Logo Detection using AI for Enhanced Targeted Marketing

Team Introduction

Section: 001

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Introduction

- In today's world, images and visual content have become powerful mediums for communication, and people are capturing images everywhere using their smartphones and other devices.
- With the growing number of images captured every day, businesses are interested in utilizing these images to analyze consumer behavior and to better streamline their marketing efforts and campaigns.
- Logo detection using AI can be a useful solution to fill this gap in targeted advertising. This report describes the problem that we intend to solve using the logo detection approach, why it is important, and how it can be a good candidate for an AI solution.

Use Case

- The project we are working on is Logo Detection using AI for Enhanced Targeted Marketing.
- The problem we aim to solve is the difficulty businesses face in analyzing the vast amount of visual content available to them for targeted advertising. With the increasing number of images being captured daily, it is soon going to be an insurmountable challenge for companies to analyze these images manually and gain insights into consumer behavior.
- Logo detection using AI can be a useful solution to fill this gap in targeted advertising. By detecting brand logos in images, businesses can analyze consumer behavior and better target their marketing campaigns.
- There is a need for a tool that can detect logos in these images for marketing and demographic clustering. By detecting logos, time-appropriate targeted marketing can be done based on the object detection results. Demographic grouping and location grouping can also be performed, and time stamps can be obtained for metadata from surveillance images.

Importance of the Problem:

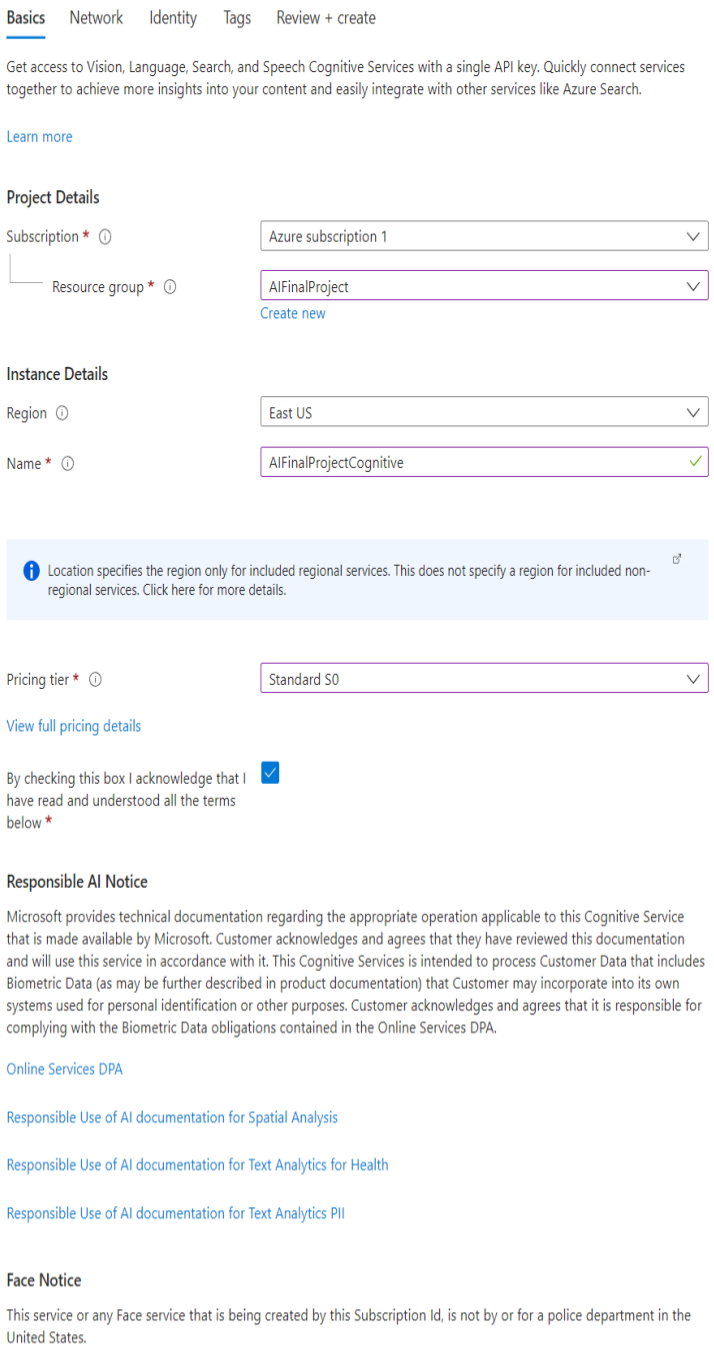
- The problem we are trying to solve is important because it is key to staying relevant and up to speed for any business to remain or reach the top in their sector, it can help businesses better target their marketing campaigns and analyze consumer behavior.
- By detecting logos in images, businesses can perform demographic and location-based grouping, time-stamp metadata, and perform sentiment analysis. This information can then be used to enhance their marketing campaigns, improve sales, and better understand their customers. Therefore, the logo detection problem is an excellent candidate for an AI solution.

Making and Implementation of the Model:

- The task we set out to achieve was to develop a logo detection model using AI.

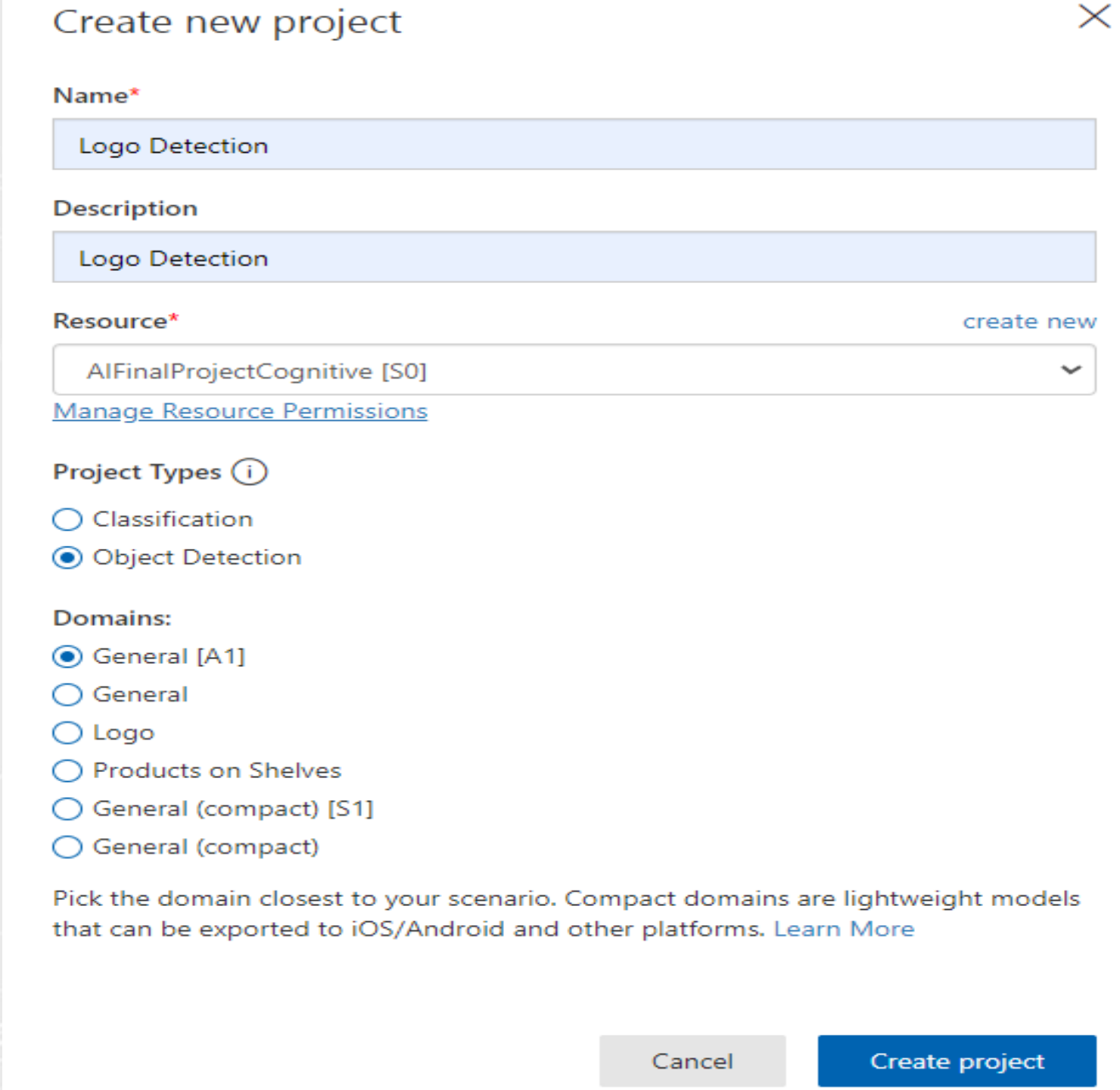
Step 1: Create Cognitive Services on Microsoft Azure Portal

Creating Cognitive Services on the Microsoft Azure Portal involves setting up cloud-based APIs and services that can be used to build intelligent applications that can see, hear, speak, and understand natural language. These services provide pre-built algorithms for various AI tasks, such as image and speech recognition, language understanding, and more.



Step 2: Creating the Project on Azure Portal

Creating the project on the Azure Portal involves creating a new resource group, selecting the relevant cognitive service, and setting up the required parameters, such as pricing tier and region.

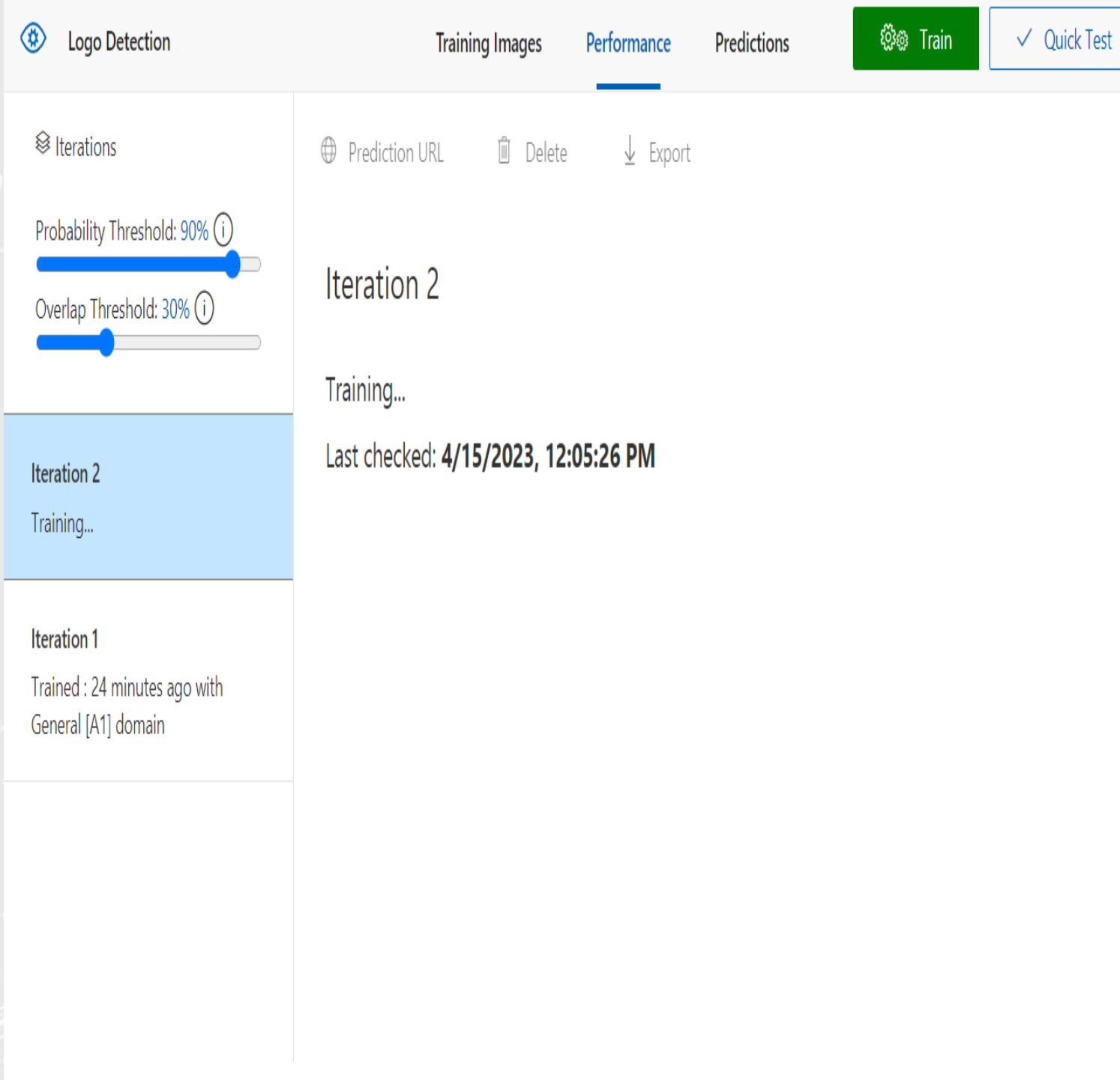


Step 3: Uploading and Tagging of the Images for Training

In this step, the images that will be used to train the AI model are uploaded to the Azure portal and tagged with appropriate labels. This is necessary for the model to learn and recognize the images accurately. We should ensure that there is a balance between the number of images provided for each logo (in our case) and that a minimum of 15 images per logo have been uploaded and tagged.

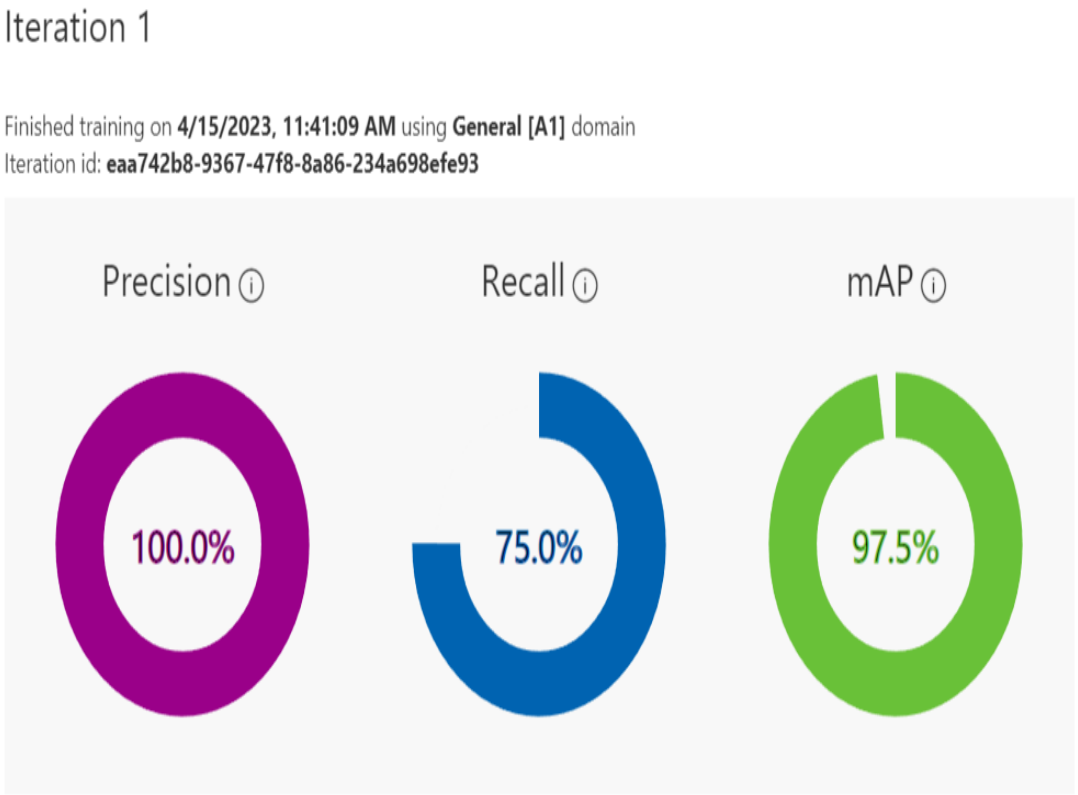
Retraining the images for better accuracy

- Added a few more images in iteration 2 and trained it for better results.



Step 4: Custom Vision Logo Detection – Performance.

This next step involves using the Custom Vision service provided by Microsoft to train the model for logo detection. Custom Vision is a cloud-based service that enables the creation and training of custom image classifiers using pre-built models or by building custom models from scratch. This step focuses on training the model with the tagged images uploaded in Step 3 and evaluating its performance.

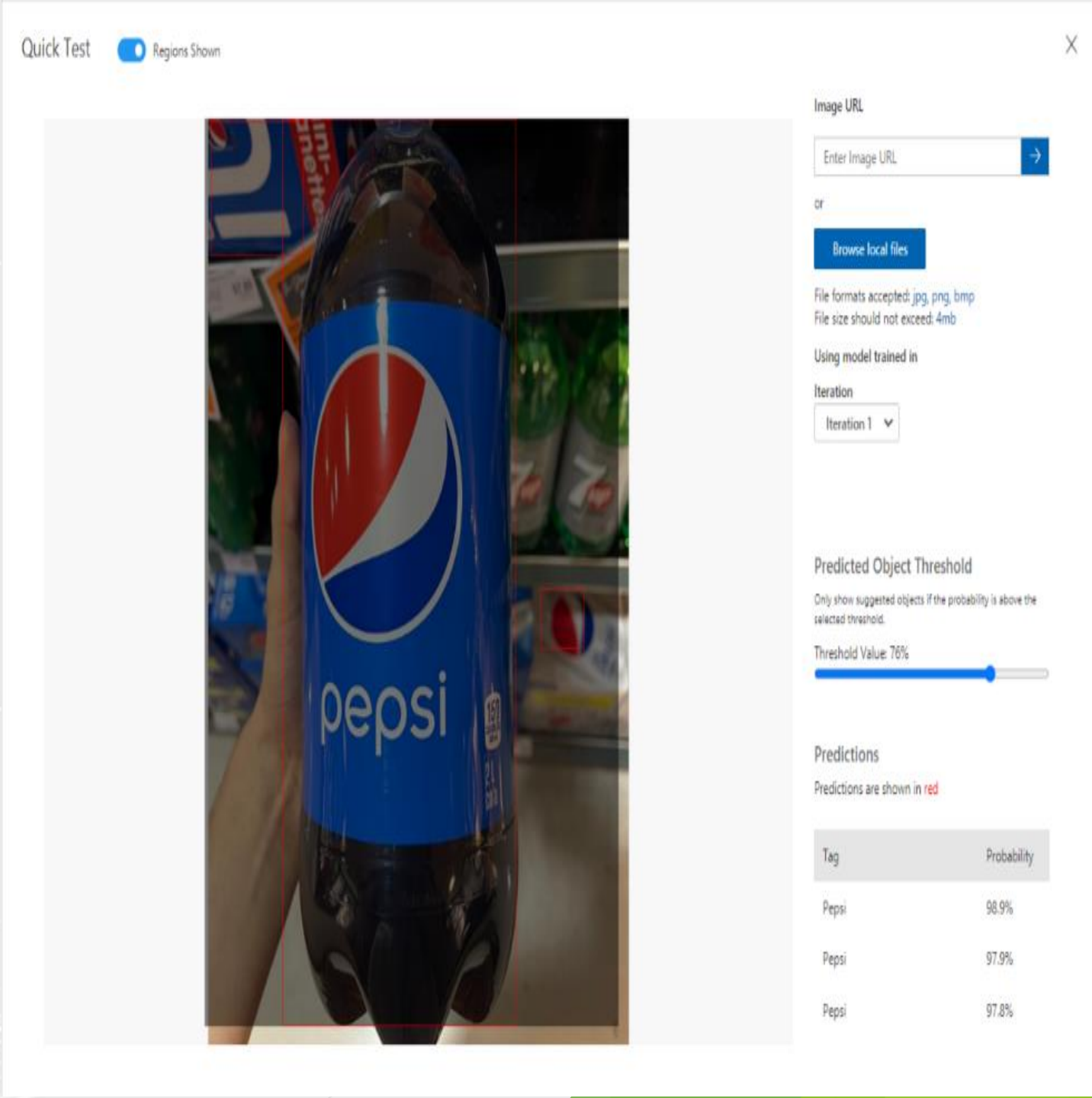


Performance Per Tag

Tag	Precision	Recall	A.P.	Image count
Coca cola	100.0%	75.0%	95.0%	21
Pepsi	100.0%	75.0%	100.0%	20

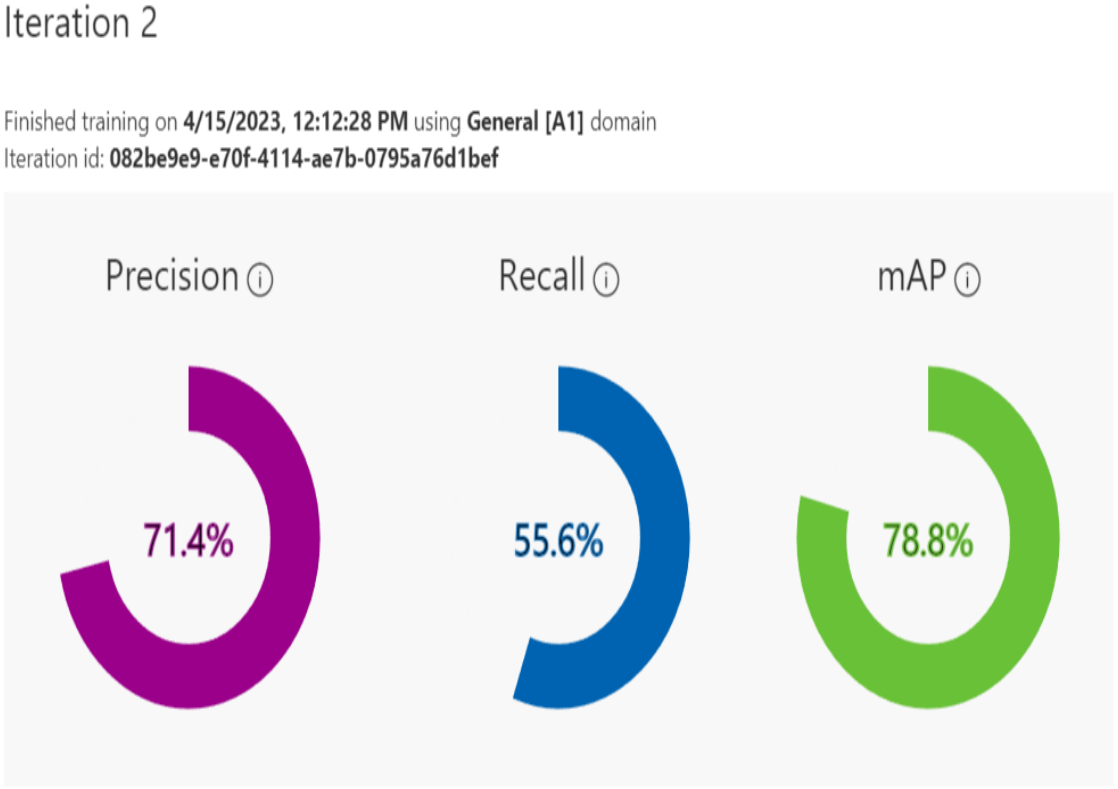
Step 5: Logo Detection – Testing

In this step, the Custom Vision service is used to test the logo detection model. The model is evaluated using a set of test images, and its performance is measured in terms of precision, recall as seen above, this then proceeds to return the result for a test image with results.



Step 6: Logo Detection - Performance Retraining

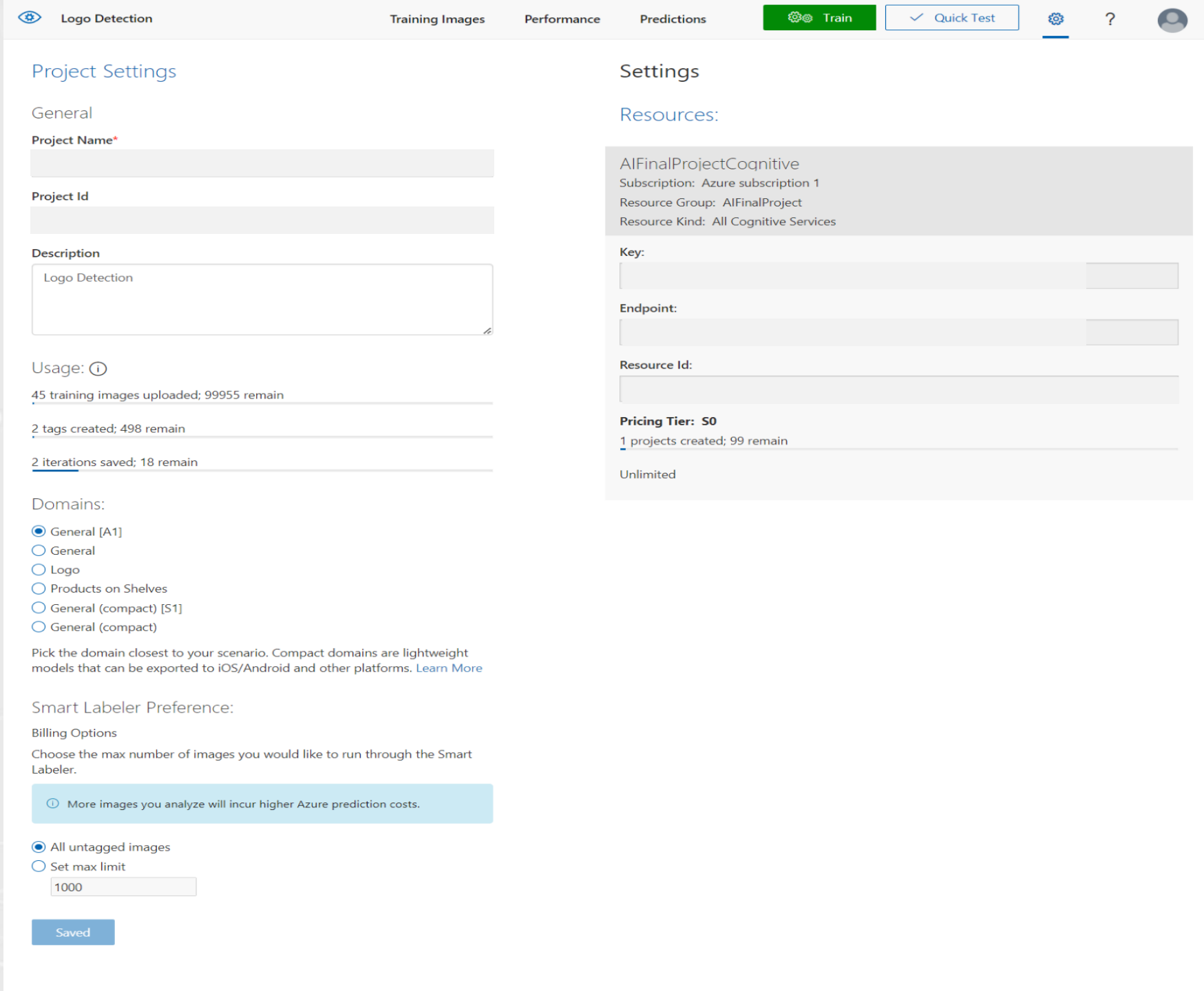
This isn’t traditionally always the case but based on our end requirement we proceeded to do a second iteration of our model and necessary retraining with the required images.



Step 7: Keys and Endpoint

"Keys and Endpoint" is a crucial step in the process of using Custom Vision for logo detection. Once the Custom Vision model is trained, you will need to obtain the keys and endpoint for your project, which will allow you to programmatically access the model through the Custom Vision API. This step involves navigating to the "Keys and Endpoint" tab in the Custom Vision project dashboard and copying the necessary information to use in your code.

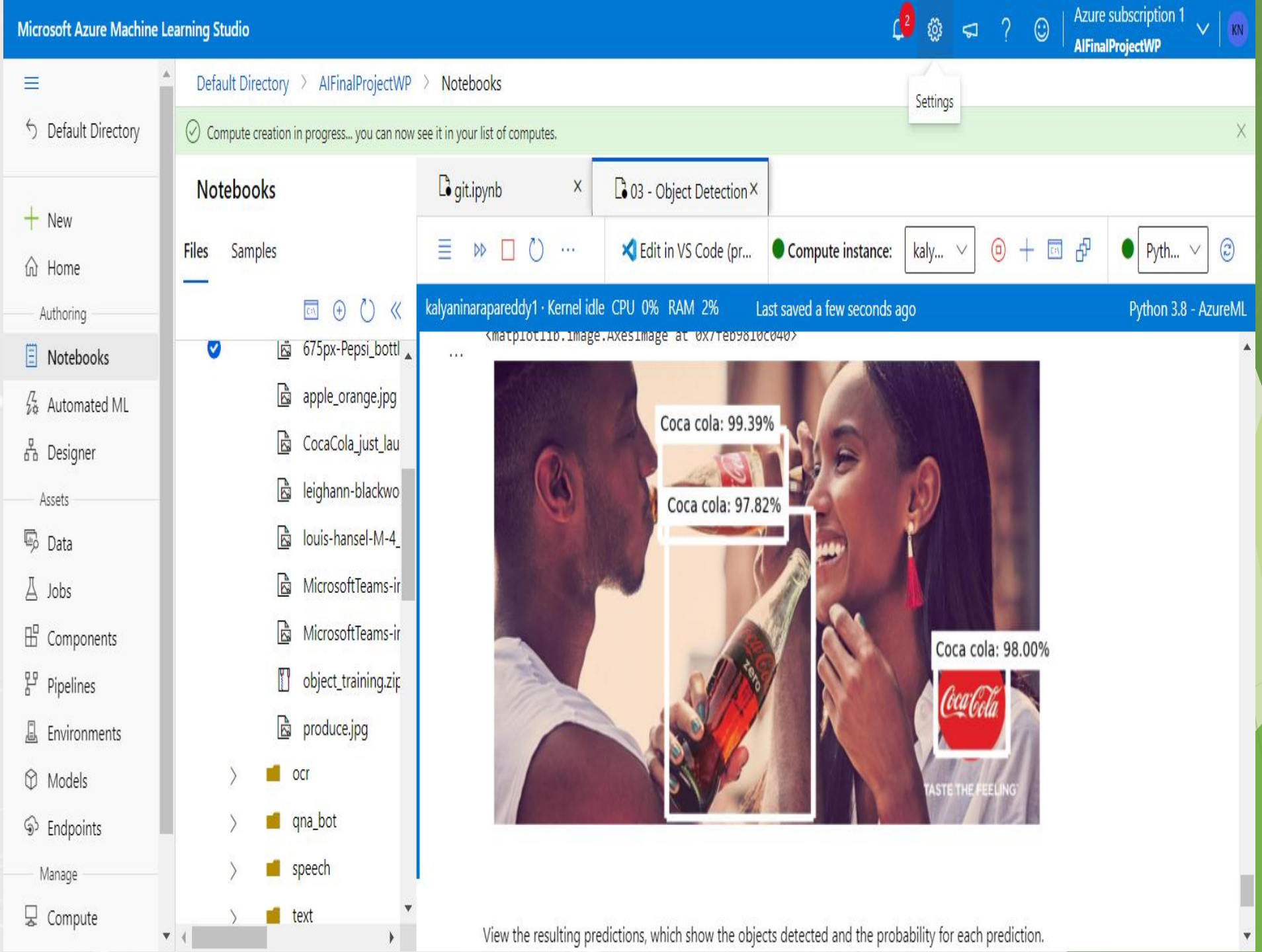
Step 7:


Logo Detection
Training Images
Performance
Predictions
Train
Quick Test
Project Settings
General
Project Name*
Project Id
Description
Logo Detection
Usage:
45 training images uploaded; 99955 remain
2 tags created; 498 remain
2 iterations saved; 18 remain
Domains:
General [A1]
General
Logo
Products on Shelves
General (compact) [S1]
General (compact)
Pick the domain closest to your scenario. Compact domains are lightweight models that can be exported to iOS/Android and other platforms. Learn More
Smart Labeler Preference:
Billing Options
Choose the max number of images you would like to run through the Smart Labeler.
More images you analyze will incur higher Azure prediction costs.
All untagged images
Set max limit
1000
Saved
Settings
Resources:
AIFinalProjectCognitive
Subscription: Azure subscription 1
Resource Group: AIFinalProject
Resource Kind: All Cognitive Services
Key:
Endpoint:
Resource Id:
Pricing Tier: S0
1 projects created; 99 remain
Unlimited

Step 8: Implementing Logo Detection in Python Notebook

After obtaining the API keys and endpoints, the next step is to implement the logo detection functionality in a Python notebook. This involves importing the necessary libraries, initializing the endpoint and keys, and creating a function that takes an image URL as input and returns the logo detection results. The notebook can also be used to test the functionality and tweak the parameters for optimal performance.

Step 8:


Microsoft Azure Machine Learning Studio
Azure subscription 1
AIFinalProjectWP
Settings
Default Directory
Default Directory > AIFinalProjectWP > Notebooks
Compute creation in progress... you can now see it in your list of computes.
New
Home
Authoring
Notebooks
Automated ML
Designer
Assets
Data
Jobs
Components
Pipelines
Environments
Models
Endpoints
Manage
Compute
Notebooks
Files
Samples
675px-Pepsi_bottl
apple_orange.jpg
CocaCola_just_lau
leighann-blackwo
louis-hansel-M-4_
MicrosoftTeams-ir
MicrosoftTeams-ir
object_training.zip
produce.jpg
ocr
qna_bot
speech
text
git.ipynb
03 - Object Detection
Edit in VS Code (pr...
Compute instance:
kaly...
Pyth...
kalyaninarapareddy1 · Kernel idle CPU 0% RAM 2%
Last saved a few seconds ago
Python 3.8 - AzureML
<matplotlib.image.AxesImage at 0x7feb9810c040>
Coca cola: 99.39%
Coca cola: 97.82%
Coca cola: 98.00%
TASTE THE FEELING
View the resulting predictions, which show the objects detected and the probability for each prediction.

Step 9: Prediction Testing

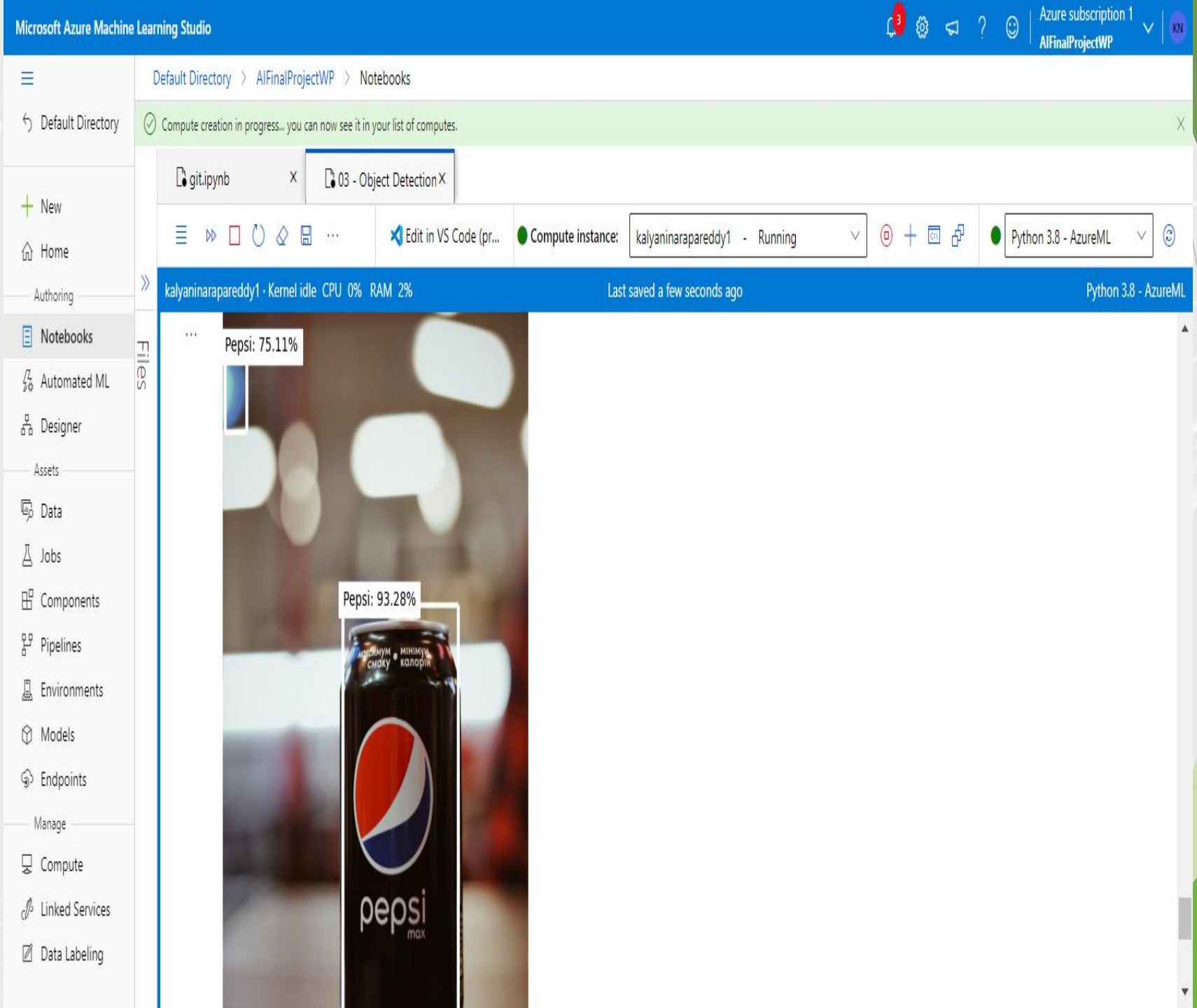
The logical next step would typically involve testing the model by making predictions on new, unseen data.

This can be done by running the testing code in the Jupyter Notebook or in a separate testing script.

In the case of Pepsi logo detection, we gave the model an image(URL) as input, and it produced an output prediction indicating whether the image contains the Pepsi logo or not.

It's important to note that the accuracy of the model can be evaluated using metrics such as precision, and recall. If the model does not perform well on the testing data, it may be necessary to refine the training data or adjust the model parameters and retrain the model.

Step 9:


Microsoft Azure Machine Learning Studio
Azure subscription 1
AIFinalProjectWP
Default Directory
Default Directory > AIFinalProjectWP > Notebooks
Compute creation in progress... you can now see it in your list of computes.
git.ipynb
03 - Object Detection
New
Home
Authoring
Notebooks
Automated ML
Designer
Assets
Data
Jobs
Components
Pipelines
Environments
Models
Endpoints
Manage
Compute
Linked Services
Data Labeling
Files
Edit in VS Code (pr...
Compute instance:
kalyaninarapareddy1 - Running
Python 3.8 - AzureML
kalyaninarapareddy1 - Kernel idle CPU 0% RAM 2%
Last saved a few seconds ago
Python 3.8 - AzureML
Pepsi: 75.11%
Pepsi: 93.28%
pepsi
max

Step 10: Deployment of the Model

To deploy the model, we used a web framework called Django to create a web application that allows users to upload images and receive predictions for the detection of the Pepsi/Coca-Cola logo. The model was integrated into the application using the endpoints generated in Azure Custom Vision.

Step 10:

C:\Windows\System32\cmd.exe

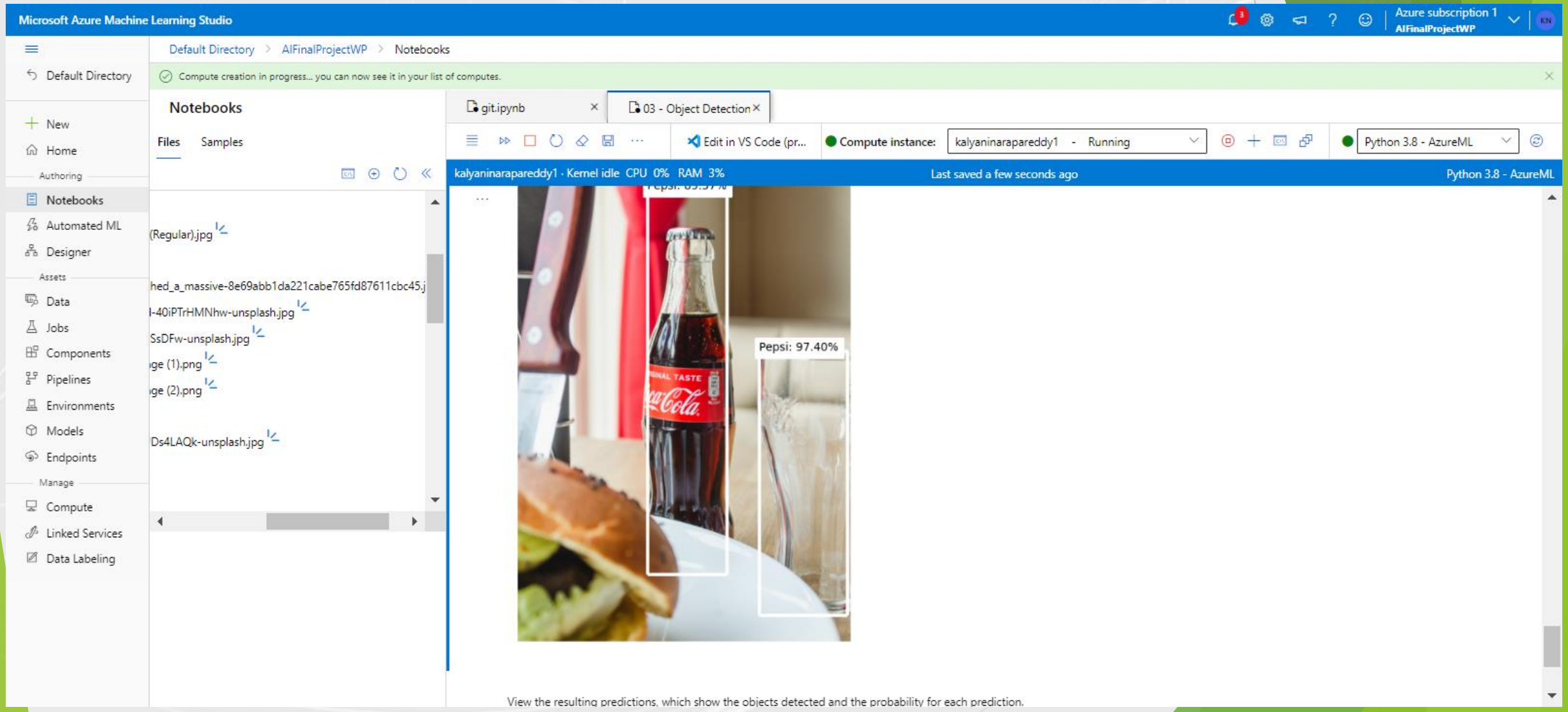
```
Microsoft Windows [Version 10.0.19045.2846]
(c) Microsoft Corporation. All rights reserved.

C:\Users\Admin\OneDrive - St. Clair College\Documents\DAB\DAB106 Assignment>pip install Django
Collecting Django
  Downloading Django-4.2-py3-none-any.whl (8.0 MB)
     ---------------------------------------- 8.0/8.0 MB 34.1 MB/s eta 0:00:00
Collecting asgiref<4,>=3.6.0
  Downloading asgiref-3.6.0-py3-none-any.whl (23 kB)
Collecting sqlparse>=0.3.1
  Downloading sqlparse-0.4.3-py3-none-any.whl (42 kB)
     ---------------------------------------- 42.8/42.8 kB ? eta 0:00:00
Requirement already satisfied: tzdata in c:\users\admin\appdata\local\programs\python\python311\lib\site-packages (from Django) (2023.3)
Installing collected packages: sqlparse, asgiref, Django
Successfully installed Django-4.2 asgiref-3.6.0 sqlparse-0.4.3

[notice] A new release of pip available: 22.3.1 -> 23.1
[notice] To update, run: python.exe -m pip install --upgrade pip

C:\Users\Admin\OneDrive - St. Clair College\Documents\DAB\DAB106 Assignment>pip install azure-cognitiveservices-vision-customvision
Collecting azure-cognitiveservices-vision-customvision
  Downloading azure_cognitiveservices_vision_customvision-3.1.0-py2.py3-none-any.whl (62 kB)
     ---------------------------------------- 62.0/62.0 kB 3.2 MB/s eta 0:00:00
Collecting msrest>=0.5.0
  Downloading msrest-0.7.1-py3-none-any.whl (85 kB)
     ---------------------------------------- 85.4/85.4 kB 4.7 MB/s eta 0:00:00
Collecting azure-common~=1.1
  Downloading azure_common-1.1.28-py2.py3-none-any.whl (14 kB)
Collecting azure-core>=1.24.0
  Downloading azure_core-1.26.4-py3-none-any.whl (173 kB)
     ---------------------------------------- 173.9/173.9 kB 10.2 MB/s eta 0:00:00
Requirement already satisfied: certifi>=2017.4.17 in c:\users\admin\appdata\local\programs\python\python311\lib\site-packages (from msrest>=0.5.0->azure-cognitiveservices-visi
on-customvision) (2022.12.7)
Collecting isodate>=0.6.0
  Downloading isodate-0.6.1-py2.py3-none-any.whl (41 kB)
     ---------------------------------------- 41.7/41.7 kB ? eta 0:00:00
Collecting requests-oauthlib>=0.5.0
  Downloading requests_oauthlib-1.3.1-py2.py3-none-any.whl (23 kB)
Requirement already satisfied: requests~=2.16 in c:\users\admin\appdata\local\programs\python\python311\lib\site-packages (from msrest>=0.5.0->azure-cognitiveservices-vision-c
ustomvision) (2.21.0)
Requirement already satisfied: six>=1.11.0 in c:\users\admin\appdata\local\programs\python\python311\lib\site-packages (from azure-core>=1.24.0->msrest>=0.5.0->azure-cognitive
```

Limitations:

One of the limitations at this rudimentary stage of our model of logo detection using AI is that the logo is detected by pixel and color grading, and if the quality of the image is out of the threshold, it may not be detected accurately. Therefore, it is essential to feed the model with different images of the same brand logo to lower the threshold and maintain the same accuracy.

Our solution involved two iterations to test the accuracy and ensure the model acted as expected. One challenge we faced was that a Coca-Cola image was detected as Pepsi because of the type of logo specimens used for training. We made changes to the training dataset to improve the accuracy of the model(Iteration 2).

Yet there is a limitation to overcome: the glass bottle is recognized from the shape of the fed training images for the Pepsi logo.



Results and Opportunities for Improvement:

While we did not entirely solve the logo detection problem, we are on the right track. We learned that feeding the model with different kinds of images of the same brand logo can lower the threshold and still maintain the same accuracy.

In the future, B2B companies may be interested in using this tool for their analysis for better marketing, and it would be effective to keep track of the post-results of any targeted campaigns. Additionally, age detection can be done for platforms' enhanced/segregated target ads, and sentiment analysis can be performed down the line.

Conclusion of the project:

Logo detection using AI is a useful solution to fill the gap in advertising and targeting. It can help businesses better target their marketing campaigns, analyze consumer behavior, and improve sales.

While there are limitations to this approach, we are on the right track, and further improvements can be made by feeding the model with different kinds of images of the same brand logo.

Logo Detection using AI for Enhanced Targeted Marketing is a project that can greatly benefit businesses by improving their marketing strategies and providing valuable insights into consumer behavior.

With AI-powered logo detection, companies can target their campaigns more effectively and stay ahead of the competition.

Report Writing on Ethical Implications of AI- A Glimpse:

Bias: AI systems may learn and perpetuate biases from the data they are trained on, which can lead to unfair and discriminatory outcomes for certain groups.

Privacy: The collection and use of personal data by AI systems can raise concerns about privacy and data protection.

Accountability: Determining responsibility for decisions made by AI systems can be challenging, particularly in cases where the system is designed to learn and evolve over time.

Job displacement: The increased use of AI and automation can lead to job displacement and the need for reskilling and upskilling.

Accessibility: AI systems can potentially widen or narrow educational opportunities depending on their design and implementation. For example, AI-powered educational tools may not be accessible to students with disabilities if they are not designed with accessibility in mind. This raises concerns about equity and access to education.

Questions?

Thank you!