



Logo Detection using AI for Enhanced Targeted Marketing

Team Introduction

Section: 001

Group number: 02



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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.

[Basics](#) [Network](#) [Identity](#) [Tags](#) [Review + create](#)

Get access to Vision, Language, Search, and Speech Cognitive Services with a single API key. Quickly connect services together to achieve more insights into your content and easily integrate with other services like Azure Search.

[Learn more](#)

Project Details

Subscription * ⓘ

Resource group * ⓘ [Create new](#)

Instance Details

Region ⓘ

Name * ⓘ ✓

i Location specifies the region only for included regional services. This does not specify a region for included non-regional services. [Click here for more details.](#)

Pricing tier * ⓘ

[View full pricing details](#)

By checking this box I acknowledge that I ☒ have read and understood all the terms below *

Responsible AI Notice

Microsoft provides technical documentation regarding the appropriate operation applicable to this Cognitive Service that is made available by Microsoft. Customer acknowledges and agrees that they have reviewed this documentation and will use this service in accordance with it. This Cognitive Services is intended to process Customer Data that includes Biometric Data (as may be further described in product documentation) that Customer may incorporate into its own systems used for personal identification or other purposes. Customer acknowledges and agrees that it is responsible for complying with the Biometric Data obligations contained in the Online Services DPA.

[Online Services DPA](#)

[Responsible Use of AI documentation for Spatial Analysis](#)

[Responsible Use of AI documentation for Text Analytics for Health](#)

[Responsible Use of AI documentation for Text Analytics PII](#)

Face Notice

This service or any Face service that is being created by this Subscription Id, is not by or for a police department in the United States.

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.

×

Create new project

Name*

Logo Detection

Description

Logo Detection

Resource*

create new

AlFinalProjectCognitive [S0]

[Manage Resource Permissions](#)

Project Types ⓘ

☐ Classification

☒ Object Detection

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](#)

Cancel

Create project

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.



My Objects

Coca cola X

Pepsi X

Retraining the images for better accuracy

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

Logo Detection

Training ImagesPerformancePredictionsTrainQuick Test

Iterations

Prediction URLDeleteExport

Iteration 2

Training...

Last checked: 4/15/2023, 12:05:26 PM

Probability Threshold: 90%

Overlap Threshold: 30%

Iteration 1

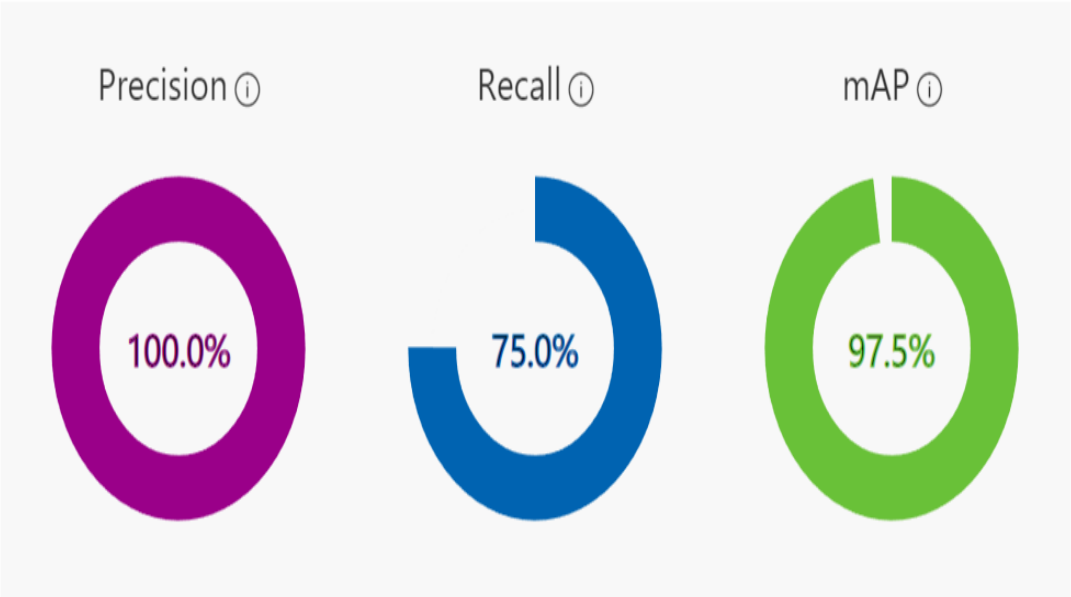
Trained : 24 minutes ago with General [A1] domain

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.

Iteration 1

Finished training on 4/15/2023, 11:41:09 AM using General [A1] domain
Iteration id: eaa742b8-9367-47f8-8a86-234a698efe93



Performance Per Tag

Tag	Precision ^	Recall	A.P.	Image count
Coca cola	100.0%	75.0%	95.0%	21 <div></div>
Pepsi	100.0%	75.0%	100.0%	20 <div></div>

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.

Quick Test

Regions Shown



Image URL

Enter Image URL



or

Browse local files

File formats accepted: jpg, png, bmp

File size should not exceed: 4mb

Using model trained in

Iteration

Iteration 1

Predicted Object Threshold

Only show suggested objects if the probability is above the selected threshold.

Threshold Value: 76%

Predictions

Predictions are shown in red

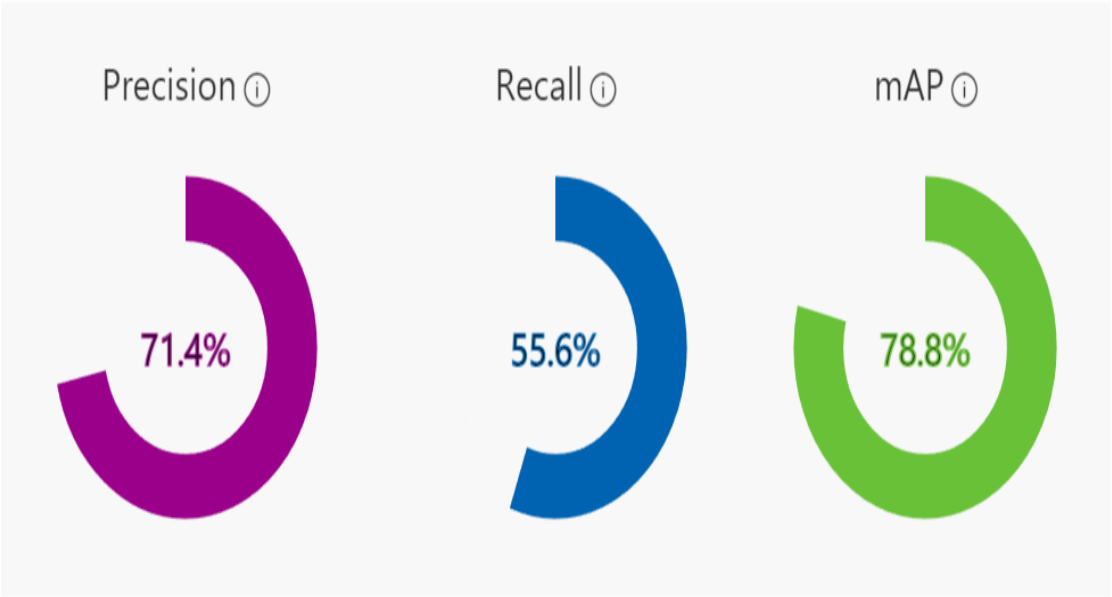
Tag	Probability
Pepsi	98.9%
Pepsi	97.9%
Pepsi	97.8%

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.

Iteration 2

Finished training on 4/15/2023, 12:12:28 PM using General [A1] domain
Iteration id: 082be9e9-e70f-4114-ae7b-0795a76d1bef



Performance Per Tag

Tag	Precision ^	Recall	A.P.	Image count
Coca cola	75.0%	60.0%	84.3%	26 <div></div>
Pepsi	66.7%	50.0%	73.3%	20 <div></div>

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:

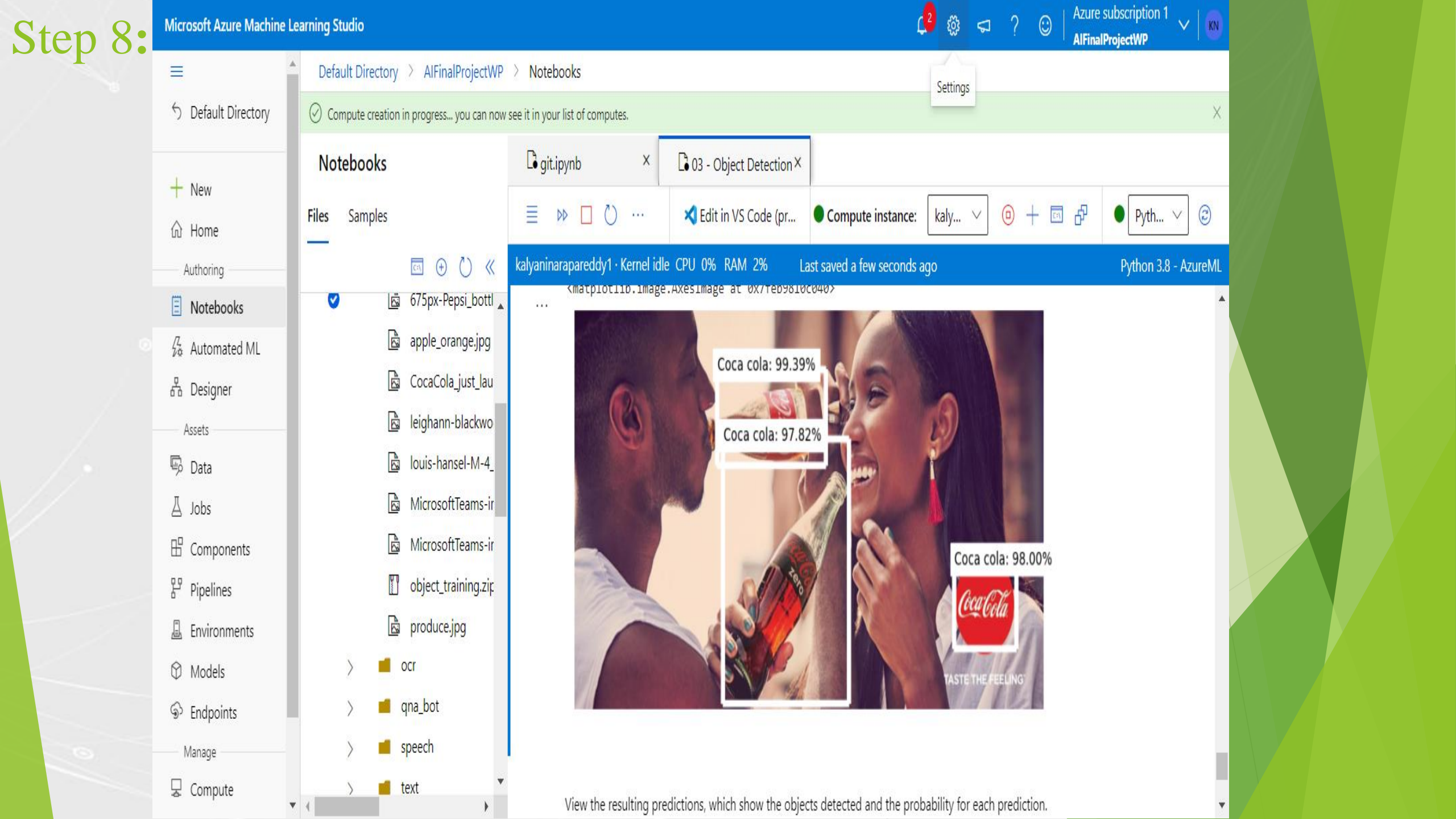
Pricing Tier: S0

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:

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

Default Directory > AIFinalProjectWP > Notebooks

Compute creation in progress... you can now see it in your list of computes.

git.ipynb x 03 - Object DetectionX

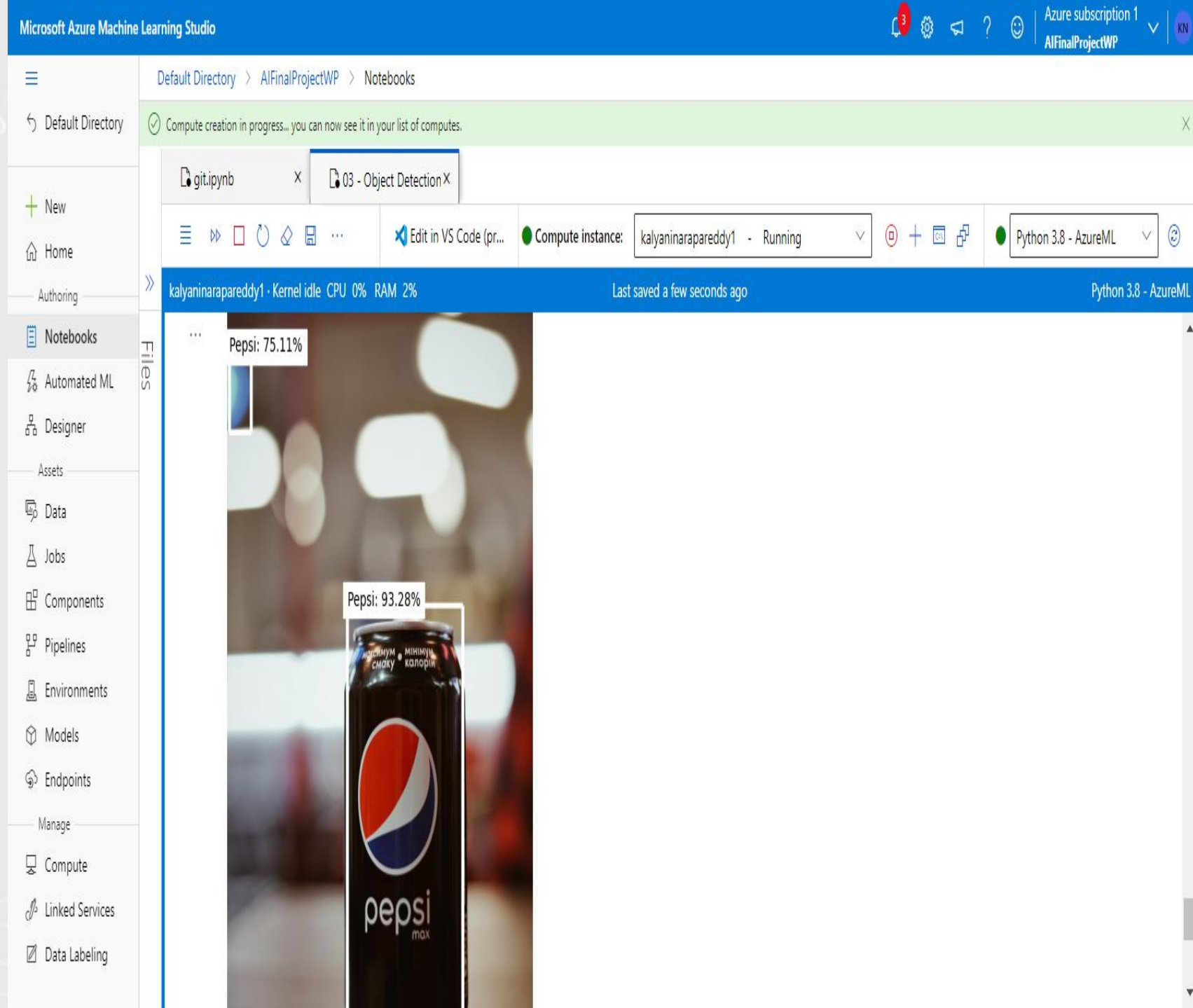
Edit in VS Code (pr... Compute instance: kalyaninarapareddy1 - Running Python 3.8 - AzureML

kalyaninarapareddy1 · Kernel idle CPU 0% RAM 2% Last saved a few seconds ago Python 3.8 - AzureML

Files

Pepsi: 75.11%

Pepsi: 93.28%



The screenshot displays the Microsoft Azure Machine Learning Studio interface. The top navigation bar shows the current path as 'Default Directory > AIFinalProjectWP > Notebooks'. A green notification banner indicates 'Compute creation in progress... you can now see it in your list of computes.' The left sidebar contains a 'Files' pane with a list of items: 'git.ipynb' and '03 - Object DetectionX'. Below this is a toolbar with icons for editing and running code. The main workspace area shows a Jupyter Notebook titled '03 - Object DetectionX'. The notebook content displays two images of a Pepsi can. The first image has a bounding box with a confidence score of 'Pepsi: 75.11%'. The second image has a bounding box with a confidence score of 'Pepsi: 93.28%'. The interface also shows a 'Compute instance' dropdown set to 'kalyaninarapareddy1 - Running' and a 'Python 3.8 - AzureML' environment. The bottom status bar indicates the kernel is idle, CPU usage is 0%, and RAM usage is 2%.

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-vision-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-customvision) (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.

Microsoft Azure Machine Learning Studio

Default Directory > AIFinalProjectWP > Notebooks

Compute creation in progress... you can now see it in your list of computes.

Notebooks

Files Samples

git.ipynb 03 - Object Detection

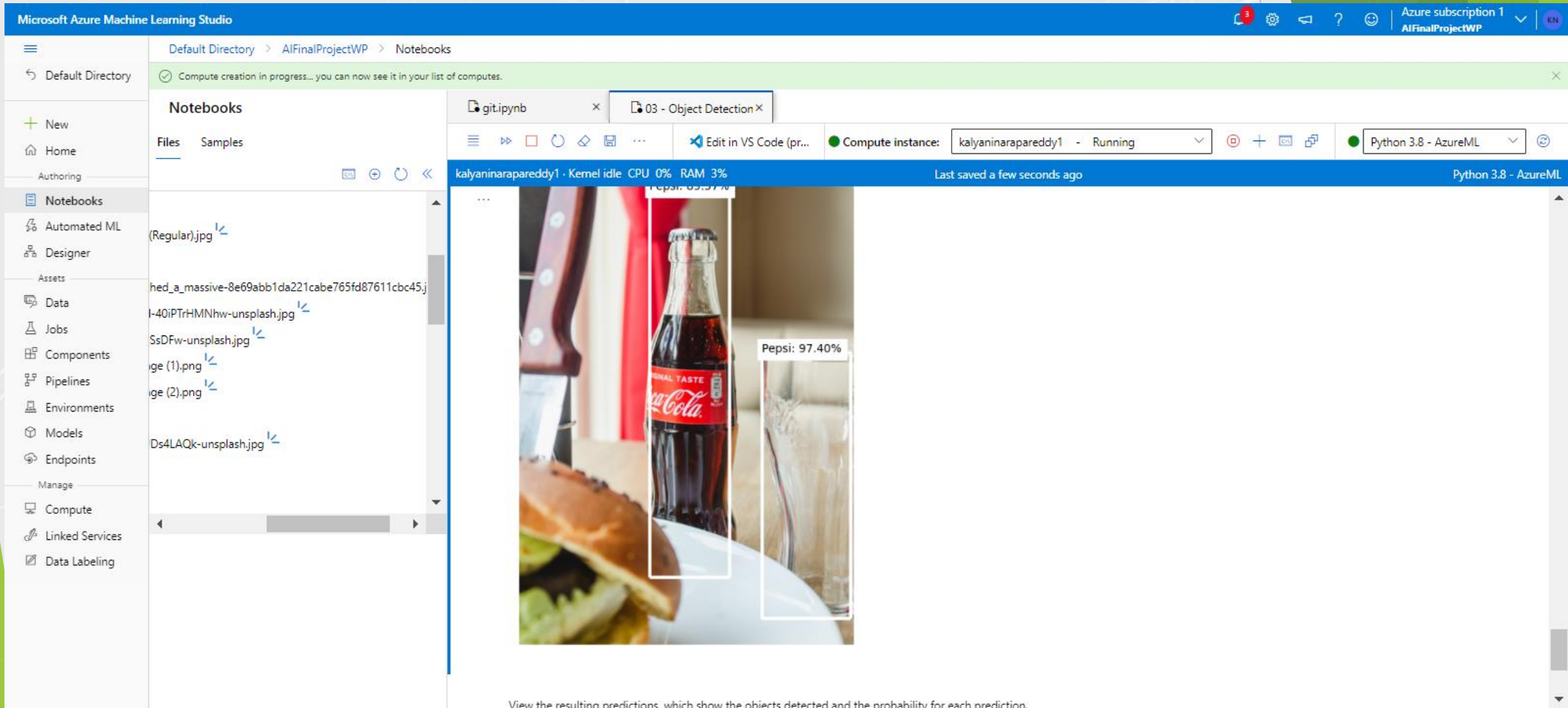
Edit in VS Code (pr...) Compute instance: kalyaninarapareddy1 - Running Python 3.8 - AzureML

kalyaninarapareddy1 · Kernel idle CPU: 0% RAM: 3% Last saved a few seconds ago Python 3.8 - AzureML

(Regular).jpg
hed_a_massive-8e69abb1da221cabe765fd87611cbc45.j
l-40iPTrHMNhw-unsplash.jpg
SsDFw-unsplash.jpg
ge (1).png
ge (2).png
Ds4LAQk-unsplash.jpg

Pepsi: 97.40%

View the resulting predictions, which show the objects detected and the probability for each prediction.

The screenshot displays the Microsoft Azure Machine Learning Studio interface. On the left is a sidebar with navigation options like 'Default Directory', 'New', 'Home', 'Notebooks', 'Automated ML', 'Designer', 'Assets', 'Data', 'Jobs', 'Components', 'Pipelines', 'Environments', 'Models', 'Endpoints', 'Manage', 'Compute', 'Linked Services', and 'Data Labeling'. The main workspace shows a notebook titled '03 - Object Detection'. It features a toolbar with icons for running, saving, and other actions. Below the toolbar, a status bar indicates the compute instance 'kalyaninarapareddy1' is running on 'Python 3.8 - AzureML'. The notebook content shows a list of files in the 'Files' tab, including '(Regular).jpg', 'hed_a_massive-8e69abb1da221cabe765fd87611cbc45.j', 'l-40iPTrHMNhw-unsplash.jpg', 'SsDFw-unsplash.jpg', 'ge (1).png', 'ge (2).png', and 'Ds4LAQk-unsplash.jpg'. The main area displays a photograph of a Pepsi bottle on a table next to a burger. A white bounding box is drawn around the bottle, and a label 'Pepsi: 97.40%' is positioned next to it, indicating the model's prediction and confidence score. At the bottom, a caption reads: 'View the resulting predictions, which show the objects detected and the probability for each prediction.'

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!