

Sprint 3 – A Gesture Based Tool for Sterile Browsing of Radiology Images

Team ID: PNT2022TMID53060

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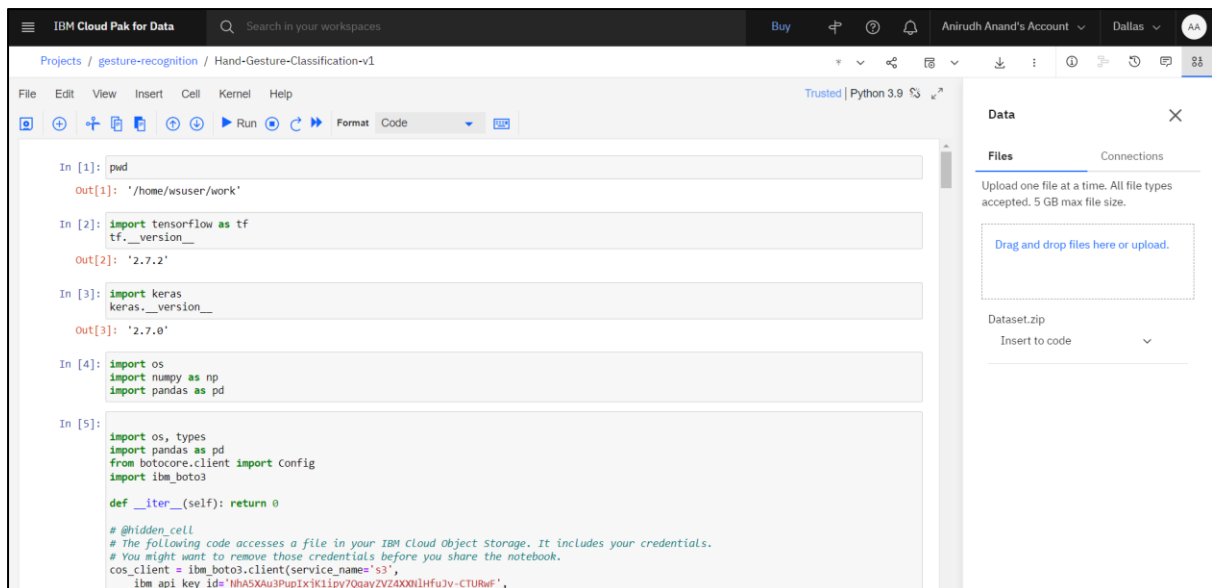
Code: Updated on GitHub in the Sprint-3 folder under Project Development Phase.

Description of USN and Screenshots:

USN-8:

As a user, I need the deep learning model to be accessible worldwide.

1. Model Training on Watson Studio



```
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Projects / gesture-recognition / Hand-Gesture-Classification-v1

File Edit View Insert Cell Kernel Help | Trusted | Python 3.9

In [1]: pwd
Out[1]: '/home/wsuser/work'

In [2]: import tensorflow as tf
tf.__version__
Out[2]: '2.7.2'

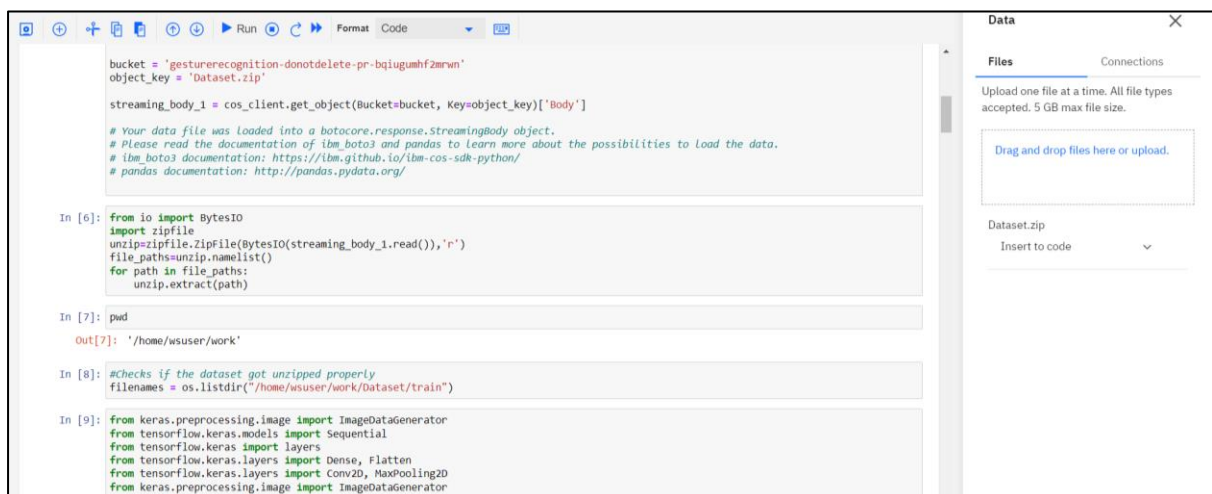
In [3]: import keras
keras.__version__
Out[3]: '2.7.0'

In [4]: import os
import numpy as np
import pandas as pd

In [5]: import os, types
import pandas as pd
from botocore.client import Config
import boto3

def __iter__(self): return 0

# @hidden_cell
# The following code accesses a file in your IBM Cloud Object Storage. It includes your credentials.
# You might want to remove those credentials before you share the notebook.
cos_client = boto3.client(service_name='s3',
    ibm_api_key_id='NHA5XAu3PupIxc11py7QqayZV24X0u1Hfu3v-CTURw6',
    ibm_api_key_secret='')
```



```
bucket = 'gesture-recognition-donotdelete-pr-bqjugumhf2mrwn'
object_key = 'Dataset.zip'

streaming_body_1 = cos_client.get_object(Bucket=bucket, Key=object_key)['Body']

# Your data file was loaded into a botocore.response.StreamingBody object.
# Please read the documentation of boto3 and pandas to learn more about the possibilities to load the data.
# boto3 documentation: https://boto3.amazonaws.com/v1/documentation/api/latest/guide/quickstart.html#python
# pandas documentation: http://pandas.pydata.org/

In [6]: from io import BytesIO
import zipfile
unzip=zipfile.ZipFile(BytesIO(streaming_body_1.read()), 'r')
file_paths=unzip.namelist()
for path in file_paths:
    unzip.extract(path)

In [7]: pwd
Out[7]: '/home/wsuser/work'


In [8]: #Checks if the dataset got unzipped properly
filenames = os.listdir("/home/wsuser/work/Dataset/train")

In [9]: from keras.preprocessing.image import ImageDataGenerator
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import layers
from tensorflow.keras.layers import Dense, Flatten
from tensorflow.keras.layers import Conv2D, MaxPooling2D
from keras.preprocessing.image import ImageDataGenerator
```


2. Setting up Deployment Space using IBM's Machine Learning Service

[Resource list](#) / **Watson Machine Learning-0w** Active [Add tags](#) [Details](#) [Actions...](#)

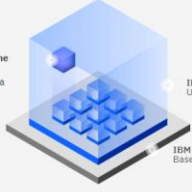
Manage
Plan
Connections



Watson Machine Learning in Cloud Pak for Data

Use Watson Machine Learning on Cloud Pak for Data to put AI models to work. Deploy, monitor, and update models to get the insights you need from your data modeling.

[Launch in IBM Cloud Pak for Data](#)



IBM Watson Machine Learning in Cloud Pak for Data

IBM Cloud Pak for Data Unifying platform

IBM Cloud Base cloud infrastructure

IBM Watson Machine Learning is part of IBM Cloud Pak for Data and serves as the data science capability of the data fabric architecture.

Helpful links

Documentation

Learn about the tools and capabilities you need to run, monitor, and update your AI assets.

Learning path

Check out sample projects, notebooks, and data sets to help you be productive.

Videos

Watch videos to learn about Watson Machine Learning and Cloud Pak for Data as a Service.

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[Deployments](#) / **gesture-recognition**

Overview Assets Deployments Jobs **Manage**

General
Access control
Environments

Description
No description provided.

Space GUID
9930b49f-907b-4a1f-b5f0-e146c7d08...

Date created
Nov 9, 2022, 12:21 PM
by Anirudh Anand (You)

Last updated
Nov 9, 2022, 12:26 PM

Deployment space tags
No tags are set to this space.

Danger Zone

Leave space
Remove your ability to access this space and its deployments. [Leave](#)

Delete space
Delete this space, including data and models, and associated storage. **Note:** Manually delete deployments first. [Delete](#)

Name
Cloud Object Storage-sz

Bucket
c9ccb096-6a6b-4c33-b0ad-d36e975868c8

Machine learning service
Watson Machine Learning-0w

Drop files here or browse for files to upload.

Stay on the page until upload completes. Incomplete uploads are cancelled.



```
In [25]: from ibm_watson_machine_learning import APIClient
        wml_credentials={
            "url": "https://us-south.ml.cloud.ibm.com",
            "apikey": "xhyfr2sw7BoEP8UnaHSRxiVomv1h4Cqyk0F7MzxcloSa"
        }

In [26]: client = APIClient(wml_credentials)

In [27]: client
Out[27]: <ibm_watson_machine_learning.client.APIClient at 0x7fb1ec10760>

In [28]: def guid_space_name(client, gesture):
        space_client.spaces.get_details()
        return(next(item for item in space['resources'] if item['entity']['name']==gesture)['metadata']['id'])

In [29]: space_guid=guid_space_name(client, 'gesture-recognition')
        print("Space UID = " + space_guid)
        Space UID = 9930b49f-907b-4a1f-b5f0-e146c7d081b1

In [30]: client.set_default_space(space_guid)
Out[30]: 'SUCCESS'

In [31]: client.software_specifications.list(100)
```

Data

Files [Connections](#)

Upload one file at a time. All file types accepted. 5 GB max file size.

Drag and drop files here or upload.

Dataset.zip

[Insert to code](#)

```
In [32]: software_spec_uid = client.software_specifications.get_uid_by_name('tensorflow_rt22.1-py3.9')
Out[32]: 'acd9c798-6974-5d2f-a657-ce06e986df4d'

In [34]: model_details = client.repository.store_model(model='gesture-classifier.tgz', meta_props={
    client.repository.ModelMetaNames.NAME: "CNN",
    client.repository.ModelMetaNames.TYPE: 'tensorflow_rt22.1',
    client.repository.ModelMetaNames.SOFTWARE_SPEC_UID: software_spec_uid
})

model_id = client.repository.get_model_uid(model_details)

This method is deprecated, please use get_model_id()
/opt/conda/envs/Python-3.9/lib/python3.9/site-packages/ibm_watson_machine_learning/repository.py:1453: UserWarning: This method is
deprecated, please use get_model_id()
warn("This method is deprecated, please use get_model_id()")

In [35]: model_id
Out[35]: 'b551a542-6d4f-43d1-a1df-815fe17e7e8c'
```

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Deployments /

gesture-recognition

Overview Assets Deployments Jobs Manage

Find assets Import assets

1 asset

Asset types

Models 1

Name	Last modified
CNN Model	4 hours ago Service

Items per page: 20 1-1 of 1 items 1 of 1 pages

Drop files here or browse for files to upload.

Stay on the page until upload completes. Incomplete uploads are cancelled.

3. Downloading the model to a local system

```
Download-Model.ipynb
File Edit View Insert Runtime Tools Help Last saved at 1:00 PM

+ Code + Text

pip install ibm_watson_machine_learning

Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/
Requirement already satisfied: ibm_watson_machine_learning in /usr/local/lib/python3.7/dist-packages (1.0.257)
Requirement already satisfied: tabulate in /usr/local/lib/python3.7/dist-packages (from ibm_watson_machine_learning) (0.8.10)
Requirement already satisfied: requests in /usr/local/lib/python3.7/dist-packages (from ibm_watson_machine_learning) (2.23.0)
Requirement already satisfied: importlib-metadata in /usr/local/lib/python3.7/dist-packages (from ibm_watson_machine_learning) (4.13.0)
Requirement already satisfied: certifi in /usr/local/lib/python3.7/dist-packages (from ibm_watson_machine_learning) (2022.9.24)
Requirement already satisfied: pandas<1.5.0,>=0.24.2 in /usr/local/lib/python3.7/dist-packages (from ibm_watson_machine_learning) (1.3.5)
Requirement already satisfied: lomond in /usr/local/lib/python3.7/dist-packages (from ibm_watson_machine_learning) (0.3.3)
Requirement already satisfied: ibm-cos-sdk==2.7.* in /usr/local/lib/python3.7/dist-packages (from ibm_watson_machine_learning) (2.7.0)
Requirement already satisfied: urllib3 in /usr/local/lib/python3.7/dist-packages (from ibm_watson_machine_learning) (1.24.3)
Requirement already satisfied: packaging in /usr/local/lib/python3.7/dist-packages (from ibm_watson_machine_learning) (21.3)
Requirement already satisfied: jmespath<1.0.0,>=0.7.1 in /usr/local/lib/python3.7/dist-packages (from ibm-cos-sdk==2.7.*->ibm_watson_machine_learning) (0.10.0)
Requirement already satisfied: ibm-cos-sdk<3transfer=2.7.0 in /usr/local/lib/python3.7/dist-packages (from ibm-cos-sdk==2.7.*->ibm_watson_machine_learning) (2.7.0)
Requirement already satisfied: ibm-cos-sdk-core==2.7.0 in /usr/local/lib/python3.7/dist-packages (from ibm-cos-sdk==2.7.*->ibm_watson_machine_learning) (2.7.0)
Requirement already satisfied: docutils<0.16,>=0.10 in /usr/local/lib/python3.7/dist-packages (from ibm-cos-sdk-core==2.7.0->ibm_watson_machine_learning) (0.15.2)
Requirement already satisfied: python-dateutil<3.0.0,>=2.1 in /usr/local/lib/python3.7/dist-packages (from ibm-cos-sdk-core==2.7.0->ibm_watson_machine_learning) (2.8.1)
Requirement already satisfied: numpy>=1.17.3 in /usr/local/lib/python3.7/dist-packages (from pandas<1.5.0,>=0.24.2->ibm_watson_machine_learning) (1.21.6)
Requirement already satisfied: pytz>=2017.3 in /usr/local/lib/python3.7/dist-packages (from pandas<1.5.0,>=0.24.2->ibm_watson_machine_learning) (2022.6)
Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.7/dist-packages (from python-dateutil<3.0.0,>=2.1->ibm-cos-sdk-core==2.7.0->ibm_watson_machine_learning) (1.16.0)
Requirement already satisfied: chardet<4,>=3.0.2 in /usr/local/lib/python3.7/dist-packages (from requests->ibm_watson_machine_learning) (3.0.4)
Requirement already satisfied: idna<3,>=2.5 in /usr/local/lib/python3.7/dist-packages (from requests->ibm_watson_machine_learning) (2.10)
Requirement already satisfied: typing-extensions>=3.6.4 in /usr/local/lib/python3.7/dist-packages (from importlib-metadata->ibm_watson_machine_learning) (4.1.1)
Requirement already satisfied: zipp>=0.5 in /usr/local/lib/python3.7/dist-packages (from importlib-metadata->ibm_watson_machine_learning) (3.10.0)
Requirement already satisfied: pyparsing<=3.0.5,>=2.0.2 in /usr/local/lib/python3.7/dist-packages (from packaging->ibm_watson_machine_learning) (3.0.9)

[ ] from ibm_watson_machine_learning import APIClient
```

```

[ ] from ibm_watson_machine_learning import APIClient

wml_credentials={
    "url": "https://us-south.ml.cloud.ibm.com",
    "apikey": "xhyfr2sw7BoEM8unaHSrXiVommlh4Cqyk0F7HzxcloSa"
}

[ ] client = APIClient(wml_credentials)

Python 3.7 and 3.8 frameworks are deprecated and will be removed in a future release. Use Python 3.9 framework instead.

[ ] client

<ibm_watson_machine_learning.client.APIClient at 0x7fafa7d62790>

[ ] def guid_space_name(client, Gesture):
    space=client.spaces.get_details()
    return(next(item for item in space['resources'] if item['entity']['name']==Gesture)['metadata']['id'])

[ ] space_uid=guid_space_name(client, 'gesture-recognition')
print("Space UID = " + space_uid)

Space UID = 9930b49f-907b-4a1f-b5f0-e146c7d081b1

[ ] client.set_default_space(space_uid)

'SUCCESS'

```

```

[ ] import os
from google.colab import drive
drive.mount('/content/drive', force_remount=True)
os.chdir('/content/drive/My Drive')
print("Change successful.")

Mounted at /content/drive
Change successful.

[ ] client.repository.download("b551a542-6d4f-43d1-a1df-815fe17e7e8c", "gesture-model.tar.gz")

Successfully saved model content to file: 'gesture-model.tar.gz'
'/content/drive/MyDrive/gesture-model.tar.gz'

```

USN-9:

As a user, I need the application to be accessible. The application should be able to plug-in different models with minimal modifications.

- The model trained on IBM Watson Studio is stored on the deployment space using IBM's Machine Learning Service.
- From here, the model can be downloaded (as a zip file) using the `ibm_watson_machine_learning` python package.
- The downloaded model can be extracted and loaded using Kera's `load_model()` function.

```

1 from flask import Flask, render_template, url_for, flash, redirect, session, logging, request
2 from wtforms import Form, StringField, TextareaField, PasswordField, validators
3 from flask_mail import Mail, Message
4 import os
5 import cv2
6 import operator
7 from time import sleep
8 import numpy as np
9 from tensorflow.keras.models import load_model
10 from werkzeug.utils import secure_filename
11 from datetime import datetime
12 import database
13
14 app = Flask(__name__)
15 mail = Mail(app)
16 model = load_model("./model/gesture.h5")
17 print("Model loaded")
18
19 app.config['MAIL_SERVER'] = 'smtp.gmail.com'
20 app.config['MAIL_PORT'] = 465
21 app.config['MAIL_USERNAME'] = 'XXX'
22 app.config['MAIL_PASSWORD'] = 'XXX'
23 app.config['MAIL_USE_TLS'] = False

```

```

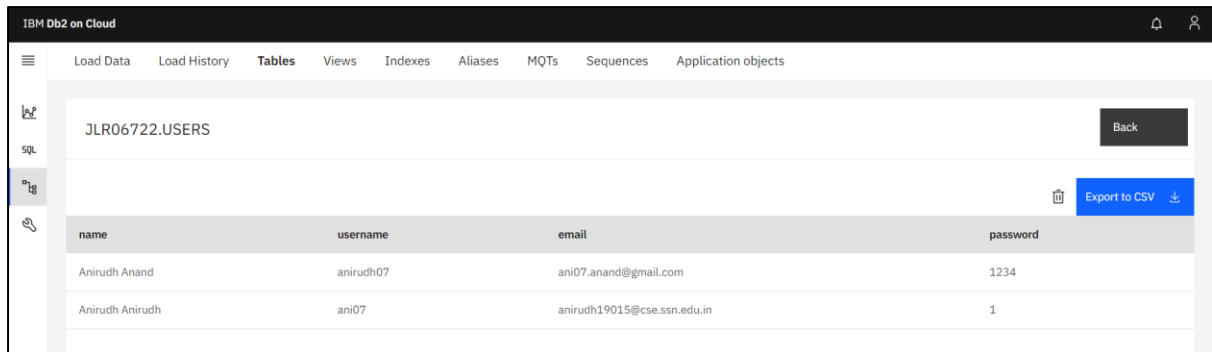
2022-11-09 16:36:33.544788: W tensorflow/stream_executor/platform/default/dso_loader.cc:64] Could not load dynamic library 'cudnn6.8.dll'; dlerror: cudnn6.8.dll not found
2022-11-09 16:36:33.754295: W tensorflow/core/common/runtime/gpu_device.cc:1934] Cannot dlopen some GPU libraries. Please make sure the missing libraries are installed properly if you would like to use GPU. Follow the guide at https://www.tensorflow.org/install/gpu for how to download and setup the required libraries for your platform.
Skipping registering GPU devices...
2022-11-09 16:36:33.772285: I tensorflow/core/platform/gpu/device_guard.cc:193] This TensorFlow binary is optimized with oneAPI Deep Neural Network Library (oneDNN) to use the following GPU instructions in performance-critical operations: AVX AVX2
To enable them in other operations, rebuild tensorflow with the appropriate compiler flags.
Paddle loaded!
* Debugger is active!
* Debugger PID: 369-121-125

```

USN-10:

As a user, I should be able to access my dashboard to change my password.

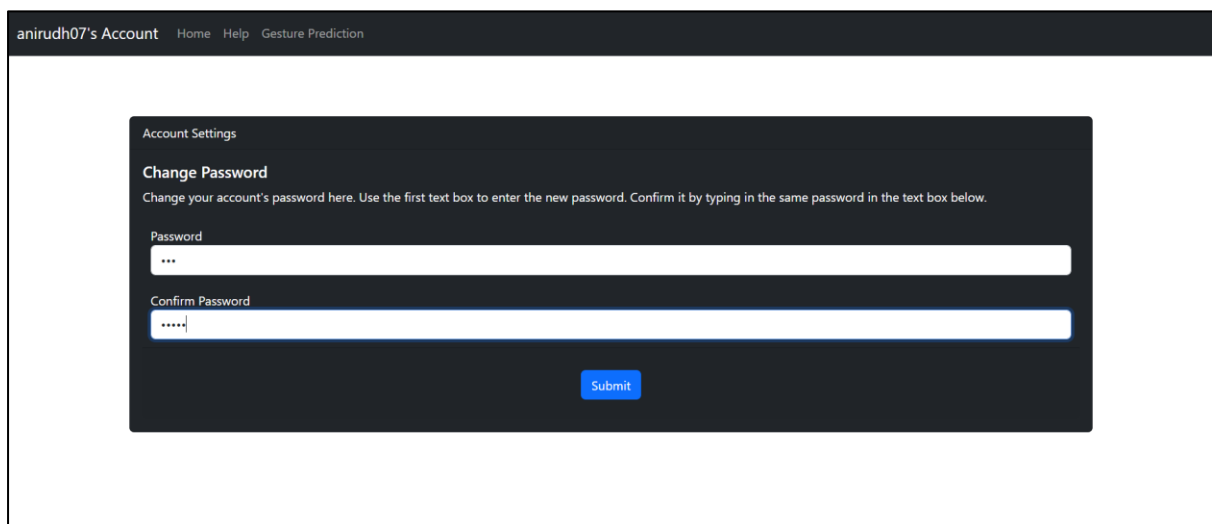
DB2 Database before password update



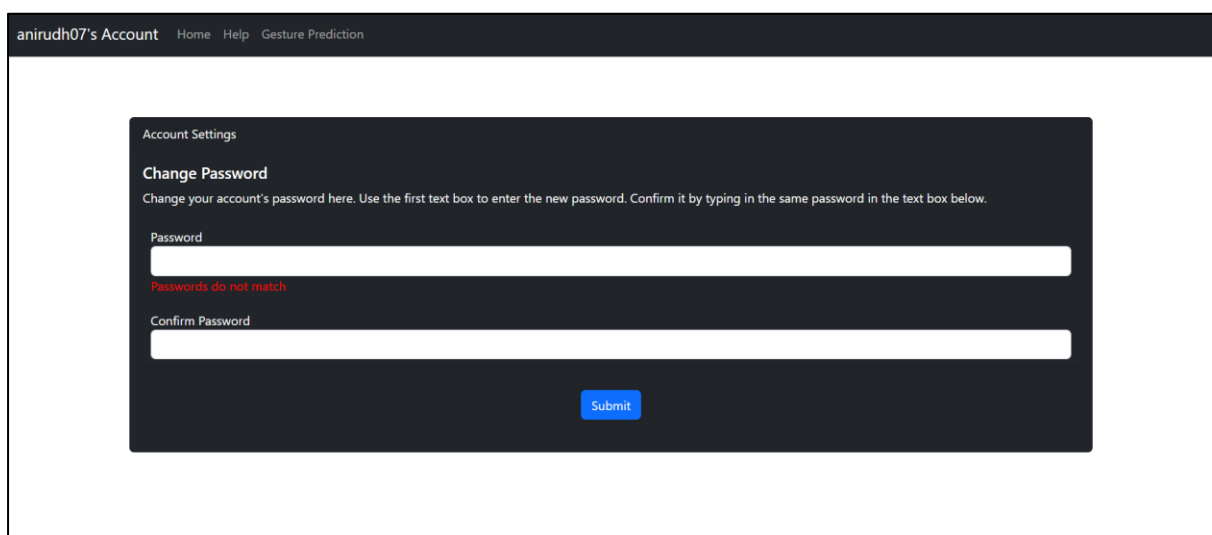
The screenshot shows the IBM Db2 on Cloud interface. The top navigation bar includes 'Load Data', 'Load History', 'Tables', 'Views', 'Indexes', 'Aliases', 'MQTs', 'Sequences', and 'Application objects'. The 'Tables' tab is selected, displaying a table named 'JLR06722.USERS'. The table has four columns: 'name', 'username', 'email', and 'password'. There are two rows of data. A 'Back' button is in the top right, and an 'Export to CSV' button is in the bottom right.

name	username	email	password
Anirudh Anand	anirudh07	ani07.anand@gmail.com	1234
Anirudh Anirudh	ani07	anirudh19015@cse.ssn.edu.in	1

Password Update



The screenshot shows the 'anirudh07's Account' dashboard. The 'Account Settings' section is active, displaying the 'Change Password' form. The form includes instructions: 'Change your account's password here. Use the first text box to enter the new password. Confirm it by typing in the same password in the text box below.' There are two input fields: 'Password' and 'Confirm Password'. The 'Password' field contains three asterisks, and the 'Confirm Password' field contains six asterisks. A blue 'Submit' button is at the bottom.



This screenshot shows the same 'Change Password' form as the previous one, but with an error message. The 'Password' field now contains a red error message: 'Passwords do not match'. The 'Confirm Password' field is empty. The 'Submit' button remains at the bottom.

anirudh07's Account

Home

Help

Gesture Prediction

Account Settings

Change Password

Change your account's password here. Use the first text box to enter the new password. Confirm it by typing in the same password in the text box below.

Password

Passwords do not match

Confirm Password

Submit

Your password has been changed successfully!

anirudh07's Account

Home

Help

Gesture Prediction

Account Settings

Change Password

Change your account's password here. Use the first text box to enter the new password. Confirm it by typing in the same password in the text box below.

Password

Confirm Password

Submit

DB2 Database after password update

IBM Db2 on Cloud

Load DataLoad HistoryTablesViewsIndexesAliasesMQTsSequencesApplication objects

JLR06722.USERS

Back

Export to CSV

name	username	email	password
Anirudh Anand	anirudh07	ani07.anand@gmail.com	123
Anirudh Anirudh	ani07	anirudh19015@cse.ssn.edu.in	1

USN-11:

As a user, I should be alerted in case:

1. The application can't access my webcam
2. The image I took/uploaded is corrupted

Please enable camera access!

anirudh07's Account Home Help

Step I: Access Webcam
Click the checkbox below to enable the application to access your camera.
☐ Allow this application to access my camera

Step II: Upload Image
Upload an image from your computer to the application by clicking on the 'Choose File' button below.

Choose File No file chosen

Predict!

Please upload an image!

anirudh07's Account Home Help

Step I: Access Webcam
Click the checkbox below to enable the application to access your camera.
☒ Allow this application to access my camera

Step II: Upload Image
Upload an image from your computer to the application by clicking on the 'Choose File' button below.

Choose File No file chosen

Predict!