

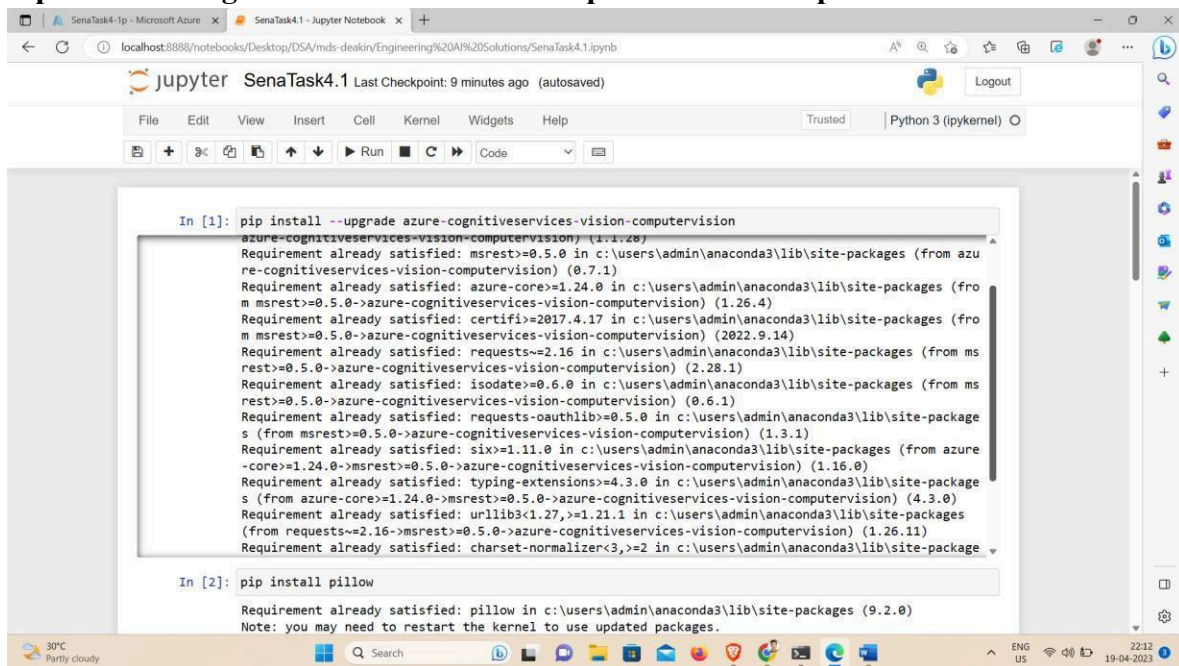
For this task you need to develop a program to detect different objects in images with their rectangles coordinates. To do this task, use the computer vision SDK to detect different objects on Azure. It is recommended to follow the instruction on slides seminar and lecture recording for week 4.

### Submit the following files on Olympus:

- Submit your answers as a PDF file. You need to answer the following parts in your document.
- Please explain cell by cell of your code from reading a local image to object detection, drawing a bounding box around different objects. To complete this task, you need to provide the screenshot of your code and explain cell by cell of the code and explain what sort of API is being used.

### Solution:

#### Step 1: Install cognitive services-vision-computer vision and pillow

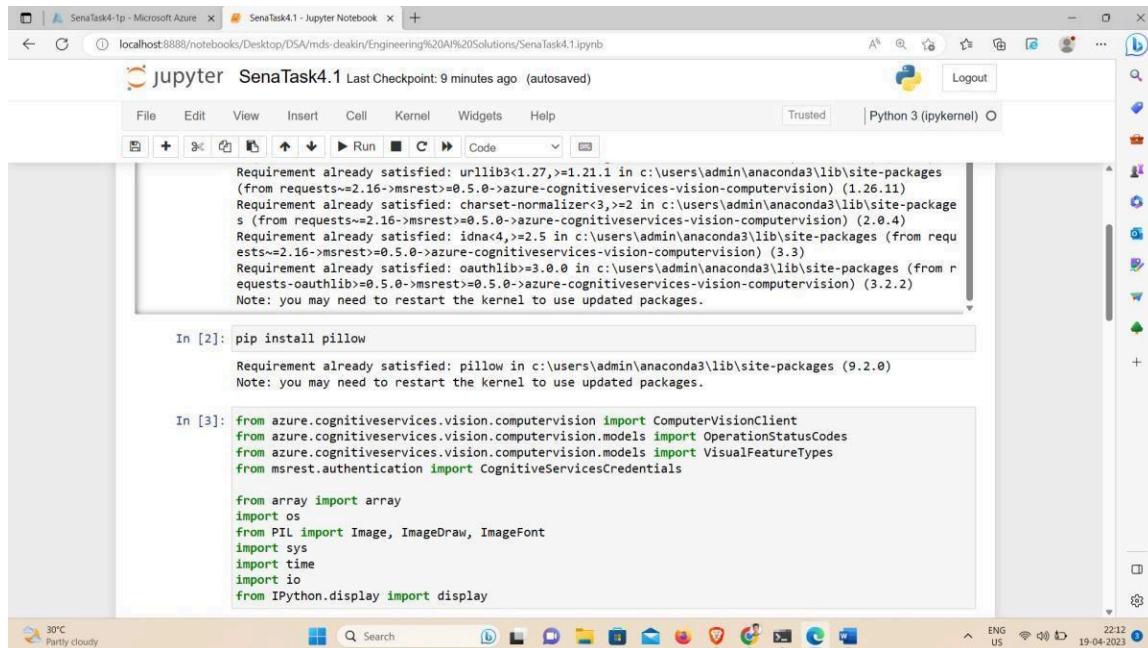


The screenshot shows a Jupyter Notebook window titled 'SenaTask4.1 - Jupyter Notebook'. The interface includes a menu bar (File, Edit, View, Insert, Cell, Kernel, Widgets, Help) and a toolbar with icons for file operations, running cells, and code execution. The notebook content displays two code cells. The first cell, labeled 'In [1]:', contains the command 'pip install --upgrade azure-cognitiveservices-vision-computervision'. The output shows that several dependencies are already satisfied, including msrest, azure-core, certifi, requests, isodate, requests-oauthlib, six, typing-extensions, urllib3, and charset-normalizer. The second cell, labeled 'In [2]:', contains the command 'pip install pillow'. The output indicates that pillow is already satisfied at version 9.2.0. A note at the bottom of the second cell states: 'Note: you may need to restart the kernel to use updated packages.' The bottom of the screen shows a Windows taskbar with the date and time set to 22:12 on 19-04-2023.

```
In [1]: pip install --upgrade azure-cognitiveservices-vision-computervision
azure-cognitiveservices-vision-computervision (1.1.28)
Requirement already satisfied: msrest==0.5.0 in c:\users\admin\anaconda3\lib\site-packages (from azure-cognitiveservices-vision-computervision) (0.7.1)
Requirement already satisfied: azure-core==1.24.0 in c:\users\admin\anaconda3\lib\site-packages (from msrest==0.5.0->azure-cognitiveservices-vision-computervision) (1.26.4)
Requirement already satisfied: certifi>=2017.4.17 in c:\users\admin\anaconda3\lib\site-packages (from msrest==0.5.0->azure-cognitiveservices-vision-computervision) (2022.9.14)
Requirement already satisfied: requests==2.16 in c:\users\admin\anaconda3\lib\site-packages (from msrest==0.5.0->azure-cognitiveservices-vision-computervision) (2.28.1)
Requirement already satisfied: isodate>=0.6.0 in c:\users\admin\anaconda3\lib\site-packages (from msrest==0.5.0->azure-cognitiveservices-vision-computervision) (0.6.1)
Requirement already satisfied: requests-oauthlib==0.5.0 in c:\users\admin\anaconda3\lib\site-packages (from msrest==0.5.0->azure-cognitiveservices-vision-computervision) (1.3.1)
Requirement already satisfied: six>=1.11.0 in c:\users\admin\anaconda3\lib\site-packages (from azure-core==1.24.0->msrest==0.5.0->azure-cognitiveservices-vision-computervision) (1.16.0)
Requirement already satisfied: typing-extensions>=4.3.0 in c:\users\admin\anaconda3\lib\site-packages (from azure-core==1.24.0->msrest==0.5.0->azure-cognitiveservices-vision-computervision) (4.3.0)
Requirement already satisfied: urllib3<1.27,>=1.21.1 in c:\users\admin\anaconda3\lib\site-packages (from requests==2.16->msrest==0.5.0->azure-cognitiveservices-vision-computervision) (1.26.11)
Requirement already satisfied: charset-normalizer<3,>=2 in c:\users\admin\anaconda3\lib\site-packages (from requests==2.16->msrest==0.5.0->azure-cognitiveservices-vision-computervision) (2.0.12)

In [2]: pip install pillow
Requirement already satisfied: pillow in c:\users\admin\anaconda3\lib\site-packages (9.2.0)
Note: you may need to restart the kernel to use updated packages.
```

#### Step 2: Import Libraries



The screenshot shows a Jupyter Notebook window titled 'SenaTask4.1'. The top bar indicates the last checkpoint was 9 minutes ago. The interface includes a menu bar (File, Edit, View, Insert, Cell, Kernel, Widgets, Help) and a toolbar with icons for file operations, running, and code execution. The main area contains two code cells. The first cell shows terminal output for installing dependencies: 'Requirement already satisfied: urllib3<1.27,>=1.21.1 in c:\users\admin\anaconda3\lib\site-packages (from requests~2.16->msrest==0.5.0->azure-cognitiveservices-vision-computervision) (1.26.11)', 'Requirement already satisfied: charset-normalizer<3,>=2 in c:\users\admin\anaconda3\lib\site-packages (from requests~2.16->msrest==0.5.0->azure-cognitiveservices-vision-computervision) (2.0.4)', 'Requirement already satisfied: idna<4,>=2.5 in c:\users\admin\anaconda3\lib\site-packages (from requests~2.16->msrest==0.5.0->azure-cognitiveservices-vision-computervision) (3.3)', 'Requirement already satisfied: oauthlib=3.0.0 in c:\users\admin\anaconda3\lib\site-packages (from requests~2.16->msrest==0.5.0->msrest==0.5.0->azure-cognitiveservices-vision-computervision) (3.2.2)', and a note to restart the kernel. The second cell contains the command 'pip install pillow' and its output: 'Requirement already satisfied: pillow in c:\users\admin\anaconda3\lib\site-packages (9.2.0)' and another note to restart the kernel. The third cell contains a block of import statements: 'from azure.cognitiveservices.vision.computervision import ComputerVisionClient', 'from azure.cognitiveservices.vision.computervision.models import OperationStatusCodes', 'from azure.cognitiveservices.vision.computervision.models import VisualFeatureTypes', 'from msrest.authentication import CognitiveServicesCredentials', 'from array import array', 'import os', 'from PIL import Image, ImageDraw, ImageFont', 'import sys', 'import time', 'import io', and 'from IPython.display import display'.

```
Requirement already satisfied: urllib3<1.27,>=1.21.1 in c:\users\admin\anaconda3\lib\site-packages (from requests~2.16->msrest==0.5.0->azure-cognitiveservices-vision-computervision) (1.26.11)
Requirement already satisfied: charset-normalizer<3,>=2 in c:\users\admin\anaconda3\lib\site-packages (from requests~2.16->msrest==0.5.0->azure-cognitiveservices-vision-computervision) (2.0.4)
Requirement already satisfied: idna<4,>=2.5 in c:\users\admin\anaconda3\lib\site-packages (from requests~2.16->msrest==0.5.0->azure-cognitiveservices-vision-computervision) (3.3)
Requirement already satisfied: oauthlib=3.0.0 in c:\users\admin\anaconda3\lib\site-packages (from requests~2.16->msrest==0.5.0->msrest==0.5.0->azure-cognitiveservices-vision-computervision) (3.2.2)
Note: you may need to restart the kernel to use updated packages.

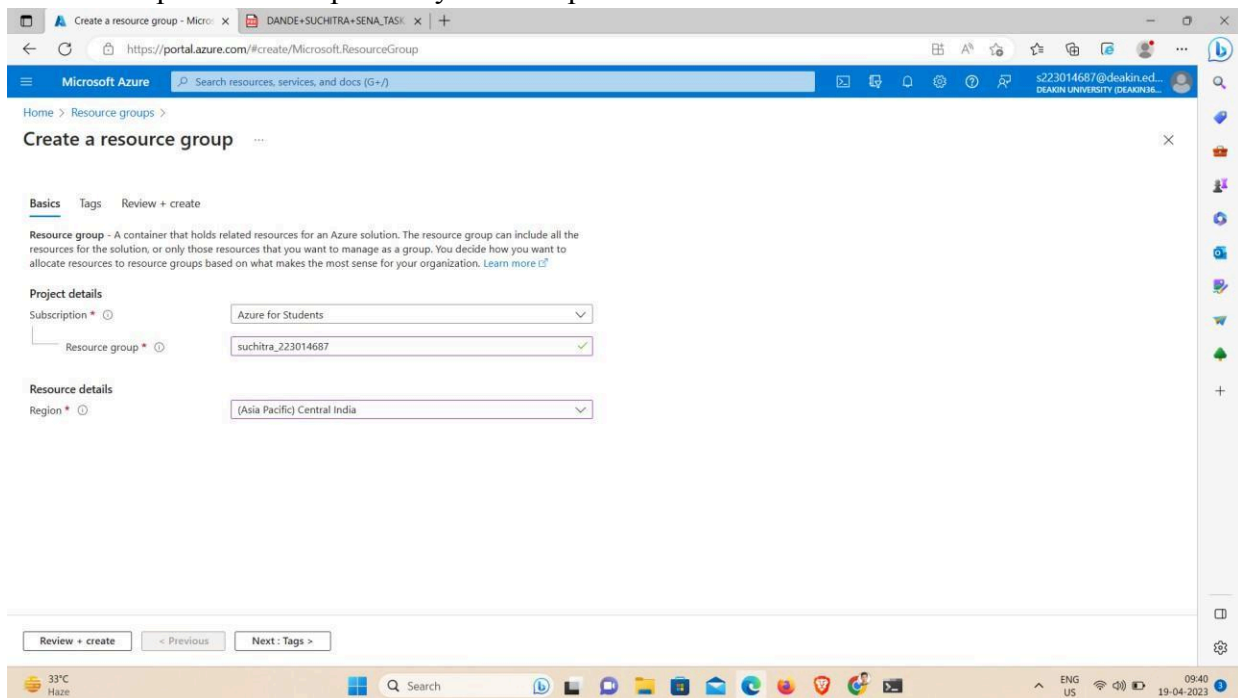
In [2]: pip install pillow

Requirement already satisfied: pillow in c:\users\admin\anaconda3\lib\site-packages (9.2.0)
Note: you may need to restart the kernel to use updated packages.

In [3]: from azure.cognitiveservices.vision.computervision import ComputerVisionClient
from azure.cognitiveservices.vision.computervision.models import OperationStatusCodes
from azure.cognitiveservices.vision.computervision.models import VisualFeatureTypes
from msrest.authentication import CognitiveServicesCredentials

from array import array
import os
from PIL import Image, ImageDraw, ImageFont
import sys
import time
import io
from IPython.display import display
```

**Step3: In the azure portal create a resource group “Suchitra\_223014687” and create computer vision as shown in below screenshots [1].**  
Add subscription and endpoint keys of Computer Vision



Computer Vision

Microsoft | Azure Service

★ 4.1 (309 ratings)

Plan: Computer Vision

Overview Plans Usage Information + Support Ratings + Reviews

Boost content discoverability, accelerate text extraction, and create products that more people can use by embedding vision capabilities in your apps. Use visual data processing to label content (from objects to concepts), extract printed and handwritten text, recognize familiar subjects like brands and landmarks, and moderate content. No machine learning expertise is required.

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Create Computer Vision

Instance Details

Region: Central India

Name: SenaTask4-1p

Pricing tier: Standard S1 (10 Calls per second)

View full pricing details

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Online Services DPA

Responsible Use of AI documentation for Spatial Analysis

By checking this box I certify that I have reviewed and acknowledge the all the terms above.\*

Review + create

Next: Network

Create Computer Vision - Microsoft Azure

Home > Resource groups > suchitra\_223014687 > Marketplace > Computer Vision

## Create Computer Vision

Validation Passed

Basics Network Identity Tags **Review + create**

**TERMS**

By clicking "Create", I (a) agree to the legal terms and privacy statement(s) associated with the Marketplace offering(s) listed above; (b) authorize Microsoft to bill my current payment method for the fees associated with the offering(s), with the same billing frequency as my Azure subscription; and (c) agree that Microsoft may share my contact, usage and transactional information with the provider(s) of the offering(s) for support, billing and other transactional activities. Microsoft does not provide rights for third-party offerings. See the [Azure Marketplace Terms](#) for additional details.

**Basics**

Subscription	Azure for Students
Resource group	suchitra_223014687
Region	Central India
Name	SenaTask4-1p
Pricing tier	Standard S1 (10 Calls per second)

**Network**

Create < Previous Next

Give feedback Download a template for automation

40°C Sunny

azure portal | Microsoft Copilot | (1) Azure Cus... | Spotting Hero | Spotting Hero | customvision | Custom Vision | whole apples | Whole orange

Home > **Microsoft.CognitiveServicesComputerVision-20230407183737 | Overview**

Deployment

Search < Delete Cancel Redeploy Download Refresh

**Your deployment is complete**

Deployment name: Microsoft.CognitiveServicesComputerVision-20... Start time: 4/7/2023, 6:43:07 PM  
Subscription: Azure for Students Correlation ID: a06370ad-451f-48d2-923b-bc7e43764d66  
Resource group: suchitra\_223014687

Deployment details

Next steps

Go to resource

Give feedback

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Secure your apps and infrastructure Go to Microsoft Defender for Cloud >

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Start learning today >

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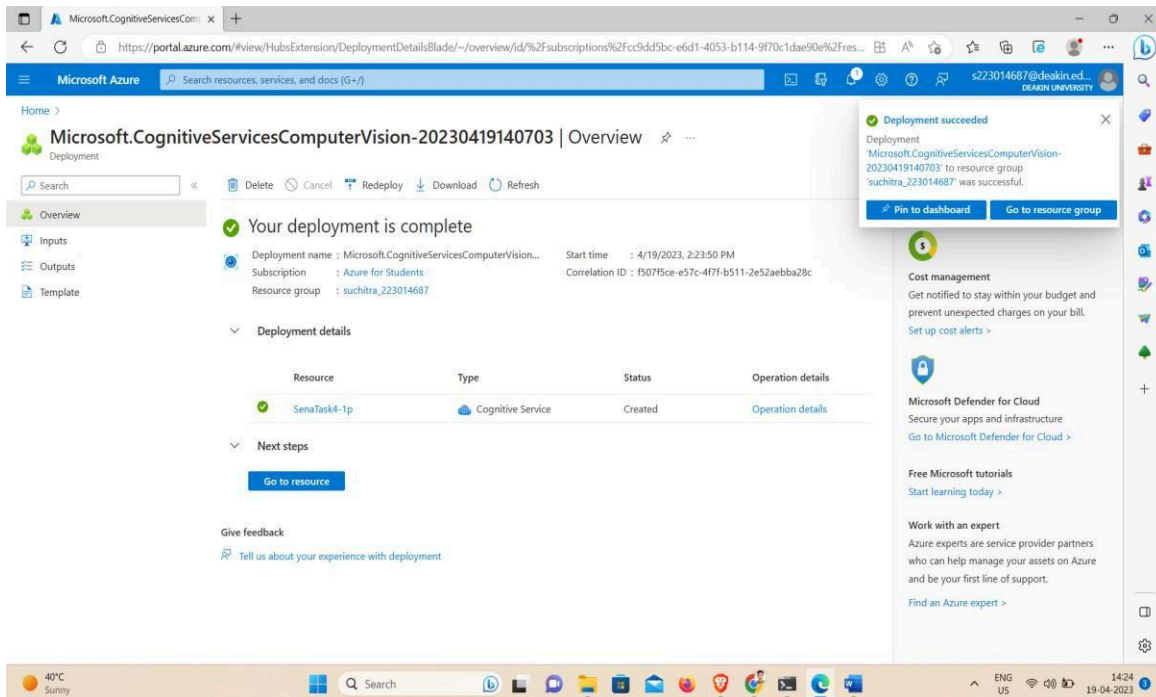
Azure experts are service provider partners who can help manage your assets on Azure and be your first line of support. Find an Azure expert > Go to Settings to activate Windows.

https://portal.azure.com/#@deakin365.onmicrosoft.com/resource/subscriptions/cc9dd5bc-e6d1-4053-b114-9f70c1dae90e

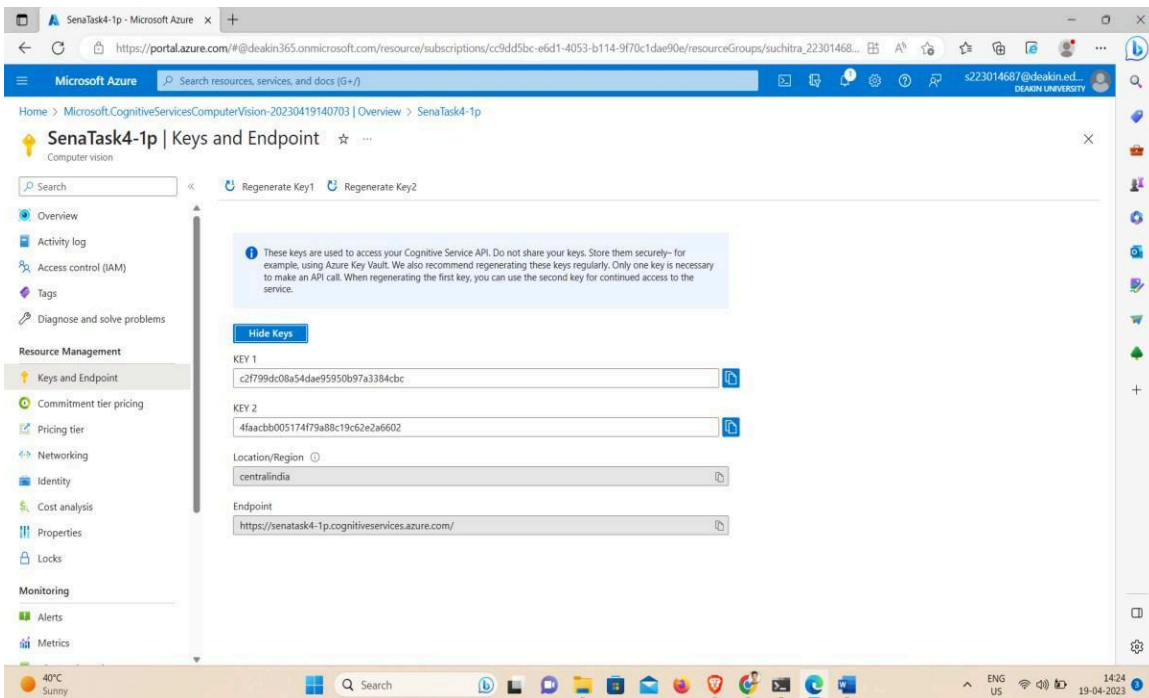
Type here to search

38°C Partly sunny

18:43 07-04-2023



Created SenaTask4-1 resource and see for the keys and Endpoint [1].



#### Step 4: Capture the Local Image

The input image is available at <https://www.colourbox.com/image/handsome-man-standing-near-his-new-car-image-2639638>, which is the InputURL for detecting objects [2].





## Step 5: Object Detection for the Above Image

The Python Code in Jupyter Notebook is attached.

1. Firstly, installed necessary packages – azure-cognitiveservices-vision-computervision, pillow and imported necessary libraries [3].

A screenshot of a Jupyter Notebook interface. The top bar shows the file name 'SenaTask4.1' and the kernel 'Python 3 (ipykernel)'. The notebook contains three code cells. The first cell shows the command to install 'azure-cognitiveservices-vision-computervision' and its dependencies, with a detailed output listing the versions of installed packages like 'azure-common', 'msrest', 'azure-core', 'requests', 'certifi', 'isodate', 'requests-oauthlib', 'six', and 'typing-extensions'. The second cell shows the command to install 'pillow', with an output indicating it is already satisfied. The third cell shows the import statements for 'ComputerVisionClient', 'OperationStatusCodes', 'VisualFeatureTypes', 'CognitiveServicesCredentials', and 'array' from the 'azure-cognitiveservices-vision-computervision' module, and 'os' from the 'array' module.

```
In [1]: pip install --upgrade azure-cognitiveservices-vision-computervision

Requirement already satisfied: azure-cognitiveservices-vision-computervision in c:\users\admin\anaconda\lib\site-packages (0.9.0)
Requirement already satisfied: azure-common==1.1 in c:\users\admin\anaconda\lib\site-packages (from azure-cognitiveservices-vision-computervision) (1.1.28)
Requirement already satisfied: msrest==0.5.0 in c:\users\admin\anaconda\lib\site-packages (from azure-cognitiveservices-vision-computervision) (0.7.1)
Requirement already satisfied: azure-core==1.24.0 in c:\users\admin\anaconda\lib\site-packages (from msrest==0.5.0->azure-cognitiveservices-vision-computervision) (1.26.4)
Requirement already satisfied: certifi==2017.4.17 in c:\users\admin\anaconda\lib\site-packages (from msrest==0.5.0->azure-cognitiveservices-vision-computervision) (2022.9.14)
Requirement already satisfied: requests==2.18 in c:\users\admin\anaconda\lib\site-packages (from msrest==0.5.0->azure-cognitiveservices-vision-computervision) (2.28.1)
Requirement already satisfied: isodate==0.6.0 in c:\users\admin\anaconda\lib\site-packages (from msrest==0.5.0->azure-cognitiveservices-vision-computervision) (0.6.1)
Requirement already satisfied: requests-oauthlib==0.5.0 in c:\users\admin\anaconda\lib\site-packages (from msrest==0.5.0->azure-cognitiveservices-vision-computervision) (1.3.1)
Requirement already satisfied: six==1.11.0 in c:\users\admin\anaconda\lib\site-packages (from azure-core==1.24.0->msrest==0.5.0->azure-cognitiveservices-vision-computervision) (1.16.0)
Requirement already satisfied: typing-extensions==4.1.0 in c:\users\admin\anaconda\lib\site-packages (from azure-core==1.24.0->msrest==0.5.0->azure-cognitiveservices-vision-computervision) (4.1.0)

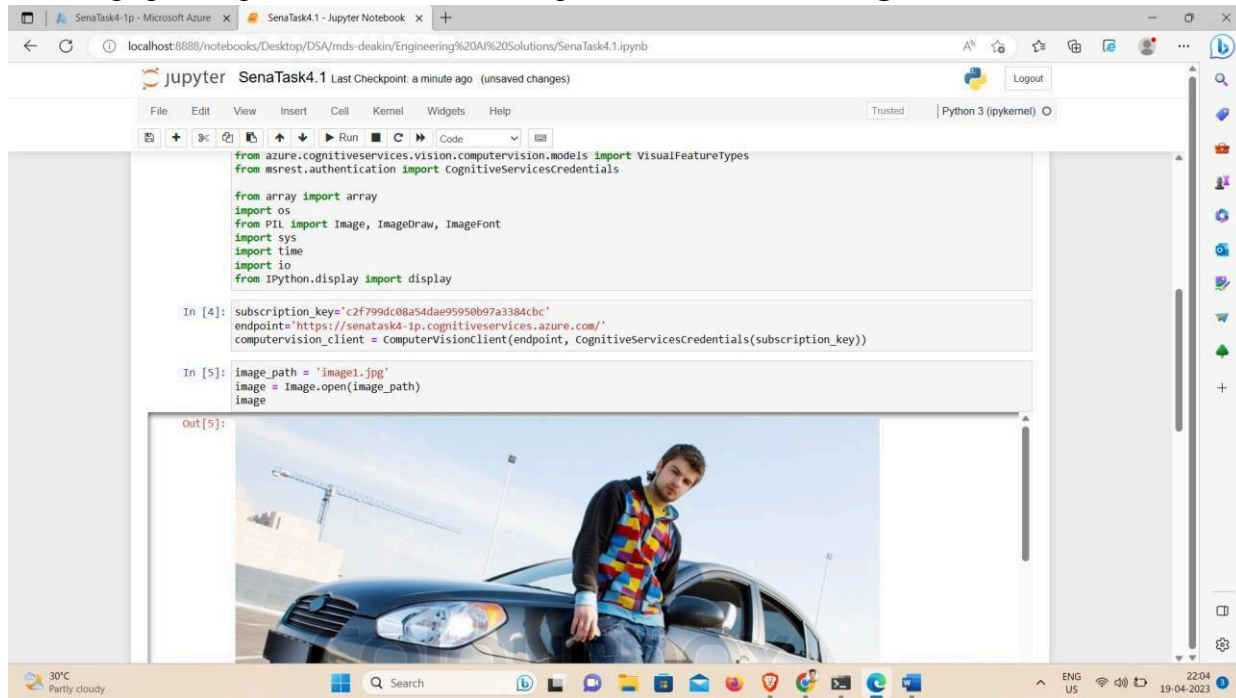
In [2]: pip install pillow

Requirement already satisfied: pillow in c:\users\admin\anaconda\lib\site-packages (9.2.0)
Note: you may need to restart the kernel to use updated packages.

In [3]: from azure.cognitiveservices.vision.computervision import ComputerVisionClient
from azure.cognitiveservices.vision.computervision.models import OperationStatusCodes
from azure.cognitiveservices.vision.computervision.models import VisualFeatureTypes
from msrest.authentication import CognitiveServicesCredentials
from array import array
import os
```

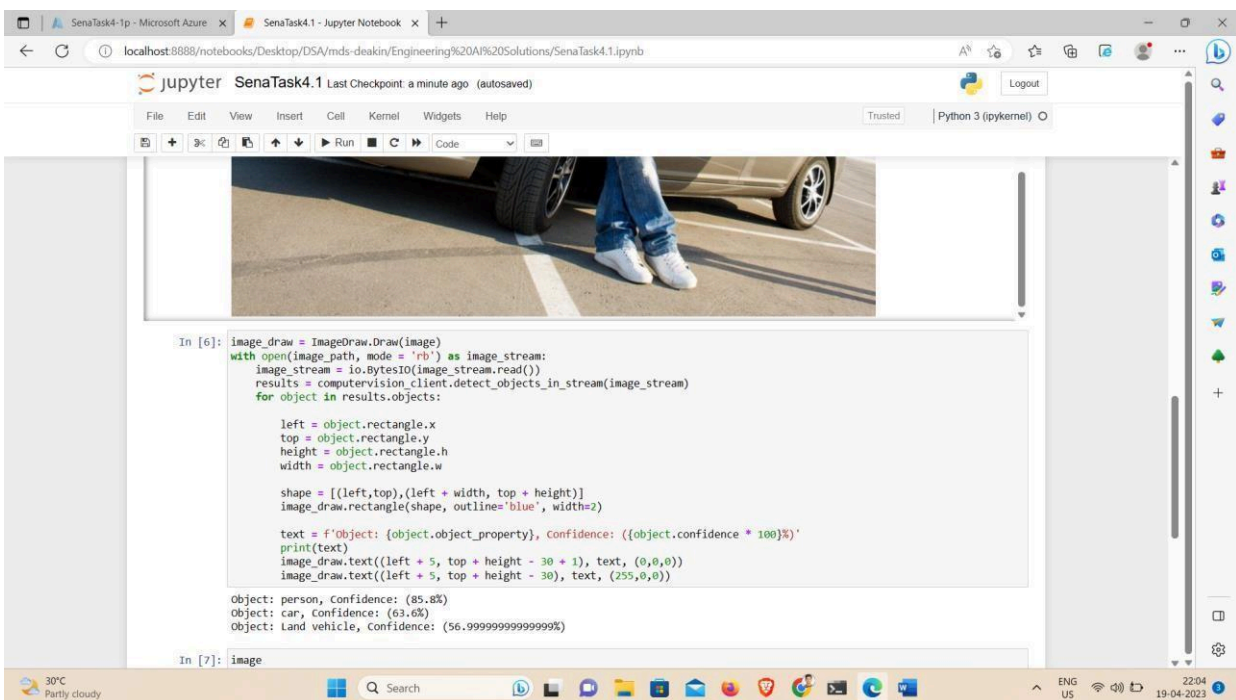
Opening the image which is saved as 'image1.jpg' and displaying it as output.

The image path is provided which is then opened and stored in 'image' variable.



## 2. Code to get the detected Images along with Bounding Boxes and Confidence Probability

- The ImageDraw Library is used to draw the image. The file is read from the image path and the image is converted to stream using BytesIO, which is stored in image\_stream variable [4].
- **detect\_objects\_in\_stream** method is used for detecting objects in this stream, which is stored in **results** variable.
- For loop is used to iterate on the objects detected in results variable, to get the object property, object confidence and object bounding box which are printed as text.
- The bounding box parameters -left, top, height and width are adjusted on the draw image using **image\_draw.text()** [4].





### 3. Output:

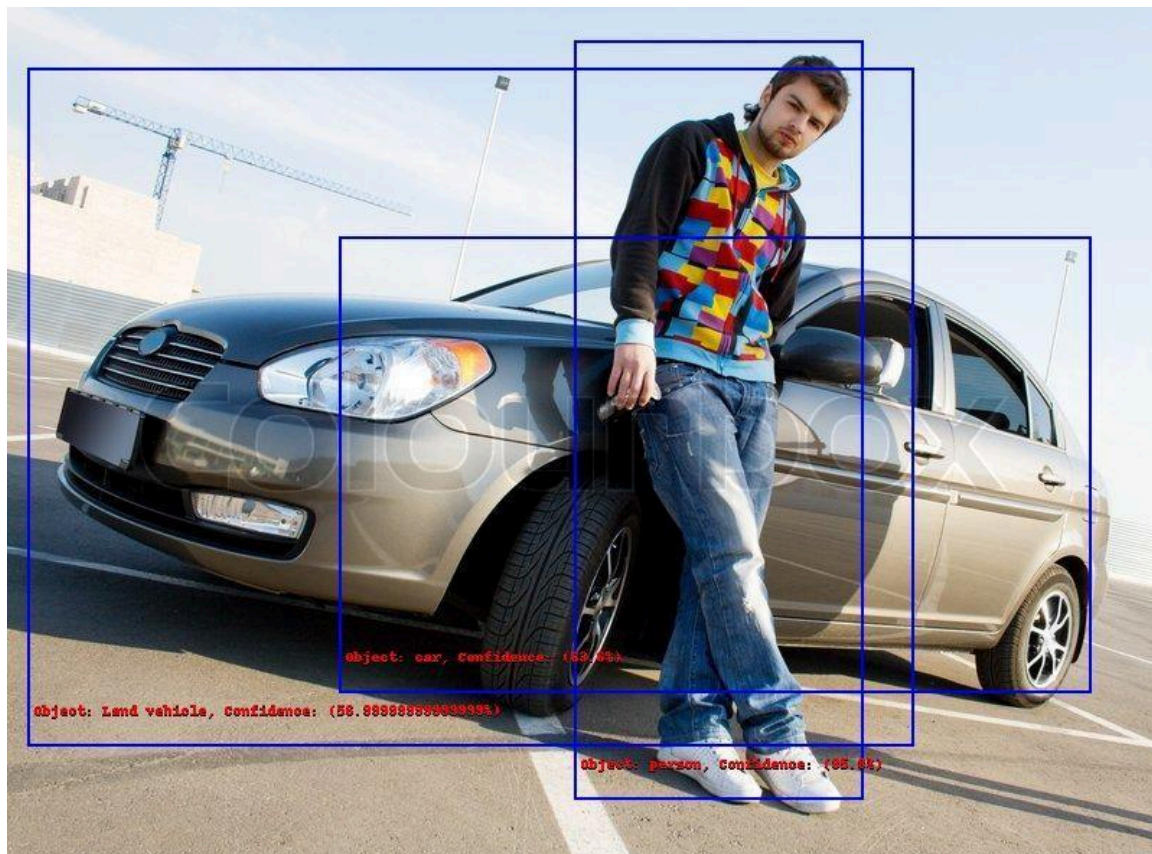
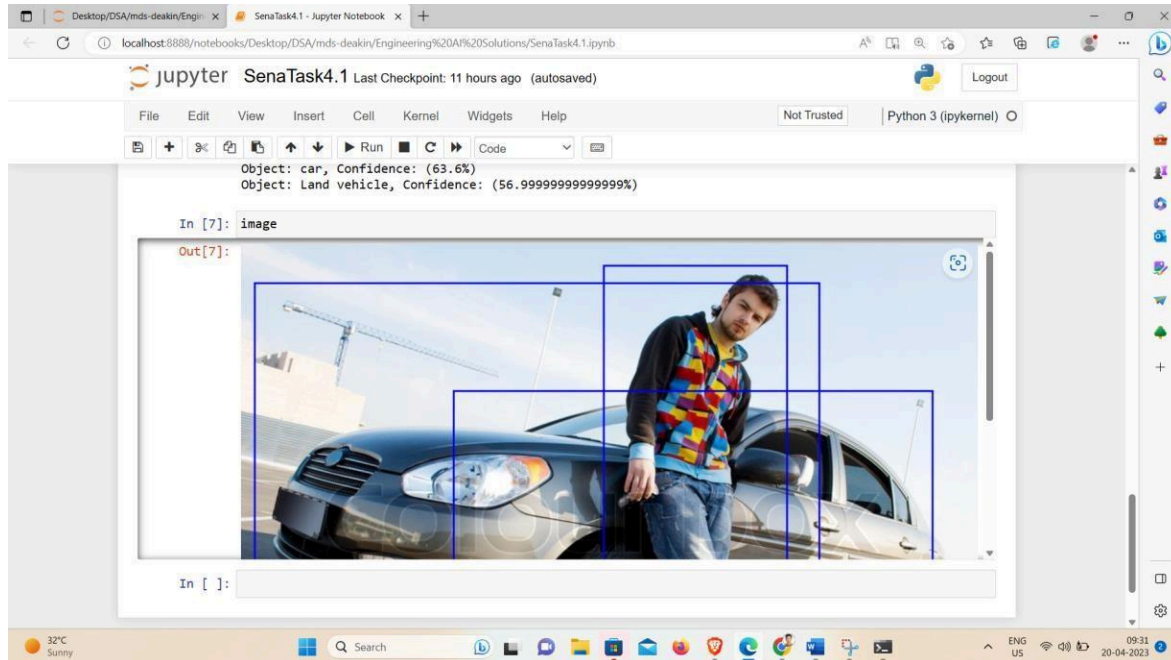
The detected objects are:

Object: person, Confidence: (85.8%) Object:

car, Confidence: (63.6%)

Object: Land vehicle, Confidence: (56.99999999999999%)

The output image along with detected objects, confidence and Bounding box probabilities are shown below.





**References:**

- [1] George Dolgikh. *'Handsome man standing near his new car. Colourbox'*  
<https://www.colourbox.com/image/handsome-man-standing-near-his-new-car-image-2639677>
- [2] Azure SDK for Python (2.0.0) *Azure Cognitive Services Computer Vision SDK for Python* Computer Vision SDK Documentation  
[https://azuresdkdocs.blob.core.windows.net/\\$web/python/azure-cognitiveservices-vision-computervision/0.7.0/index.html#more-sample-code](https://azuresdkdocs.blob.core.windows.net/$web/python/azure-cognitiveservices-vision-computervision/0.7.0/index.html#more-sample-code)
- [3] CloudCasts - Alan Smith (2022) *'Azure Computer Vision using Python'*,  
[video], YouTube, accessed 19-April-2023.