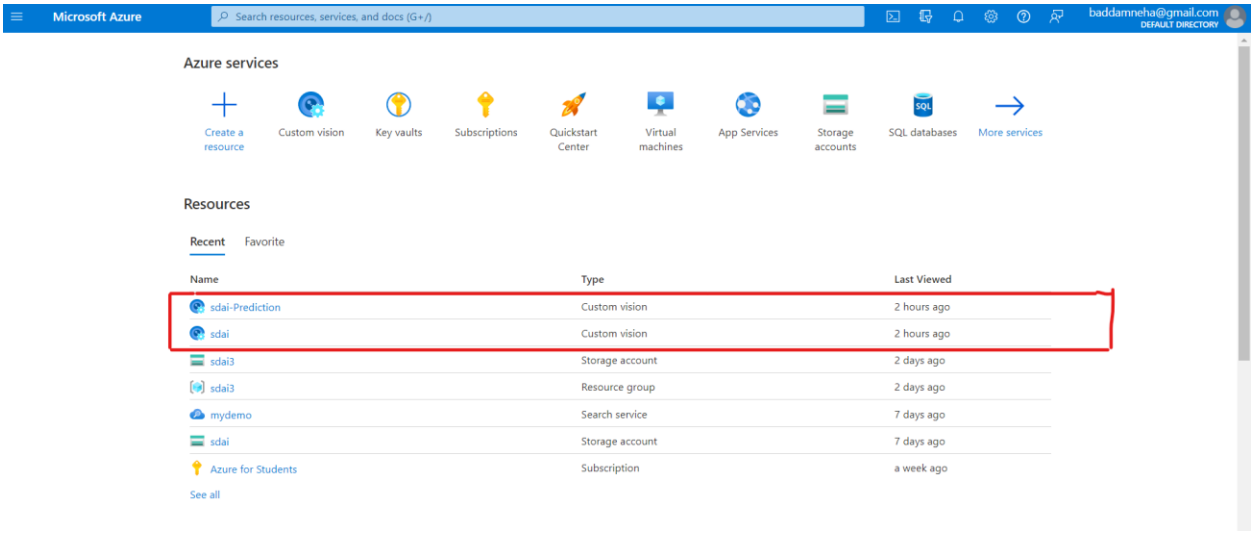
Pre-requisites

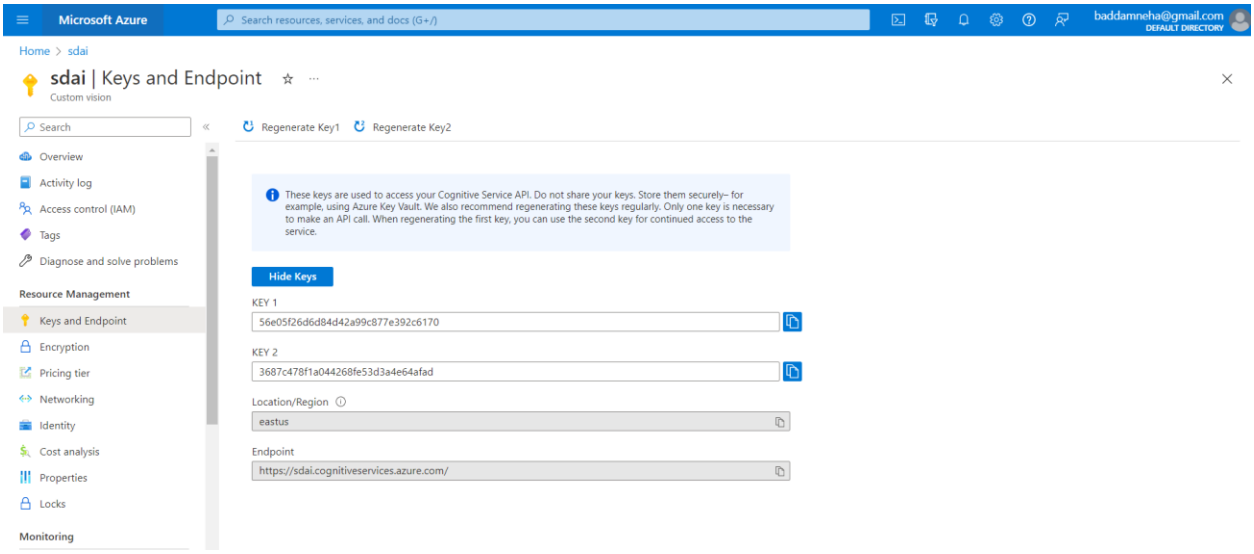
Azure Setup

Firstly, we must create a Custom Vision Project with training and prediction resources.

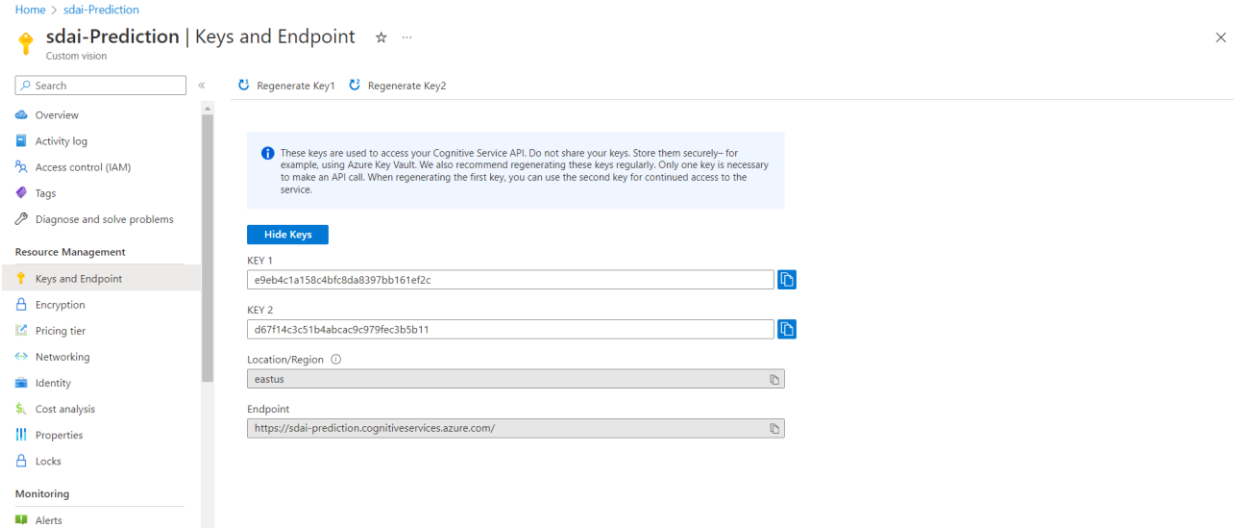


Then note down the keys and endpoints of training and prediction resources.

Training key and Endpoint:

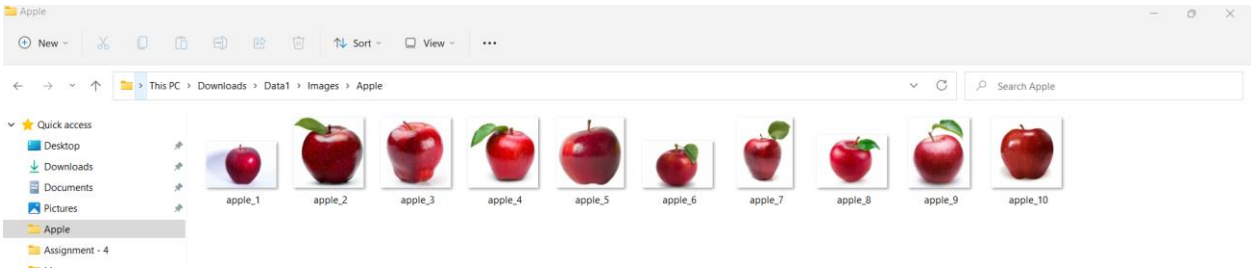


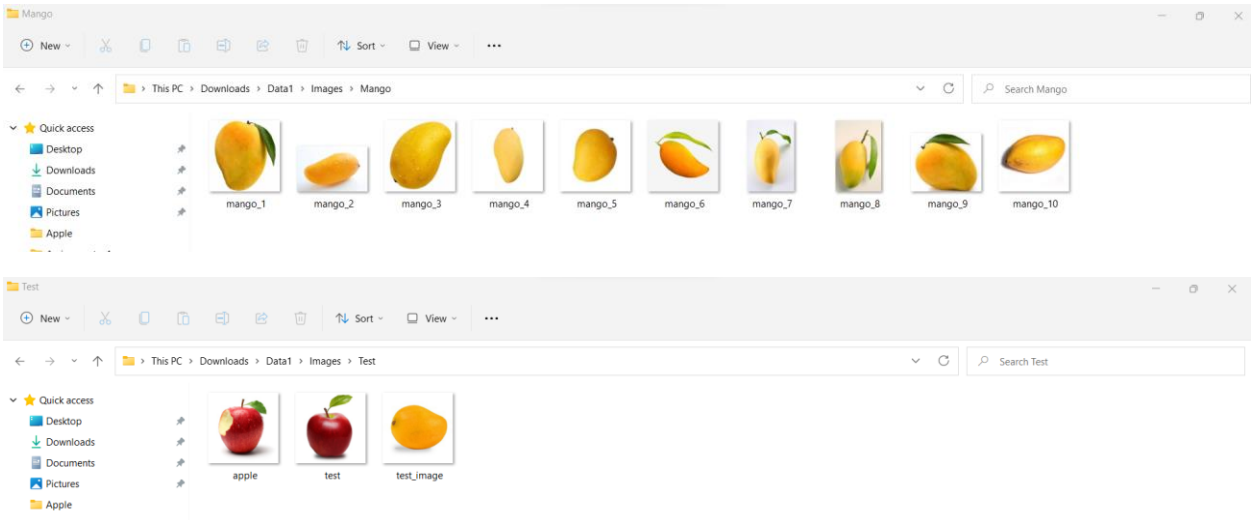
Prediction key, endpoint, and Resource ID:



Dataset setup

On your local storage create a Data folder and upload images for training and prediction.





Package Setup

Run the below command in the command prompt to install custom vision packages for code execution.

```
pip install azure-cognitiveservices-vision-customvision
```

Image classification with the Azure Custom Vision

Now, import all the packages required for image classification. Paste all the keys and endpoints in the code.

In [27]:
```
from azure.cognitiveservices.vision.customvision.training import CustomVisionTrainingClient
from azure.cognitiveservices.vision.customvision.prediction import CustomVisionPredictionClient
from azure.cognitiveservices.vision.customvision.training.models import ImageFileCreateBatch, ImageFileCreateEntry, Region
from msrest.authentication import ApiKeyCredentials
import os, time, uuid
```

In [28]:
```
# Replace with valid values
ENDPOINT = "https://sdai.cognitiveservices.azure.com/"
PredictionENDPOINT = "https://sdai-prediction.cognitiveservices.azure.com/"
training_key = "56e05f26d6d84d42a99c877e392c6170"
prediction_key = "e9eb4c1a158c4bfc8da8397bb161ef2c"
prediction_resource_id = "/subscriptions/5cf92398-d8a0-400a-9d32-05fcb62b046b/resourceGroups/sdai3/providers/Microsoft.Cognitives
```

We are validating the API key of both training and prediction and using the key and endpoint to create Custom Vision client objects for both training and prediction.

In [29]:
```
credentials = ApiKeyCredentials(in_headers={"Training-key": training_key})
trainer = CustomVisionTrainingClient(ENDPOINT, credentials)
prediction_credentials = ApiKeyCredentials(in_headers={"Prediction-key": prediction_key})
predictor = CustomVisionPredictionClient(PredictionENDPOINT, prediction_credentials)
```

After creating the custom vision project, we now create a custom vision project using the "create_project" function.

In [30]:
```
publish_iteration_name = "classifyModel"

credentials = ApiKeyCredentials(in_headers={"Training-key": training_key})
trainer = CustomVisionTrainingClient(ENDPOINT, credentials)

# Create a new project
print ("Creating project...")
project_name = uuid.uuid4()
project = trainer.create_project(project_name)
print('d')
```

```
Creating project...
d
```

After creating the project, we created two tags namely mango and apple.

In [31]:
```
# Make two tags in the new project
mango_tag = trainer.create_tag(project.id, "Mango")
apple_tag = trainer.create_tag(project.id, "Apple")
```

Now, we upload the images from the local storage in the system by giving the directory path of the folder that contains the Dataset. Each image is loaded one after the other into the respective tags. If the images are not uploaded successfully, an error with status is printed.

Upload and tag images

In [32]:
```
#__file__ : Put location where your "images" folder is located in your system

base_image_location = os.path.join (os.path.dirname("C:/Users/badda/Downloads/Data1/"), "Images")

print("Adding images...")

image_list = []

for image_num in range(1, 11):
    file_name = "mango_{}.jpg".format(image_num)
    with open(os.path.join (base_image_location, "Mango", file_name), "rb") as image_contents:
        image_list.append(ImageFileCreateEntry(name=file_name, contents=image_contents.read(), tag_ids=[mango_tag.id]))

for image_num in range(1, 11):
    file_name = "apple_{}.jpg".format(image_num)
    with open(os.path.join (base_image_location, "Apple", file_name), "rb") as image_contents:
        image_list.append(ImageFileCreateEntry(name=file_name, contents=image_contents.read(), tag_ids=[apple_tag.id]))

upload_result = trainer.create_images_from_files(project.id, ImageFileCreateBatch(images=image_list))
if not upload_result.is_batch_successful:
    print("Image batch upload failed.")
    for image in upload_result.images:
        print("Image status: ", image.status)
    exit(-1)
```

```
Adding images...
```

Now we train the project with the above-loaded images using the train_project function. Once the training is completed, the training status is printed as completed.

Train the project

In [33]:
```
print ("Training...")
iteration = trainer.train_project(project.id)
while (iteration.status != "Completed"):
    iteration = trainer.get_iteration(project.id, iteration.id)
    print ("Training status: " + iteration.status)
    print ("Waiting 10 seconds...")
    time.sleep(10)
```

```
Training...
Training status: Training
Waiting 10 seconds...
Training status: Training
Waiting 10 seconds...
Training status: Training
Waiting 10 seconds...
Training status: Training
Waiting 10 seconds...
Training status: Training
Waiting 10 seconds...
Training status: Training
Waiting 10 seconds...
Training status: Training
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Training status: Training
Waiting 10 seconds...
Training status: Training
Waiting 10 seconds...
Training status: Training
Waiting 10 seconds...
Training status: Training
Waiting 10 seconds...
Training status: Training
Waiting 10 seconds...
Training status: Completed
Waiting 10 seconds...
```

Once the training is completed, we must publish the current completed iteration to the project endpoint using the “publish_iteration” function.

Publish the current iteration

In [34]:
```
# The iteration is now trained. Publish it to the project endpoint
trainer.publish_iteration(project.id, iteration.id, publish_iteration_name, prediction_resource_id)
print ("Done!")
```

```
Done!
```

Once the training is published, we now use the test images to predict and classify the image. In the below code, I have used the image of a mango and the prediction shows that it’s 100% mango.

Test the prediction endpoint

In [35]:
```
# Now there is a trained endpoint that can be used to make a prediction
prediction_credentials = ApiKeyCredentials(in_headers={"Prediction-key": prediction_key})
predictor = CustomVisionPredictionClient(PredictionENDPOINT, prediction_credentials)

with open(os.path.join (base_image_location, "Test/test_image.jpg"), "rb") as image_contents:
    results = predictor.classify_image(
        project.id, publish_iteration_name, image_contents.read())

    # Display the results.
    for prediction in results.predictions:
        print("\t" + prediction.tag_name +
              ": {0:.2f}%".format(prediction.probability * 100))
```

```
	Mango: 100.00%
	Apple: 0.00%
```

In the below code, I have used the image of an apple and the prediction shows that it's 100% apple.

In [36]:
```
# Now there is a trained endpoint that can be used to make a prediction
prediction_credentials = ApiKeyCredentials(in_headers={"Prediction-key": prediction_key})
predictor = CustomVisionPredictionClient(PredictionENDPOINT, prediction_credentials)

with open(os.path.join (base_image_location, "Test/test.jpg"), "rb") as image_contents:
    results = predictor.classify_image(
        project.id, publish_iteration_name, image_contents.read())

    # Display the results.
    for prediction in results.predictions:
        print("\t" + prediction.tag_name +
              ": {0:.2f}%".format(prediction.probability * 100))
```

```
	Apple: 100.00%
	Mango: 0.00%
```

Now, I have written a code to upload the image from the local drive-in runtime. Here, we must copy and paste the directory of the actual test image folder and the test image filename. Once the input is given, the image is classified, and prediction is displayed.

> #Task 4: Make a small code toolkit where you upload the image in runtime and it performs classification. #You have to use same ipynb file to perform the task. (40%)

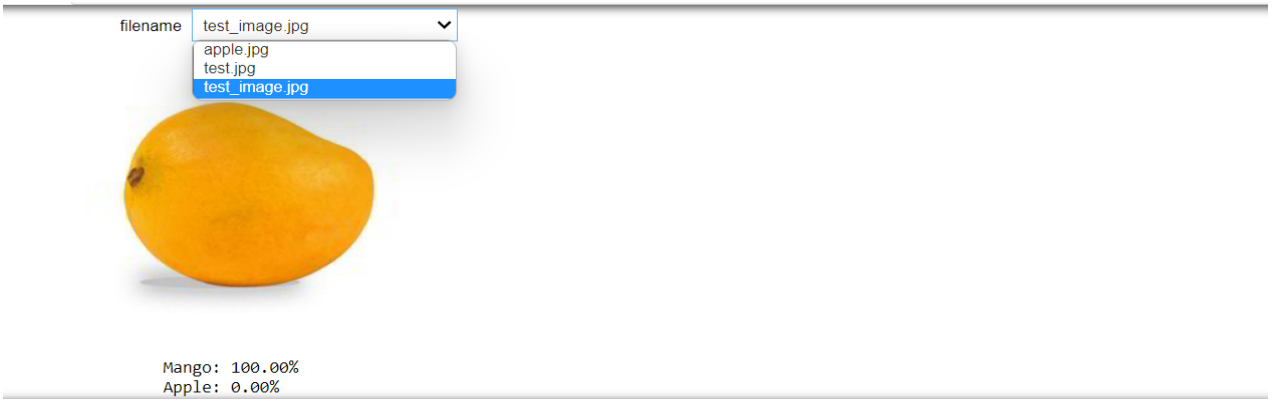
In [48]:
```
# below is a way to dynamically upload the image by giving image directory and image file name as input to perform classificatio
prediction_credentials = ApiKeyCredentials(in_headers={"Prediction-key": prediction_key})
predictor = CustomVisionPredictionClient(PredictionENDPOINT, prediction_credentials)

import os
base_image_location1 = input("Enter test image directory path ")
base_image_location1 = str(base_image_location1).replace(os.path.sep, '/') + '/'
image = input("Enter jpg image filename without extention ") + '.jpg'

with open(os.path.join (base_image_location1, image), "rb") as image_contents:
    results = predictor.classify_image(
        project.id, publish_iteration_name, image_contents.read())

    # Display the results.
    for prediction in results.predictions:
        print("\t" + prediction.tag_name +
              ": {0:.2f}%".format(prediction.probability * 100))
```

```
Enter test image directory path C:/Users/badda/Downloads/Data1/Images/Test/
Enter jpg image filename without extention apple
	Apple: 100.00%
	Mango: 0.00%
```

Below is one more way to dynamically upload images in the runtime. Here we can directly select the images from the dropdown as shown below from the file directory that has been passed to the “filedir” variable in the below code.

In [51]:
```
#Below is one more way to uplaod images at runtime to perform classification

import os
from IPython.display import Image
import ipywidgets as widgets
from ipywidgets import interact, interact_manual

#download anu image to the below directory
filedir = "C:/Users/badda/Downloads/Data1/Images/Test/"

#below function is used to select the image at runtime
@interact
def show_images(filename=os.listdir(filedir)):
    display(Image(filedir+filename))
    with open(os.path.join (filedir, filename), "rb") as image_contents:
        results = predictor.classify_image(
        project.id, publish_iteration_name, image_contents.read())

    # Display the results.
    for prediction in results.predictions:
        print("\t" + prediction.tag_name +
              ": {0:.2f}%".format(prediction.probability * 100))
```

We can download and save any number of images into the file directory mentioned in the code to display in the drop-down. We can select any image from the drop-down. When we dynamically change the images, that image is classified and a prediction is printed for that image that has been selected.



ICE-4

filename apple.jpg

```
Apple: 100.00%
Mango: 0.00%
```

filename test_image.jpg

```
Mango: 100.00%
Apple: 0.00%
```