over the other captions in the list, and notice how the bounding box shifts in the image to highlight the portion of the image used to generate the caption.

Tagging images

The next feature you will try is the **Extract Tags** functionality. Extract tags is based on thousands of recognizable objects, including living beings, scenery, and actions.

- Return to the home page of Vision Studio, then select the **Extract common tags from images** tile under the **Image analysis** tab.
- In the **Choose the model you want to try out**, leave **Prebuilt product vs. gap model** selected. In the **Choose your language**, select **English** or a language of your preference.
- Open the folder containing the images you downloaded and locate the file named **store-image-3.jpg**. Upload the store-camera-3.jpg file.
- Review the list of tags extracted from the image and the confidence score for each in the detected attributes panel. Here the confidence score is the likelihood that the text for the detected attribute describes what is actually in the image. Notice in the list of tags that it includes not only objects, but actions, such as shopping, selling, and standing.

Tagging images

Detected attributes JSON

person (98.42%)
clothing (98.33%)
retail (98.17%)
convenience store (97.87%)
supermarket (96.95%)
grocery store (96.24%)
trade (93.02%)
selling (92.41%)
market (92.20%)
customer (91.87%)
shopping (91.39%)
shop (90.44%)
shopping cart (89.81%)
shopkeeper (86.80%)
marketplace (82.08%)
store (80.67%)
indoor (79.56%)
shelf (76.19%)
standing (66.85%)
woman (64.70%)
street (41.62%)

Object detection

In this task, you use the Object detection feature of Image Analysis. Object detection detects and extracts bounding boxes based on thousands of recognizable objects and living beings.

- Return to the home page of Vision Studio, then select the **Detect common objects in images** tile under the **Image analysis tab**.
- In the **Choose the model you want to try out**, leave **Prebuilt product vs. gap model** selected.
- Open the folder containing the images you downloaded and locate the file named **store-camera-1.jpg**. Upload the **store-camera-1.jpg** file.
- In the **Detected attributes** box, observe the list of detected objects and their confidence scores.
- Hover your mouse cursor over the objects in the **Detected attributes** list to highlight the object's bounding box in the image.
- Move the **Threshold value** slider until a value of 70 is displayed to the right of the slider. Observe what happens to the objects in the list. The threshold slider specifies that only objects identified with a confidence score or probability greater than the threshold should be displayed.

Object detection

Detected attributes JSON

Threshold value 18

cell phone (56.50%)

person (80.50%)

person (57.20%)

room (66.30%)

Detect faces in Vision Studio

Detect faces in the Vision Studio

- On the **Getting started with Vision** landing page, select the **Face** tab and then select the **Detect Faces in an image** tile.
- Under the **Try It Out** subheading, acknowledge the resource usage policy by reading and checking the box.
- Select each of the sample images and observe the face detection data that is returned.
- Now let's try with some of our own images. Select https://aka.ms/mslearn-detect-faces to download **detect-faces.zip**. Then open the folder on your computer.
- Locate the file named **store-camera-1.jpg**. Upload store-camera-1.jpg and review the face detection details that are returned.
- Locate the file named **store-camera-2.jpg.** Upload store-camera-2.jpg and review the face detection details that are returned.
- Locate the file named **store-camera-3.jpg**. Upload store-camera-3.jpg and review the face detection details that are returned. Notice how Azure AI Face did not detect the face that is obscured.

In this exercise you have explored how Azure AI services can detect faces in images. If you have time, feel free to try the sample images or some of your own images

Detect faces in the Vision Studio

Detected attributes JSON

Face #1
Face mask: no

Face #2
Face mask: no

Face #3
Face mask: no

Read text in Vision Studio

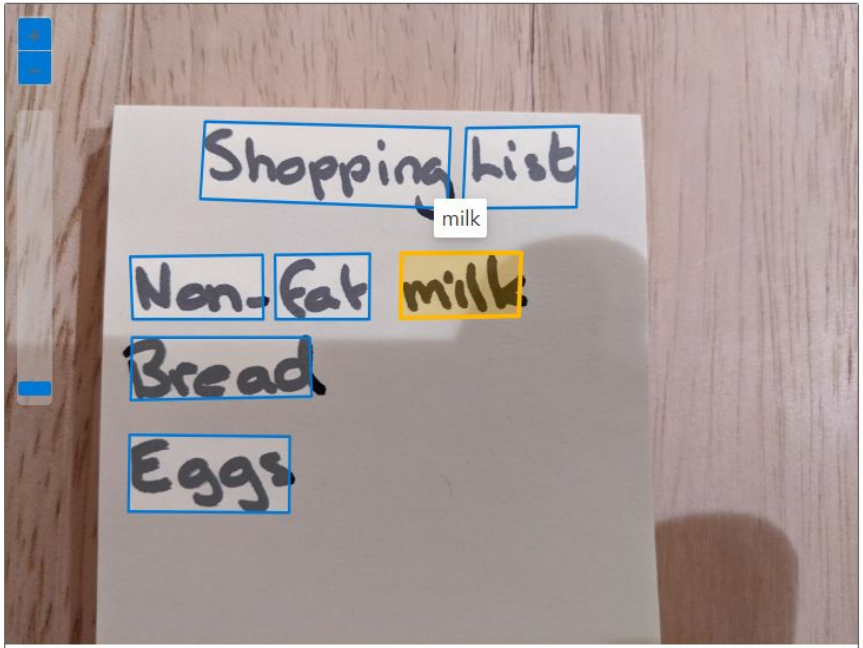
Extract text from images in the Vision Studio

- On the **Getting started with Vision** landing page, select **Optical character recognition**, and then the **Extract text from images** tile.
- Under the **Try It Out** subheading, acknowledge the resource usage policy by reading and checking the box.
- Select https://aka.ms/mslearn-ocr-images to download **ocr-images.zip**. Then open the folder.
- On the portal, select **Browse for a file** and navigate to the folder on your computer where you downloaded **ocr-images.zip**. Select **advert.jpg** and select Open.
- Now review what is returned:
    - In **Detected attributes**, any text found in the image is organized into a hierarchical structure of regions, lines, and words.
    - On the image, the location of text is indicated by a bounding box.
- You can now try another image. Select **Browse for a file** and navigate to the folder where you saved the files from GitHub. Select **letter.jpg**.
- Review the results of the second image. It should return the text and bounding boxes of the text. If you have time, try **note.jpg** and **receipt.jpg**.

Extract text from images in the Vision Studio

Great Learning
POWER AHEAD

Vision Studio > Extract text from images



Detected attributes JSON

Shopping List
Non- Fat milk
Bread
Eggs

Extract form data in Document Intelligence Studio

Ground Rule : Important

Ground rules for setting up Document intelligence resource:

- Utilize one resource group for all your tasks. **Multiple resource groups should not be created.**
- Select Region = **East US**
- Pricing tier: **Free FO**
- Wait for 10 to 15 after resource creation before utilizing it in Document Intelligence Studio
- **Use credentials present in the "Access" section** to perform Microsoft Login which is required for Document Intelligence Studio
- It is advised to create and use a **single resource for all future tasks** within the program. Creating multiple resources may lead to lab-related problems.

Create Document Intelligence resource

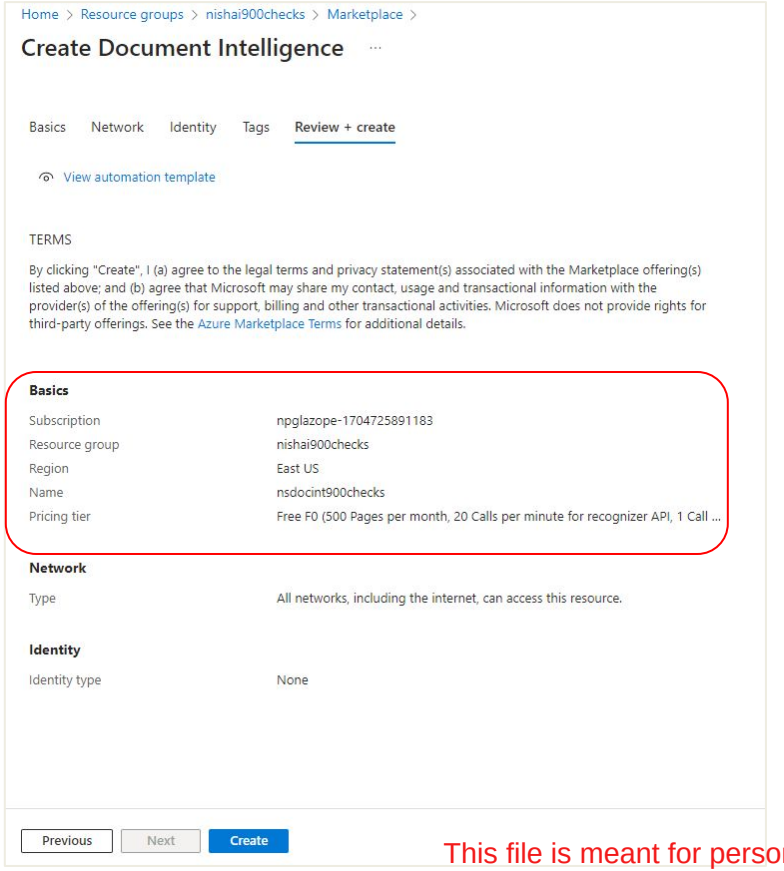
In this exercise, you will create Document Intelligence resource, if you don't already have one:

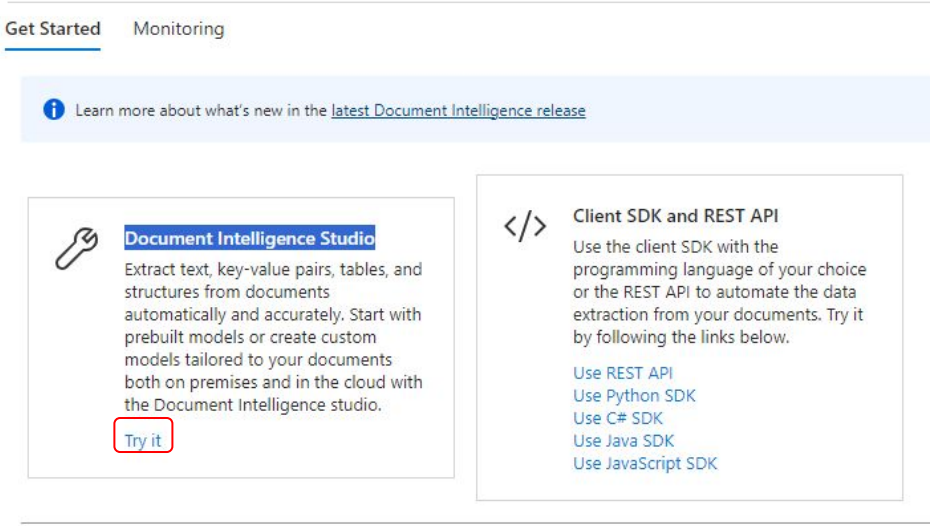
Click the "＋Create" a resource button and search for Document Intelligence services. Select create an Document Intelligence (form recognizer) services. You will be taken to a page to create an Document Intelligence resource. Configure it with the following settings:

- Subscription: Your Azure subscription.
- Resource group: Select or create a resource group with a unique name.
- Region: East US.
- Name: Enter a unique name.
- Pricing tier: Free FO

Select Review + create then Create and wait for deployment to complete.

Create Document Intelligence resource





Analyze a receipt in Document Intelligence Studio

You are now ready to analyze a receipt for the fictitious Northwind Traders retail company:

- Select https://aka.ms/mslearn-receipt to download a sample document to your computer. Open the folder.
- Select Document Intelligence Studio to return to the Get Started with Document Intelligence Studio page, and under Receipts select Try it out.
- Select Browse for files and navigate to the folder where you saved the picture. Select the picture of the receipt and then Open. The image appears on the left side of the screen.
- On the right, select Run analysis.
- When the analysis has run, the results are returned. Notice that the service has recognized specific data fields such as the merchant's name, the address, phone number, and the transaction date and time, as well as the line items, subtotal, tax, and total amounts. Next to each field is a percentage probability that the field is correct.

Analyze a receipt in Document Intelligence Studio

Explore an Azure AI Search index (UI)

Ground Rule : Important

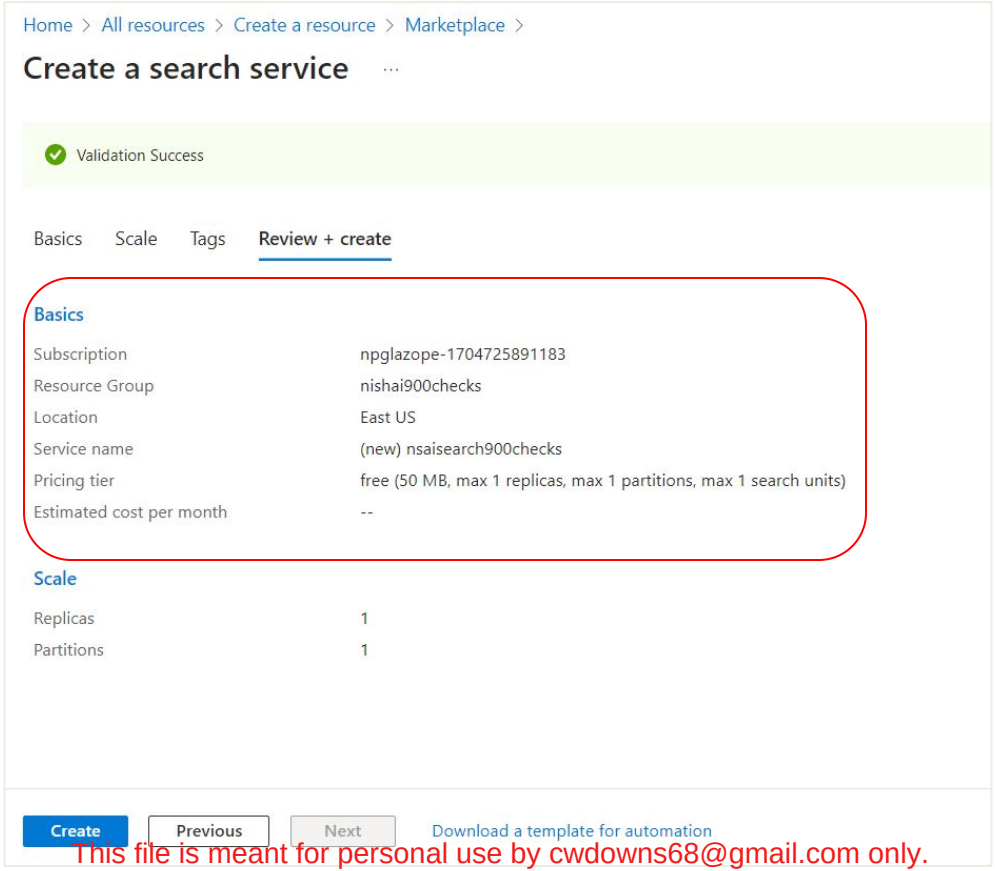
Ground rules for setting up resources:

- Utilize one resource group for all your tasks. **Multiple resource groups should not be created.**
- Select Region = **East US**
- Pricing tier for **Azure AI Search resource** = **Free**
- For **Storage account** creation **Performance** = **Standard**
- For **Storage account** creation **Redundancy** = **LRS (Locally-redundant storage)**
- Wait for 10 to 15 after resource creation before utilizing it.

Create an Azure AI Search resource

- Click the + Create a resource button, search for Azure AI Search, and create a Azure AI Search resource with the following settings:
  - Subscription: Your Azure subscription.
  - Resource group: Select the resource group which you are already using.
  - Service name: A unique name.
  - Location: East US.
  - Pricing tier: Free
- Select **Review + create**, and after you see the response **Validation Success**, select **Create**.

Create an Azure AI Search resource



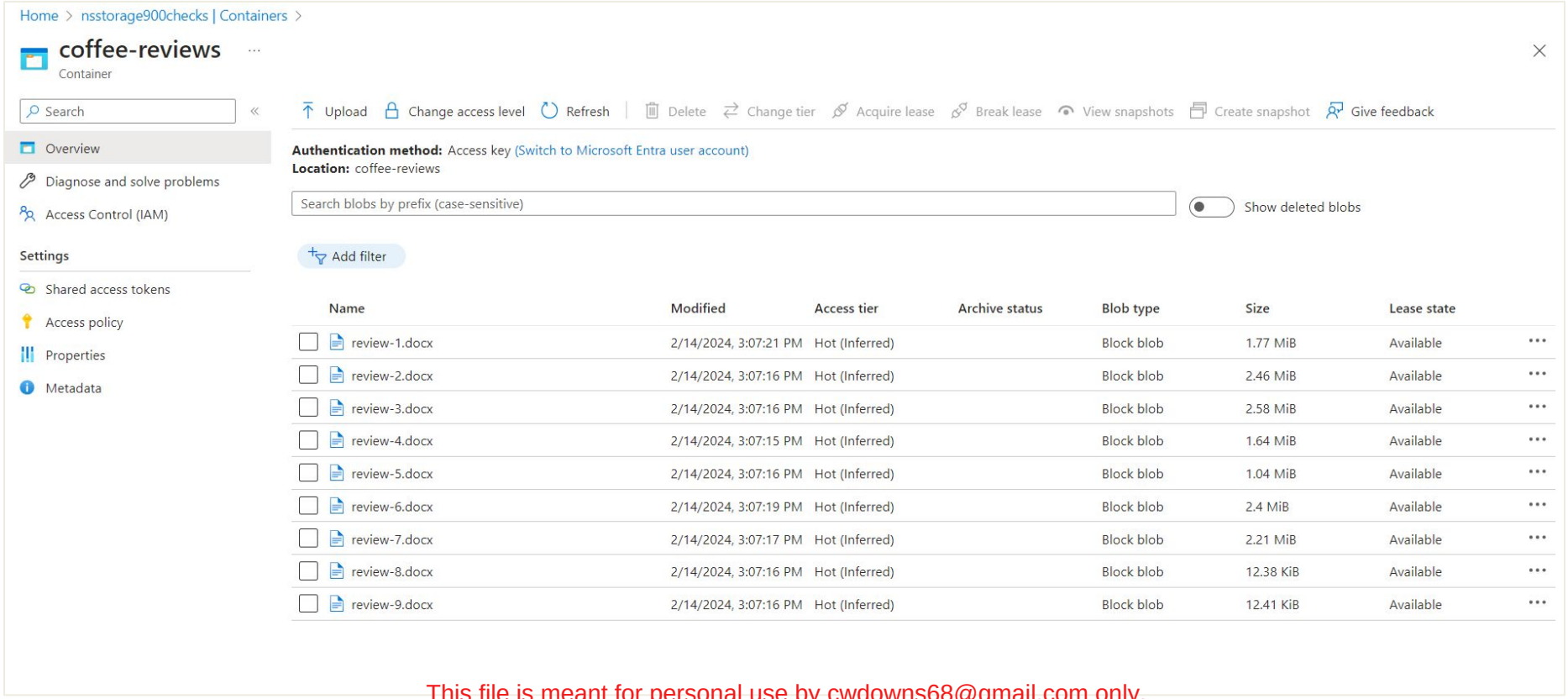
Create a storage account

- Return to the home page of the Azure portal, and then select the + Create a resource button.
- Search for storage account, and create a Storage account resource with the following settings:
    - Subscription: Your Azure subscription.
    - Resource group: Select the resource group which you are already using.
    - Storage account name: A unique name.
    - Location: East US.
    - Performance: **Standard**
    - Redundancy: **Locally redundant storage (LRS)**
- Click Review and then click Create. Wait for deployment to complete, and then go to the deployed resource.
- In the Azure Storage account you created, in the left-hand menu pane, select **Configuration** (under Settings)
- Change the setting for Allow Blob anonymous access to **Enabled** and then select **Save**.

Upload Documents to Azure Storage

- In the left-hand menu pane, select **Containers**.
- Select + Container. A pane on your right-hand side opens.
- Enter the following settings, and click Create:
  - **Name**: coffee-reviews
  - **Public access level**: Container (anonymous read access for containers and blobs)
  - **Advanced**: no changes.
- In a new browser tab, download the zipped coffee reviews from https://aka.ms/mslearn-coffee-reviews, and extract the files to the reviews folder.
- In the Azure portal, select your coffee-reviews container. In the container, select **Upload.**
- In the **Upload blob** pane, select **Select a file**.
- In the Explorer window, select **all** the files in the reviews folder, select **Open**, and then select **Upload**.
- After the upload is complete, you can close the **Upload blob** pane. Your documents are now in your coffee-reviews storage container.

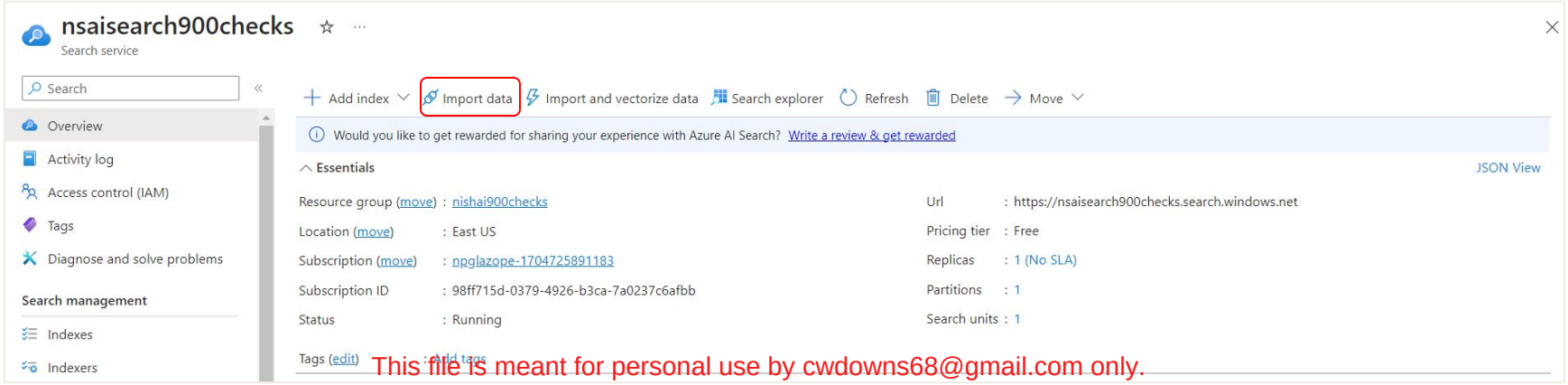
Upload Documents to Azure Storage



Index the documents

After you have the documents in storage, you can use Azure AI Search to extract insights from the documents. The Azure portal provides an Import data wizard. With this wizard, you can automatically create an index and indexer for supported data sources. You'll use the wizard to create an index, and import your search documents from storage into the Azure AI Search index.

- In the Azure portal, browse to your Azure AI Search resource. On the **Overview** page, select **Import data**.



Index the documents

- On the **Connect to your data** page, in the Data Source list, select **Azure Blob Storage**. Complete the data store details with the following values:
  - Data Source: Azure Blob Storage
  - Data source name: coffee-customer-data
  - Data to extract: Content and metadata
  - Parsing mode: Default
  - Connection string: *Select Choose an existing connection. Select your **storage account**, select the **coffee-reviews** container, and then click Select.
  - Managed identity authentication: None
  - Container name: this setting is auto-populated after you choose an existing connection.
  - Blob folder: Leave this blank.
  - Description: Reviews for Fourth Coffee shops.

Index the documents

- Select Next: **Add cognitive skills (Optional)**.
- In the **Attach Cognitive Services** section, select your Azure AI services resource.
- In the Add enrichments section:
  - Change the **Skillset name** to **coffee-skillset**.
  - Select the checkbox **Enable OCR and merge all text into merged_content field**.
  - Ensure that the **Source data field** is set to **merged_content**.
  - Change the **Enrichment granularity level** to **Pages (5000 character chunks)**.
  - Don't select Enable incremental enrichment
  - Select the following enriched fields:

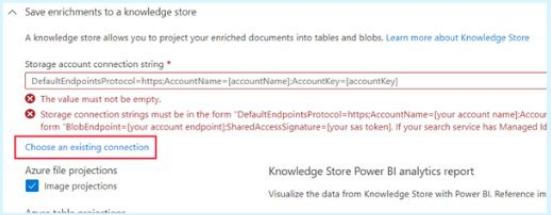
Cognitive Skill	Parameter	Field name
Extract location names		locations
Extract key phrases		keyphrases
Detect sentiment		sentiment
Generate tags from images		imageTags
Generate captions from images		imageCaption

Index the documents

- Under Save enrichments to a knowledge store, select::
  - Image projections
  - Documents
  - Pages
  - Key phrases
  - Entities
  - Image details
  - Image references

Index the documents

Note If a warning asking for a **Storage Account Connection String** appears.

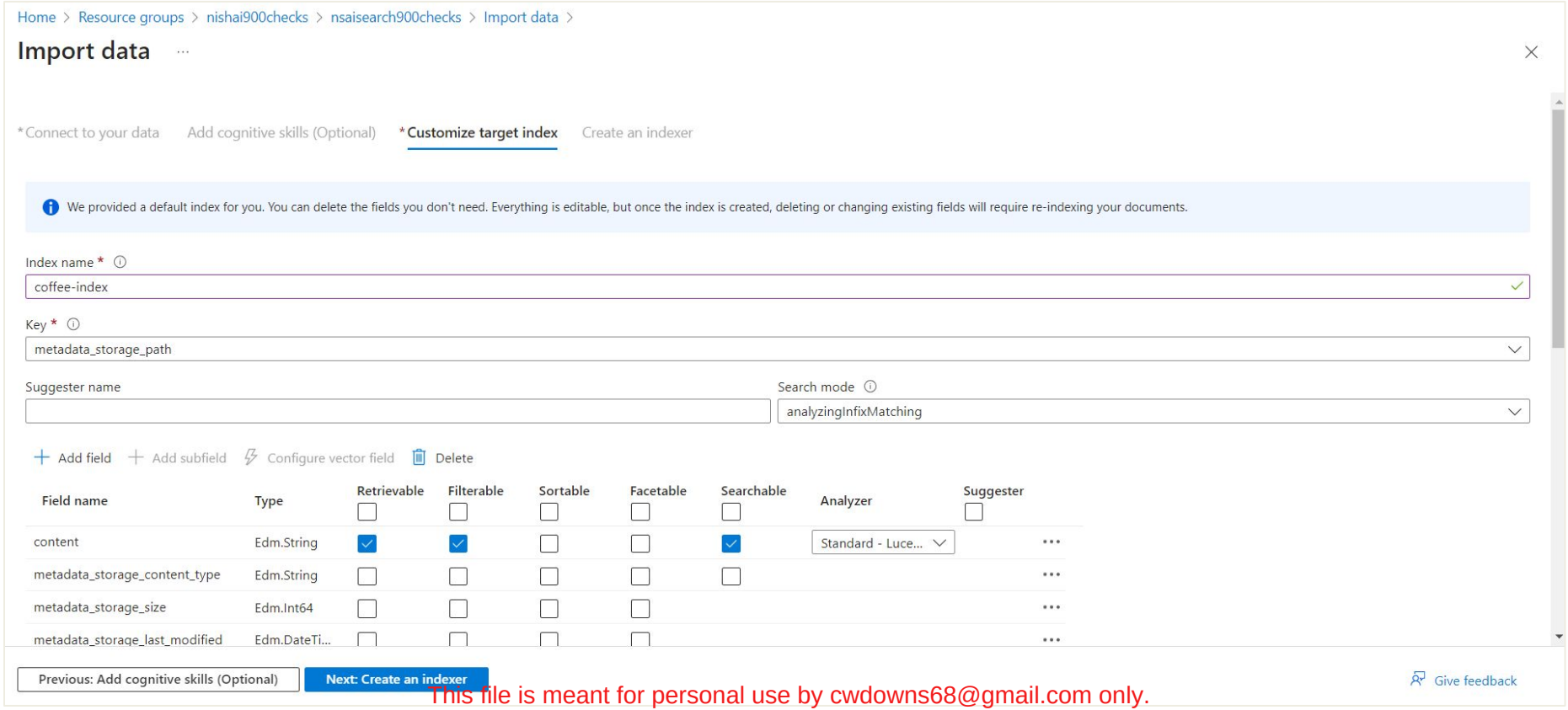


a. Select **Choose an existing connection**. Choose the storage account you created earlier.
b. Click on **+ Container** to create a new container called **knowledge-store** with the privacy level set to **Private**, and select **Create**.
c. Select the **knowledge-store** container, and then click **Select** at the bottom of the screen.

Index the documents

- Select **Azure blob projections**: **Document**. A setting for Container name with the knowledge-store container auto-populated displays. Don’t change the container name.
- Select **Next**: **Customize target index**. Change the **Index name** to **coffee-index**.
- Ensure that the **Key** is set to **metadata_storage_path**. Leave **Suggester name** blank and **Search mode** autopopulated.
- Review the index fields’ default settings. Select **filterable** for all the fields that are already selected by default.

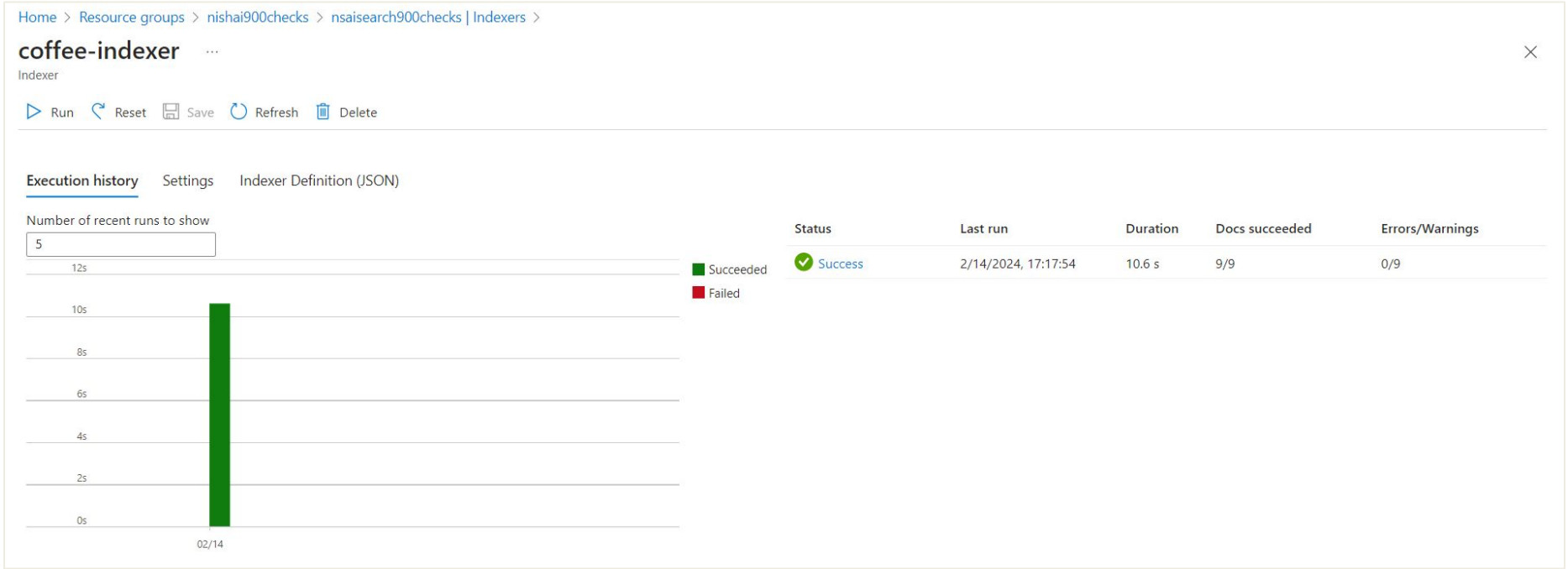
Index the documents



Index the documents

- Select **Next: Create an indexer**.
- Change the **Indexer name** to **coffee-indexer**.
- Leave the **Schedule** set to **Once**.
- Expand the **Advanced options**. Ensure that the **Base-64 Encode Keys** option is selected, as encoding keys can make the index more efficient.
- Select **Submit** to create the data source, skillset, index, and indexer. The indexer is run automatically and runs the indexing pipeline, which:
    - Extracts the document metadata fields and content from the data source.
    - Runs the skillset of cognitive skills to generate more enriched fields.
    - Maps the extracted fields to the index.
- Return to your Azure AI Search resource page. On the left pane, under **Search Management**, select **Indexers**. Select the newly created **coffee-indexer**. Wait a minute, and select **↻ Refresh** until the **Status** indicates success. Select the indexer name to see more details.

Index the documents



Query the index

Use the Search explorer to write and test queries. Search explorer is a tool built into the Azure portal that gives you an easy way to validate the quality of your search index. You can use Search explorer to write queries and review results in JSON.

- In your Search service's Overview page, select **Search explorer** at the top of the screen.
- Notice how the index selected is the coffee-index you created. Below the index selected, change the view to **JSON view**.
- In the **JSON query editor** field, copy and paste:

```
{
    "search": "*",
    "count": true
}
```

- Select **Search**. The search query returns all the documents in the search index, including a count of all the documents in the @odata.count field. The search index should return a JSON document containing your search results.

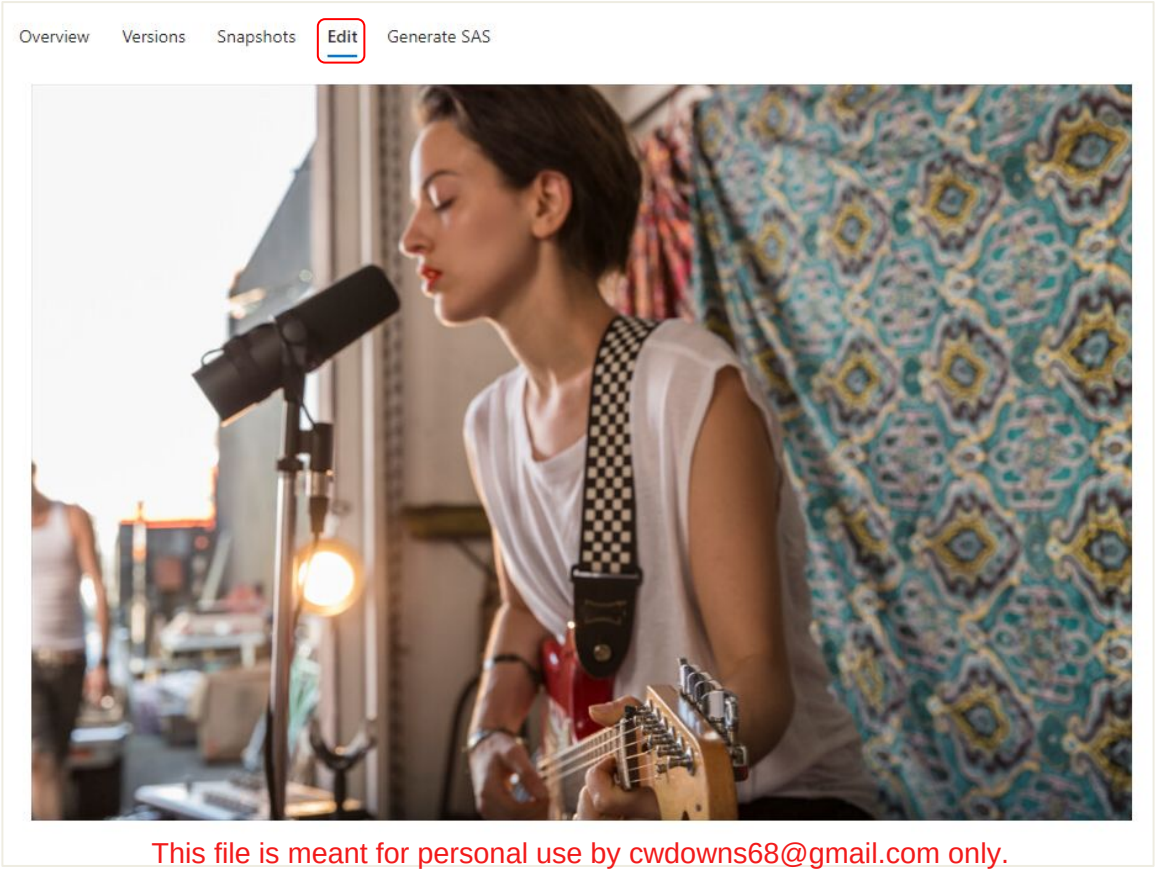
Query the index

Review the knowledge store

Let's see the power of the knowledge store in action. When you ran the Import data wizard, you also created a knowledge store. Inside the knowledge store, you'll find the enriched data extracted by AI skills persists in the form of projections and tables.

- In the Azure portal, navigate back to your Azure storage account.
- In the left-hand menu pane, select **Containers**. Select the **knowledge-store** container.
- Select any of the items, and then click the **objectprojection.json** file.
- Select **Edit** to see the JSON produced for one of the documents from your Azure data store.
- Select the storage blob breadcrumb at the top left of the screen to return to the Storage account Containers.
- In the Containers, select the container coffee-skillset-image-projection. Select any of the items.
- Select any of the .jpg files. Select **Edit** to see the image stored from the document. Notice how all the images from the documents are stored in this manner.

Review the knowledge store



Great Learning

Happy Learning !