Project: Machine Learning Model Deployment with IBM Cloud Watson Studio

Phase_3: Development Part 1

Problem Statement: Sign Language Translation

Introduction:

A gesture translator is a system that interprets hand gestures or body movements and converts them into meaningful commands or text. This technology can be used in various applications. In this project, we'll focus on building a simple sign language recognition model using IBM Watson Studio.

Predictive Use Case:

Our predictive use case will be focused on recognizing and translating Sign Language gestures into text. The goal is to translate sign language into written language.

Now we are going to create the gesture translator for that we will do the primary steps now.

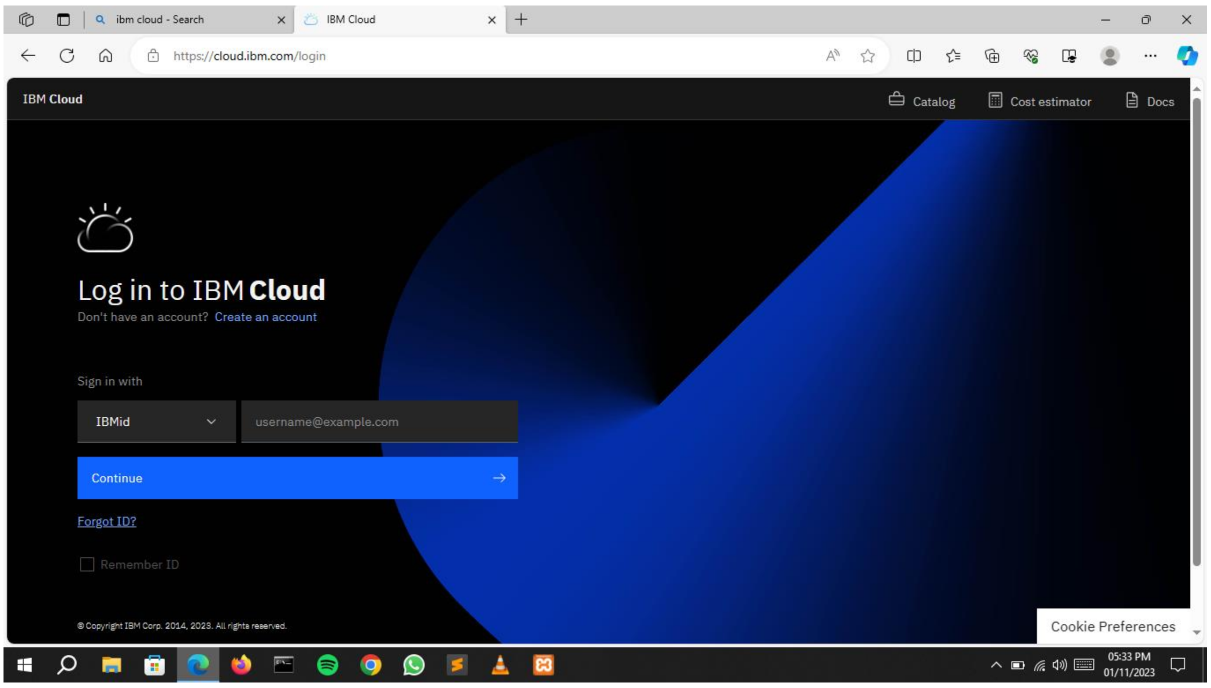
To access the IBM Cloud Watson Studio, we have to create an IBM Clous Account. To create it follow the below steps.

1. **Go to the IBM Cloud website:**

   Visit the IBM Cloud website at https://cloud.ibm.com/.

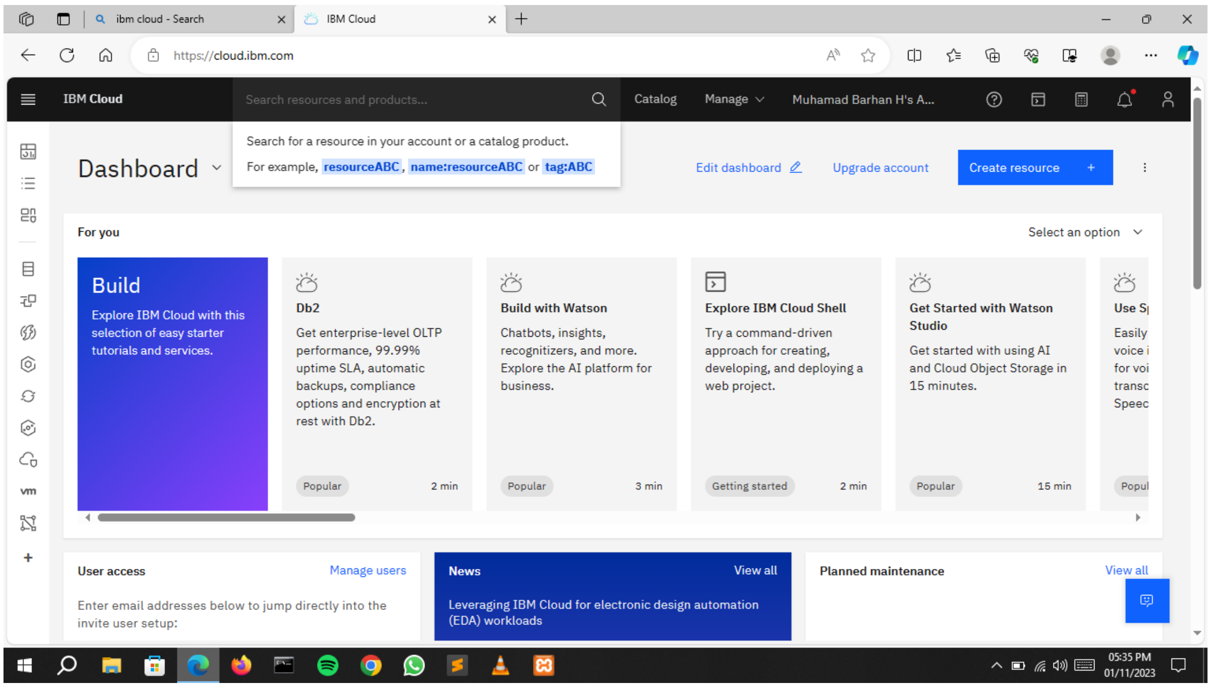
2. **Sign up or Log in:**

   If you don't already have an IBM Cloud account, click "Sign Up" to create one. If you have an account, log in with your credentials.



3. Navigation to IBM Watson Studio:

Once logged in, you'll be taken to the IBM Cloud dashboard. In the top menu, click on "Catalog."



Search for a resource in your account or a catalog product.

For example, resourceABC, name:resourceABC or tag:ABC

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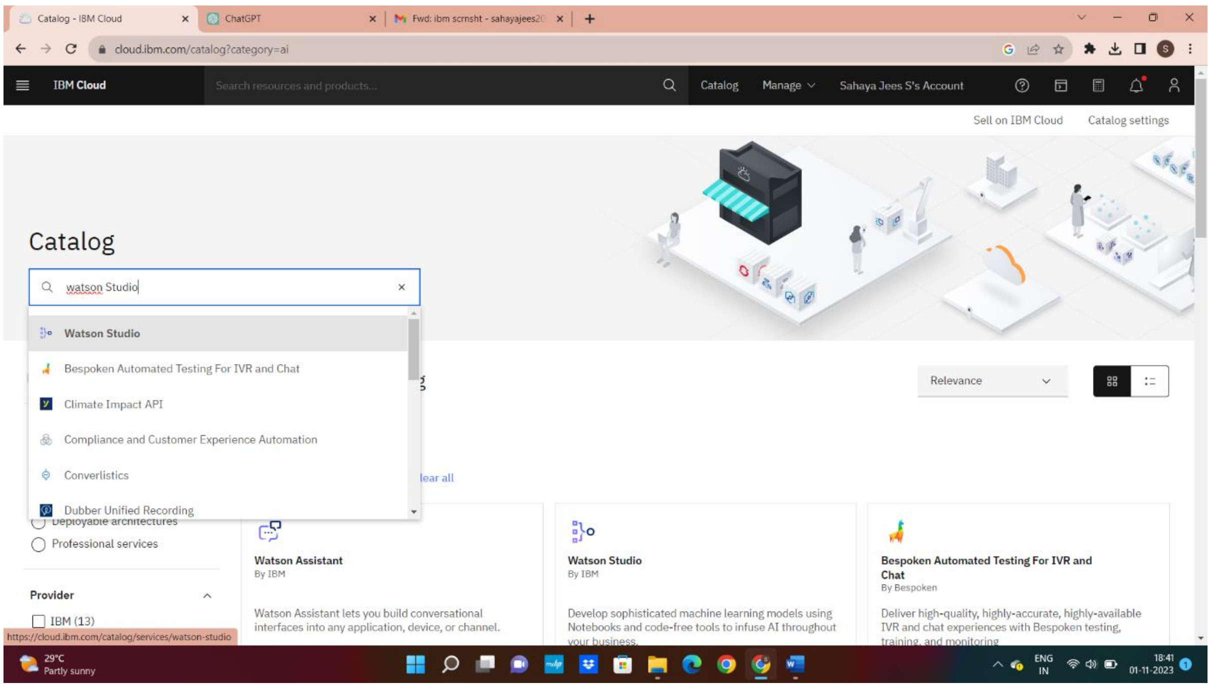
Enter email addresses below to jump directly into the invite user setup:

Leveraging IBM Cloud for electronic design automation (EDA) workloads

4. Search For Watson Studio:

In the catalog, you can use the search bar to find "Watson Studio" or browse through the services to locate it.



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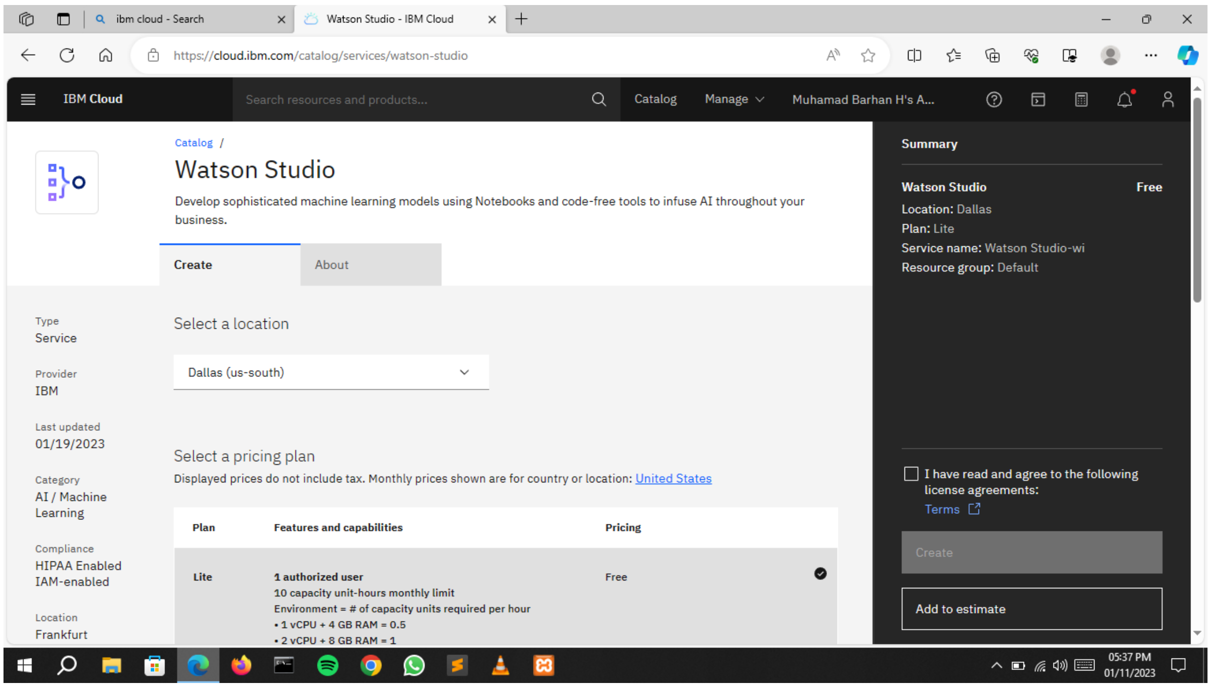
5. **Create a Watson Studio service:**
   Click on the Watson Studio service to access its details. Then, click the "Create" button to set up a new Watson Studio instance.
6. **Configure your Watson Studio service:**
   You'll need to provide some basic information for your Watson Studio service, such as a name, region, and resource group. You can also choose the pricing plan that suits your needs.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Watson Studio

Develop sophisticated machine learning models using Notebooks and code-free tools to infuse AI throughout your business.

Create | About

Type: Service
Provider: IBM
Last updated: 01/19/2023
Category: AI / Machine Learning
Compliance: HIPAA Enabled, IAM-enabled
Location: Frankfurt

Select a location

Dallas (us-south)

Select a pricing plan

Displayed prices do not include tax. Monthly prices shown are for country or location: United States

Plan	Features and capabilities	Pricing
Lite	**1 authorized user** 10 capacity unit-hours monthly limit Environment = # of capacity units required per hour • 1 vCPU + 4 GB RAM = 0.5 • 2 vCPU + 8 GB RAM = 1	Free

Summary

Watson Studio — Free
Location: Dallas
Plan: Lite
Service name: Watson Studio-wi
Resource group: Default

I have read and agree to the following license agreements:
Terms

7. **Create the service:**
   After configuring the service, click the "Create" button to create your Watson Studio instance.

Overview of dataset:

In IBM Cloud Watson Studio, you can work with datasets for training and testing machine learning models. Here is an overview of the process to prepare and split your dataset into training and testing sets.

- **Data upload:** First, you need to upload your dataset to Watson Studio. You can do this by following these steps:
  - Log in to your IBM Cloud account and access Watson Studio.
  - Create a new project or use an existing one.
  - Within your project, create a new data asset or data file that represents your dataset.

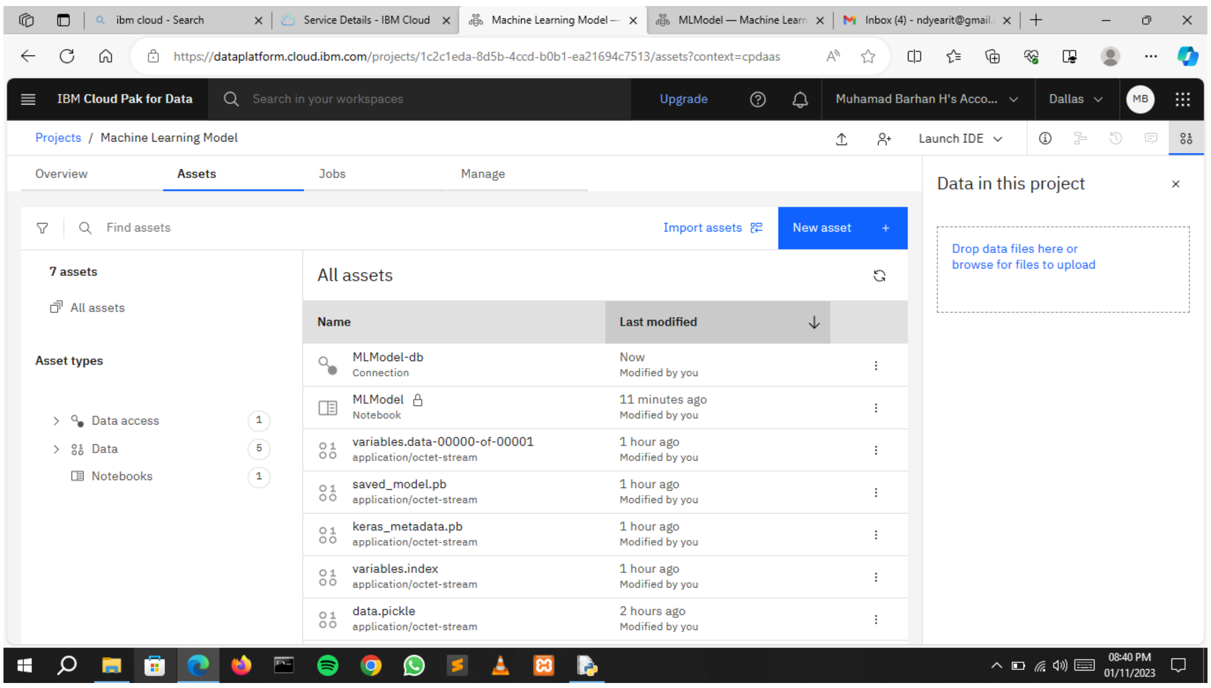
- Upload your dataset to the data asset.

- **Data Exploration and Preprocessing:** Before splitting the dataset, it's a good practice to explore and preprocess your data. This may involve tasks like handling missing values, data transformation, and feature engineering. Watson Studio provides tools and notebooks for this purpose.

- **Data Splitting:** To split your dataset into training and testing sets, you can use Python or other programming languages within Watson Studio's integrated environment.
- **Saving the Split Datasets:** After splitting the dataset, you can save the training and testing datasets back to your project in Watson Studio. This makes them easily accessible for building and evaluating machine learning models.

- **Machine Learning Model Building:** You can use the training dataset to train your machine learning model within Watson Studio's environment.

- **Model Evaluation:** Once your model is trained, you can use the testing dataset to evaluate its performance. Watson Studio provides tools for model evaluation and metrics calculation.



https://dataplatform.cloud.ibm.com/projects/1c2c1eda-8d5b-4ccd-b0b1-ea21694c7513/assets?context=cpdaas

Projects / Machine Learning Model

7 assets

All assets

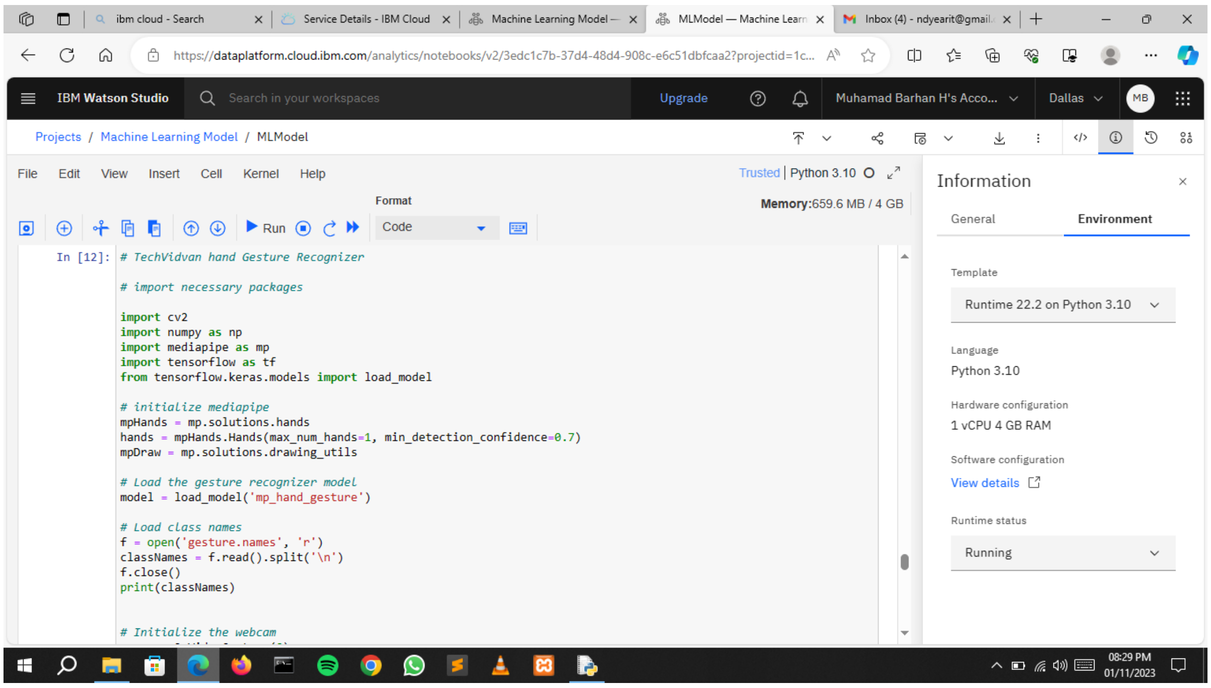
Asset types

Data access	1
Data	5
Notebooks	1

All assets

Name	Last modified
MLModel-db Connection	Now Modified by you
MLModel Notebook	11 minutes ago Modified by you
variables.data-00000-of-00001 application/octet-stream	1 hour ago Modified by you
saved_model.pb application/octet-stream	1 hour ago Modified by you
keras_metadata.pb application/octet-stream	1 hour ago Modified by you
variables.index application/octet-stream	1 hour ago Modified by you
data.pickle application/octet-stream	2 hours ago Modified by you

Sample Code:



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Template
Runtime 22.2 on Python 3.10

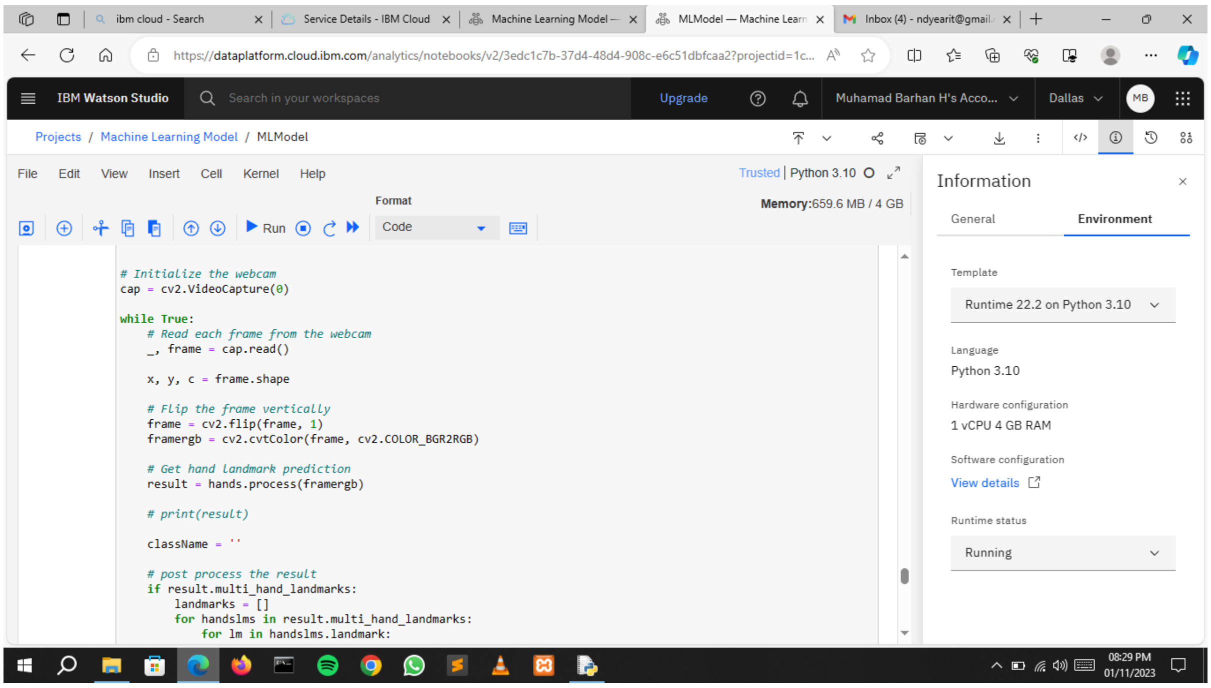
Language
Python 3.10

Hardware configuration
1 vCPU 4 GB RAM

Software configuration

Runtime status
Running

```
In [12]: # TechVidvan hand Gesture Recognizer

         # import necessary packages

         import cv2
         import numpy as np
         import mediapipe as mp
         import tensorflow as tf
         from tensorflow.keras.models import load_model

         # initialize mediapipe
         mpHands = mp.solutions.hands
         hands = mpHands.Hands(max_num_hands=1, min_detection_confidence=0.7)
         mpDraw = mp.solutions.drawing_utils

         # Load the gesture recognizer model
         model = load_model('mp_hand_gesture')

         # Load class names
         f = open('gesture.names', 'r')
         classNames = f.read().split('\n')
         f.close()
         print(classNames)


         # Initialize the webcam
```



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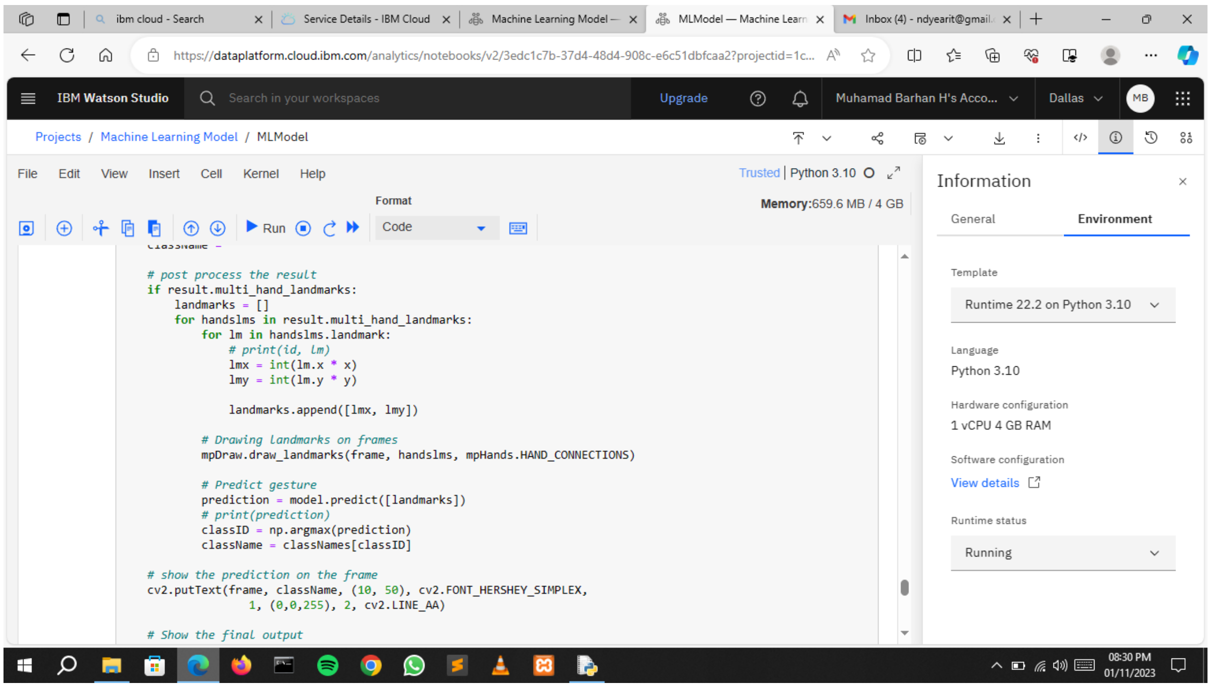
```
# Initialize the webcam
cap = cv2.VideoCapture(0)

while True:
    # Read each frame from the webcam
    _, frame = cap.read()

    x, y, c = frame.shape

    # Flip the frame vertically
    frame = cv2.flip(frame, 1)
    framergb = cv2.cvtColor(frame, cv2.COLOR_BGR2RGB)

    # Get hand landmark prediction
    result = hands.process(framergb)

    # print(result)

    className = ''

    # post process the result
    if result.multi_hand_landmarks:
        landmarks = []
        for handslms in result.multi_hand_landmarks:
            for lm in handslms.landmark:
```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```
        # post process the result
        if result.multi_hand_landmarks:
            landmarks = []
            for handslms in result.multi_hand_landmarks:
                for lm in handslms.landmark:
                    # print(id, lm)
                    lmx = int(lm.x * x)
                    lmy = int(lm.y * y)

                    landmarks.append([lmx, lmy])

                # Drawing landmarks on frames
                mpDraw.draw_landmarks(frame, handslms, mpHands.HAND_CONNECTIONS)

                # Predict gesture
                prediction = model.predict([landmarks])
                # print(prediction)
                classID = np.argmax(prediction)
                className = classNames[classID]

        # show the prediction on the frame
        cv2.putText(frame, className, (10, 50), cv2.FONT_HERSHEY_SIMPLEX,
                       1, (0,0,255), 2, cv2.LINE_AA)

        # Show the final output
```

Information

General | Environment

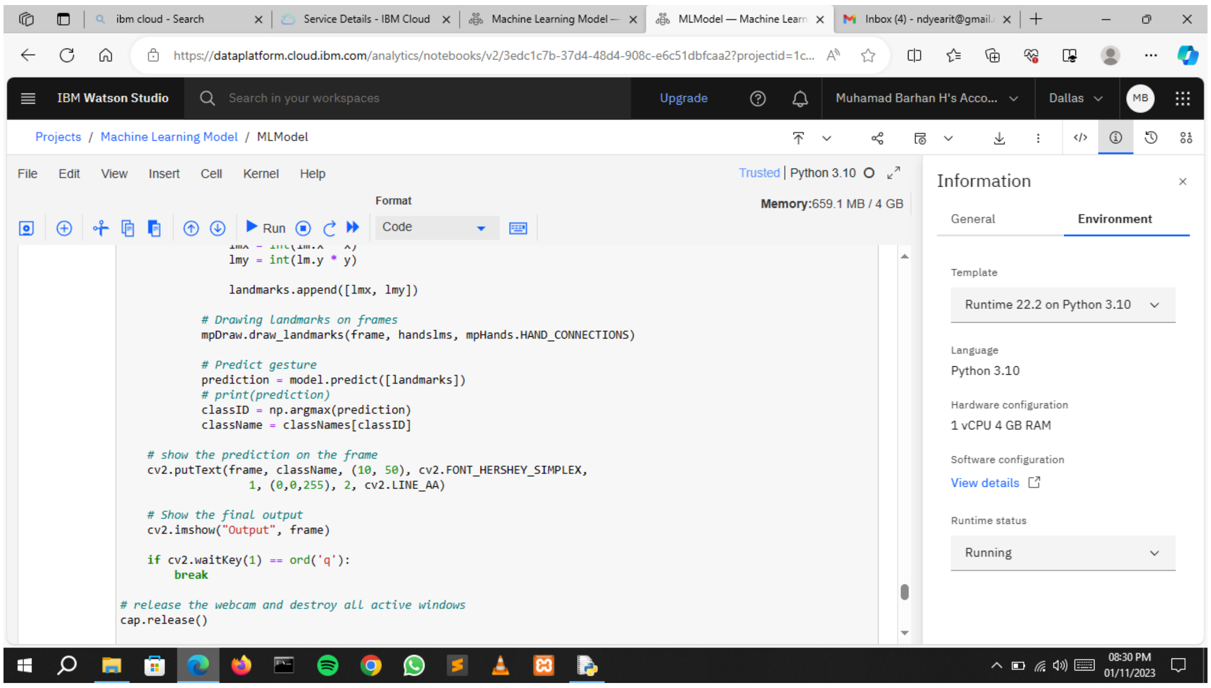
Template: Runtime 22.2 on Python 3.10

Language: Python 3.10

Hardware configuration: 1 vCPU 4 GB RAM

Software configuration: View details

Runtime status: Running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Run
Code
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```
                    lmy = int(lm.y * y)

                    landmarks.append([lmx, lmy])

                # Drawing landmarks on frames
                mpDraw.draw_landmarks(frame, handslms, mpHands.HAND_CONNECTIONS)

                # Predict gesture
                prediction = model.predict([landmarks])
                # print(prediction)
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        # show the prediction on the frame
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                       1, (0,0,255), 2, cv2.LINE_AA)

        # Show the final output
        cv2.imshow("Output", frame)

        if cv2.waitKey(1) == ord('q'):
            break

    # release the webcam and destroy all active windows
    cap.release()
```

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