Sprint-4

Train The Model On IBM

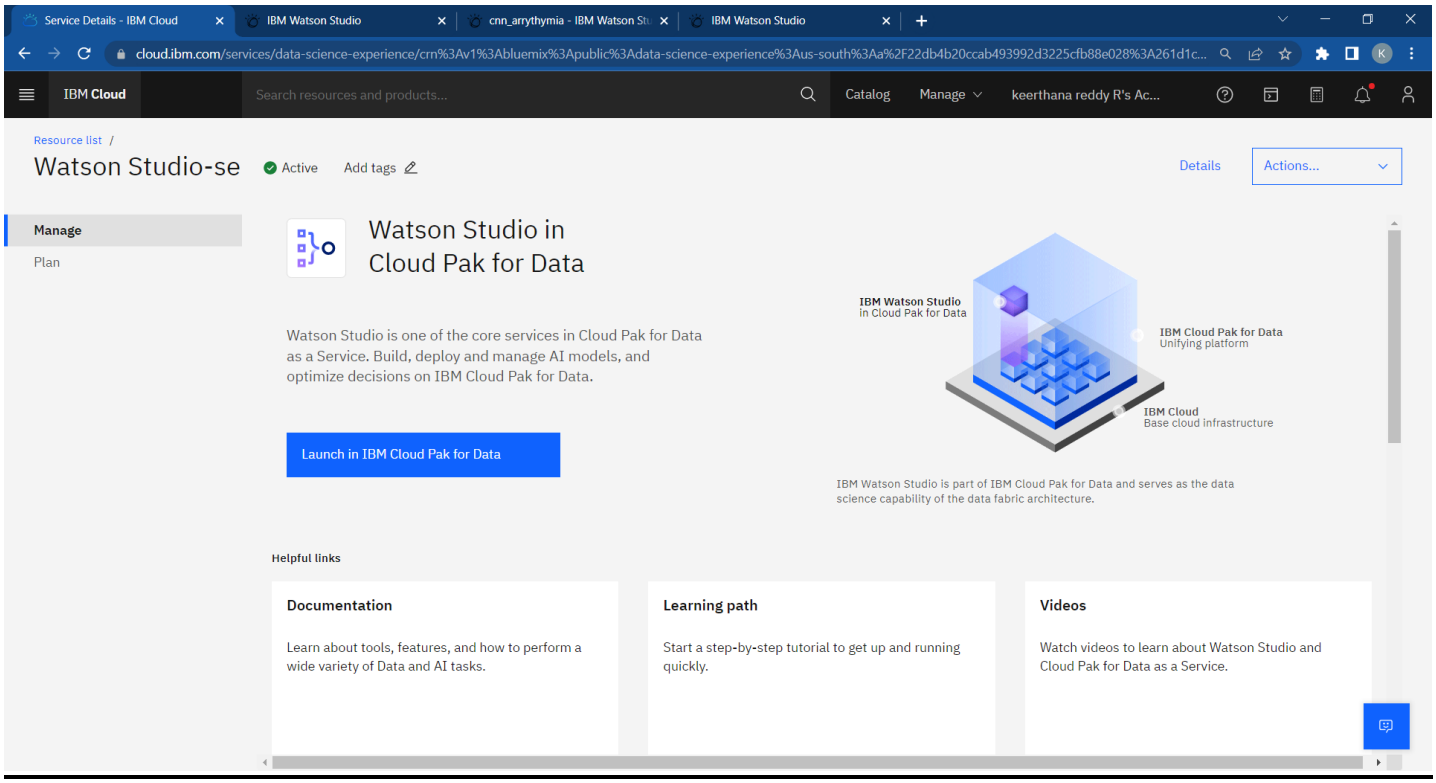
Train The Model on IBM Watson

Date	19 Nov 2022
TeamID	PNT2022TMID52880
ProjectName	Classification of Arrhythmia by Using Deep Learning with 2-D ECG Spectral Image Representation

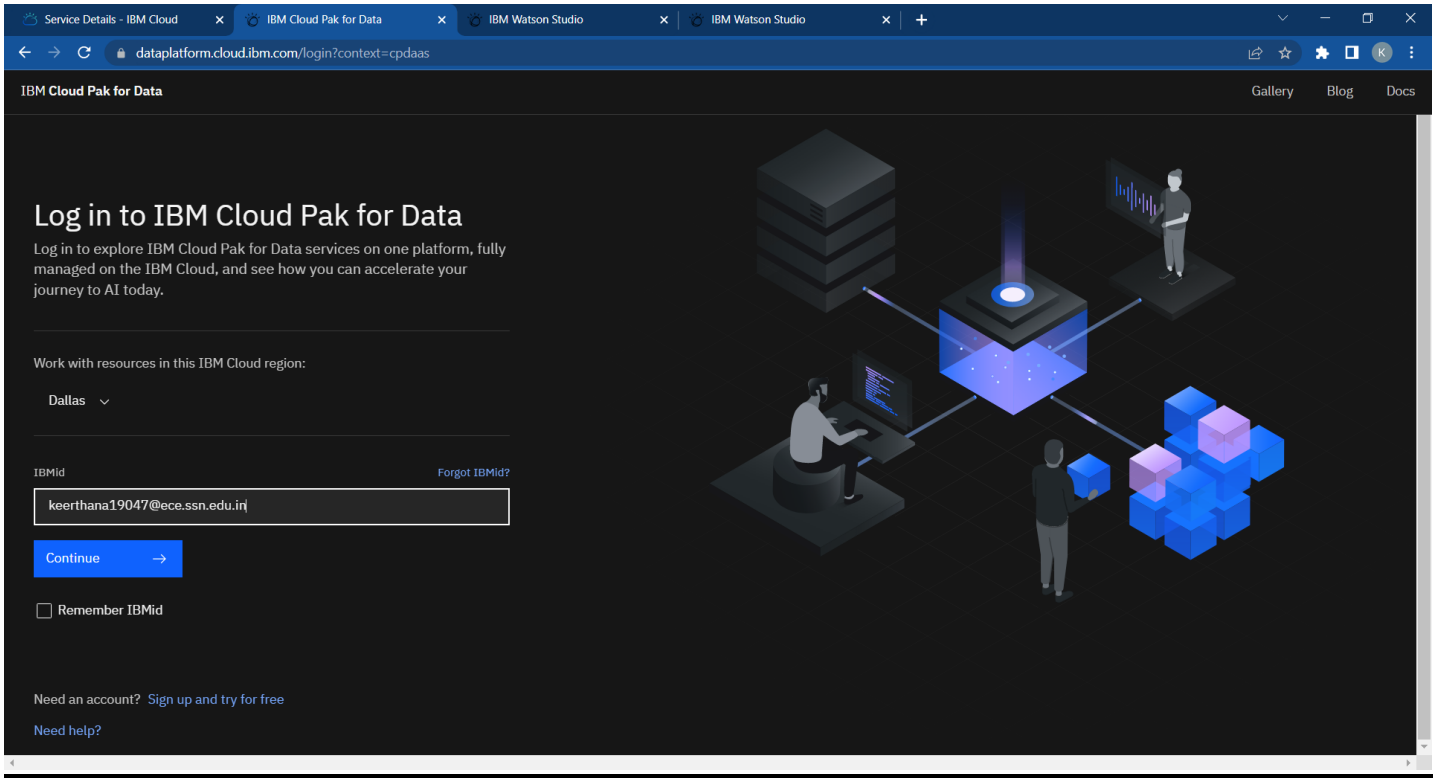
TASK:

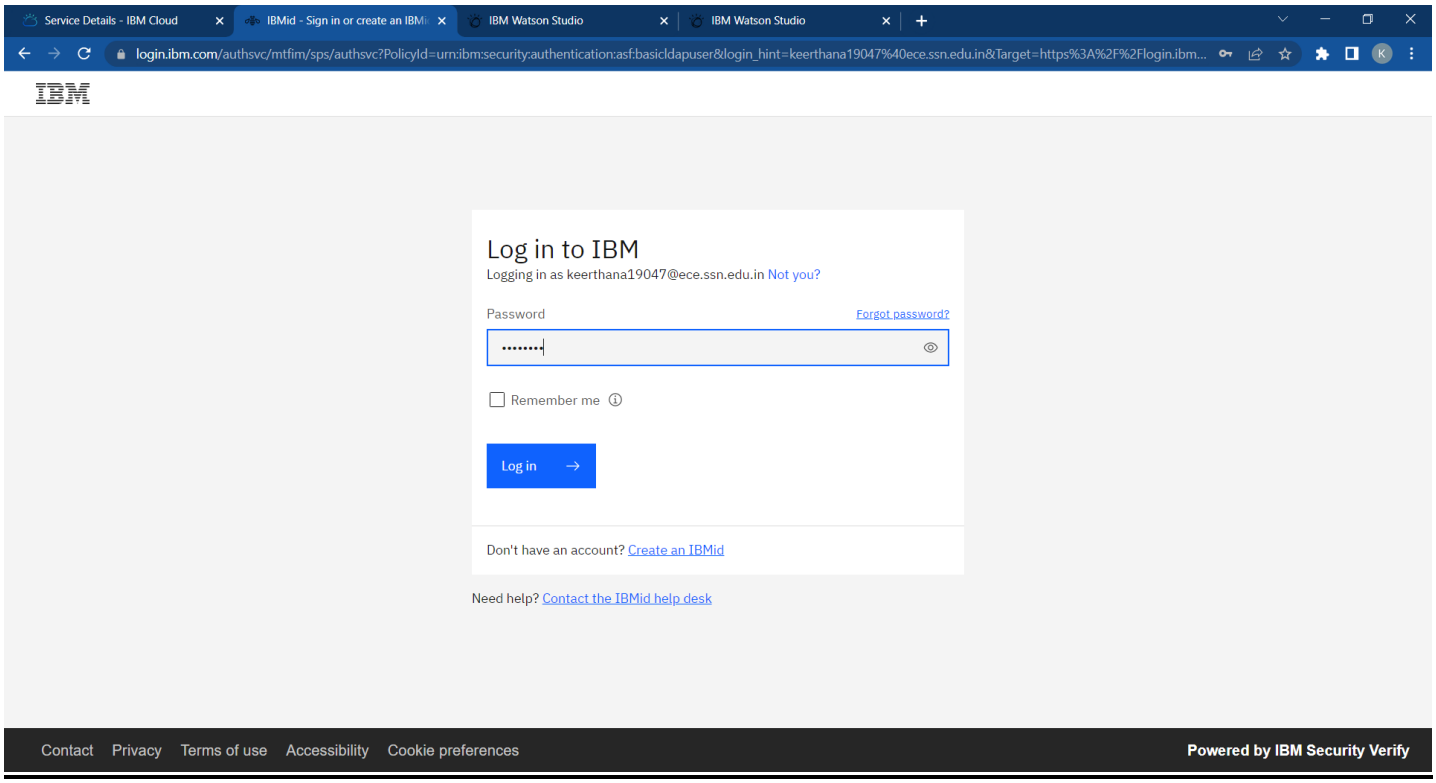
Train The Model on IBM Watson:

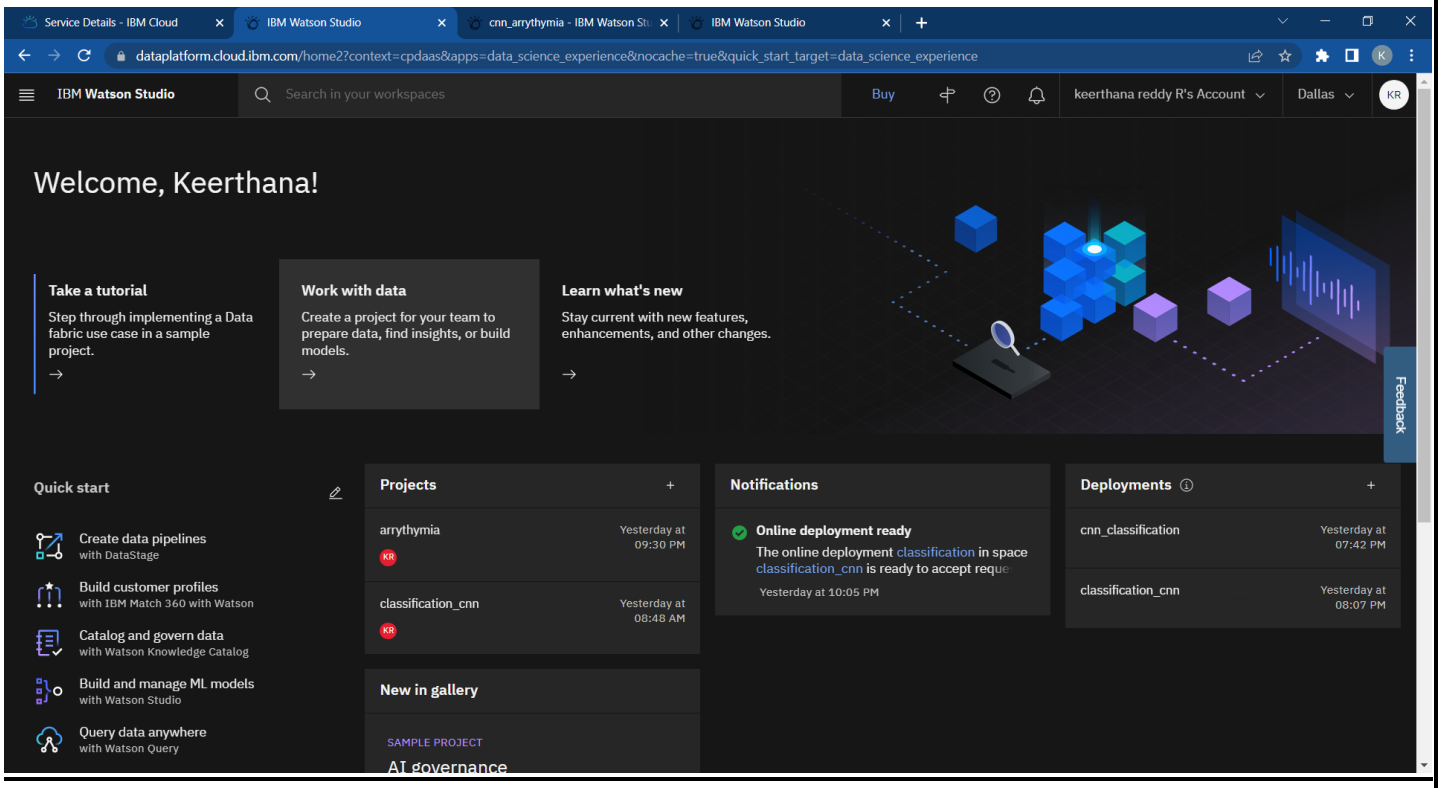
GO TO WATSON STUDIO SERVICES AND LAUNCH IT:



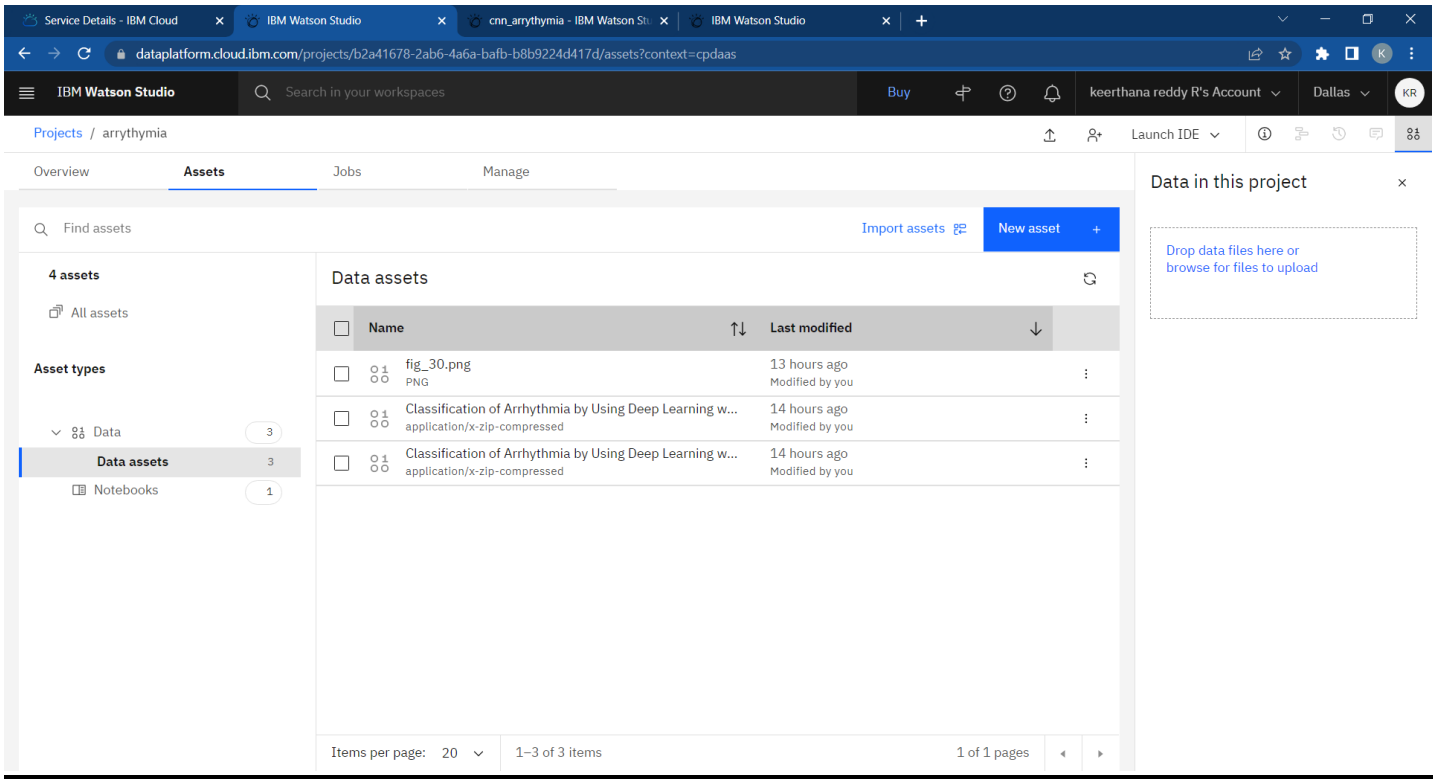
IBM CLOUD PAK LOGIN:



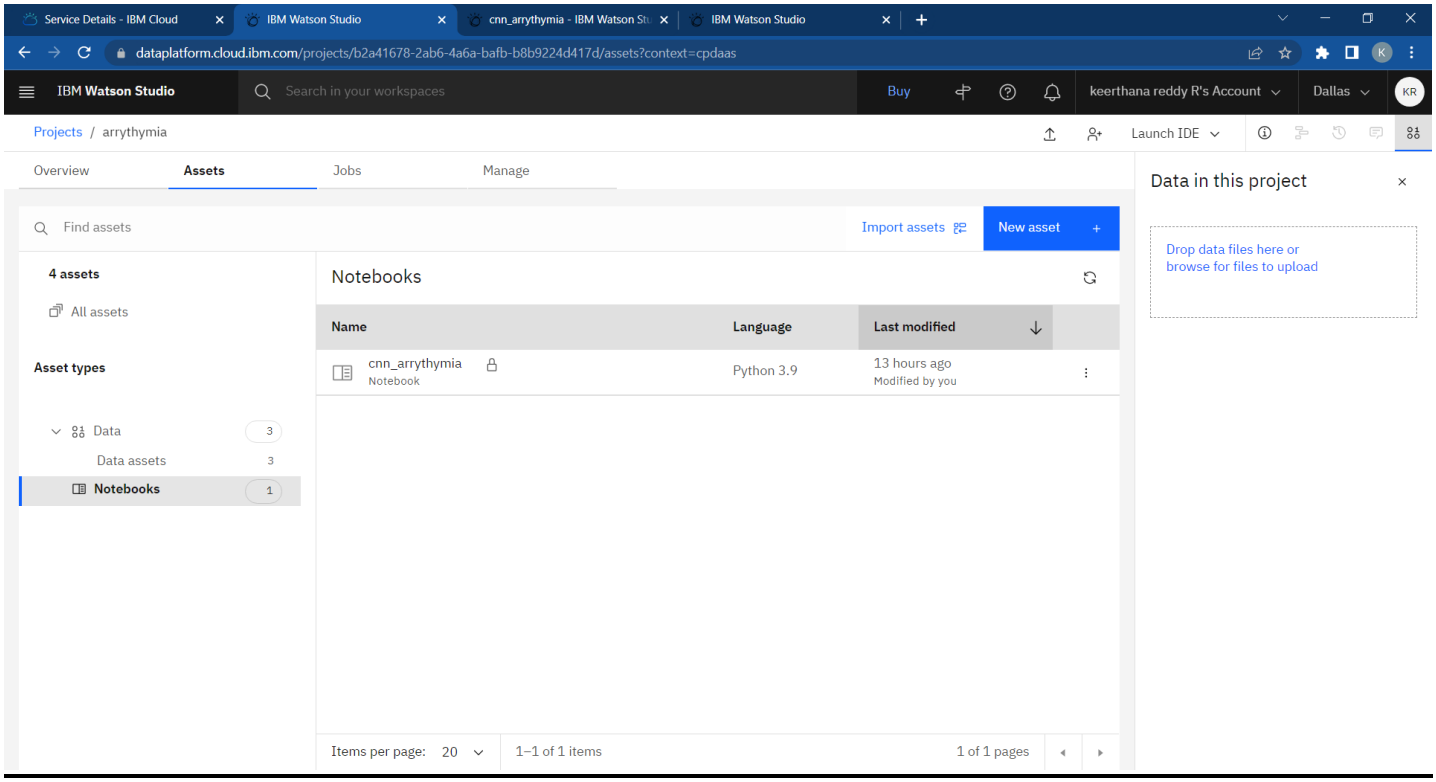




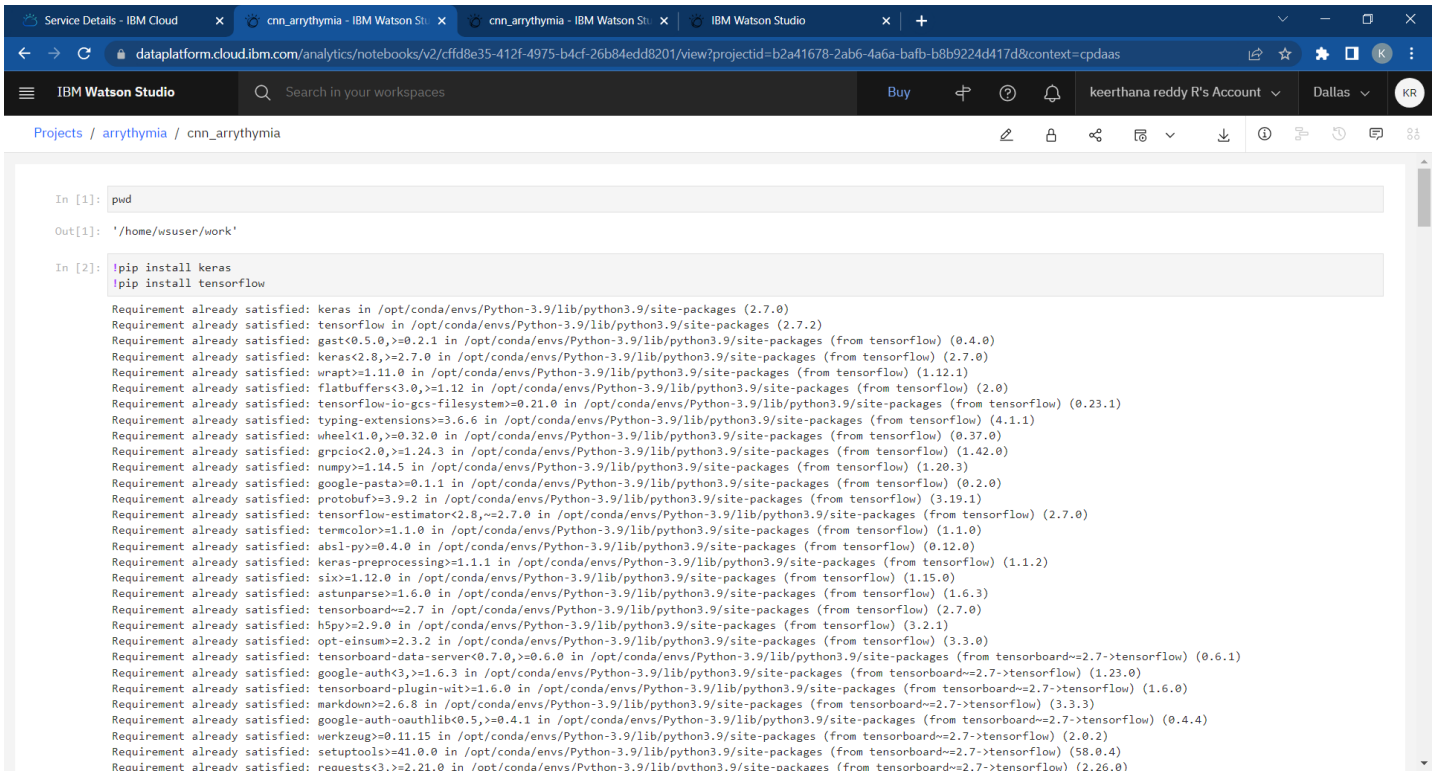
OPEN PROJECTS:



OPEN JUPYTER NOTEBOOK:



LOADING DATA AND IMAGE PREPROCESSING:



Service Details - IBM Cloud | cnn_arrythymia - IBM Watson Stu | cnn_arrythymia - IBM Watson Stu | IBM Watson Studio

dataplatform.cloud.ibm.com/analytics/notebooks/v2/cffd8e35-412f-4975-b4cf-26b84edd8201/view?projectid=b2a41678-2ab6-4a6a-bafb-b8b9224d417d&context=cpdaas

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```
Requirement already satisfied: idna<4,>=2.5 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from requests<3,>=2.21.0->tensorboard~=2.7->tensorflow) (3.3)
Requirement already satisfied: certifi>=2017.4.17 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from requests<3,>=2.21.0->tensorboard~=2.7->tensorflow) (2022.9.24)
Requirement already satisfied: oauthlib>=3.0.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from requests-oauthlib>=0.7.0->google-auth-oauthlib<0.5,>=0.4.1->tensorboard~=2.7->tensorflow) (3.2.1)
```

In [3]:
```
import keras
keras.__version__
```

Out[3]: '2.7.0'

In [4]:
```
import tensorflow
tensorflow.__version__
```

Out[4]: '2.7.2'

In [5]:
```
import os, types
import pandas as pd
from botocore.client import Config
import ibm_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 = ibm_boto3.client(service_name='s3',
    ibm_api_key_id='0TR72q7UxHPuhBZxQKIT5fYvEvnD-1_Tpa87NRZC3bi5',
    ibm_auth_endpoint="https://iam.cloud.ibm.com/oidc/token",
    config=Config(signature_version='oauth'),
    endpoint_url='https://s3.private.us.cloud-object-storage.appdomain.cloud')

bucket = 'arrythymia-donotdelete-pr-qdtl23328bk83o'
object_key = 'Classification of Arrhythmia by Using Deep Learning with 2-D ECG Spectral Image Representation.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 ibm_boto3 and pandas to learn more about the possibilities to load the data.
```

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dataplatform.cloud.ibm.com/analytics/notebooks/v2/cffd8e35-412f-4975-b4cf-26b84edd8201/view?projectid=b2a41678-2ab6-4a6a-bafb-b8b9224d417d&context=cpdaas

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Projects / arrythymia / cnn_arrythymia

```
# Your data file was loaded into a botocore.response.StreamingBody object.
# Please read the documentation of ibm_boto3 and pandas to learn more about the possibilities to load the data.
# ibm_boto3 documentation: https://ibm.github.io/ibm-cos-sdk-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]:
```
filenames=os.listdir('/home/wsuser/work/data')
print(filenames)
```

```
['train', 'test']
```

In [8]:
```
import numpy as np
import tensorflow as tf
from tensorflow import keras
from keras.preprocessing.image import ImageDataGenerator
from tensorflow.keras.models import Sequential
from tensorflow.keras import layers
from tensorflow.keras.layers import Dense,Flatten
from tensorflow.keras.layers import Conv2D,MaxPooling2D
```

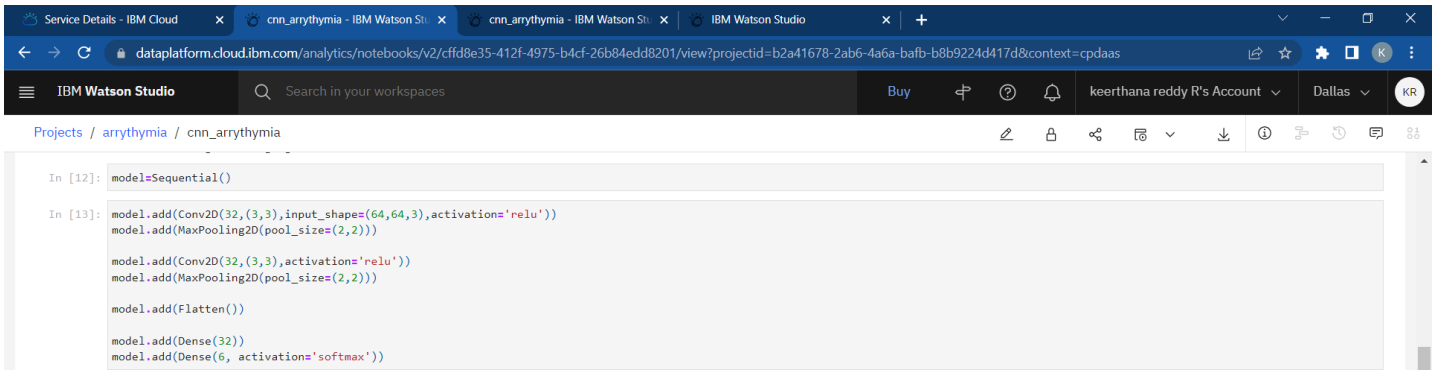
In [9]:
```
train_path = r"/home/wsuser/work/data/train"
test_path = r"/home/wsuser/work/data/test"
```

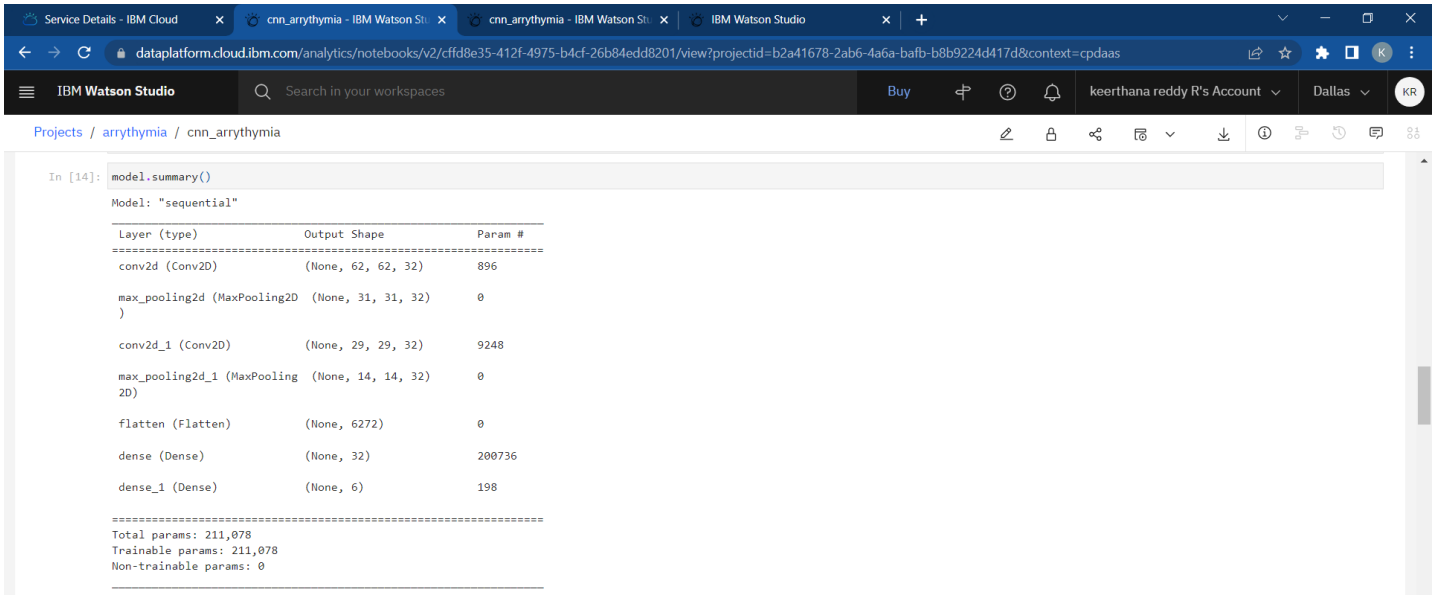
In [10]:
```
train_datagen = ImageDataGenerator(rescale=1./255, shear_range = 0.2, zoom_range=0.2, horizontal_flip = True)
test_datagen = ImageDataGenerator(rescale=1./255)
```

In [11]:
```
x_train = train_datagen.flow_from_directory(directory = train_path, target_size=(64,64), batch_size=32, class_mode= "categorical")
x_test = train_datagen.flow_from_directory(directory =test_path, target_size=(64,64), batch_size=32, class_mode= "categorical")
```

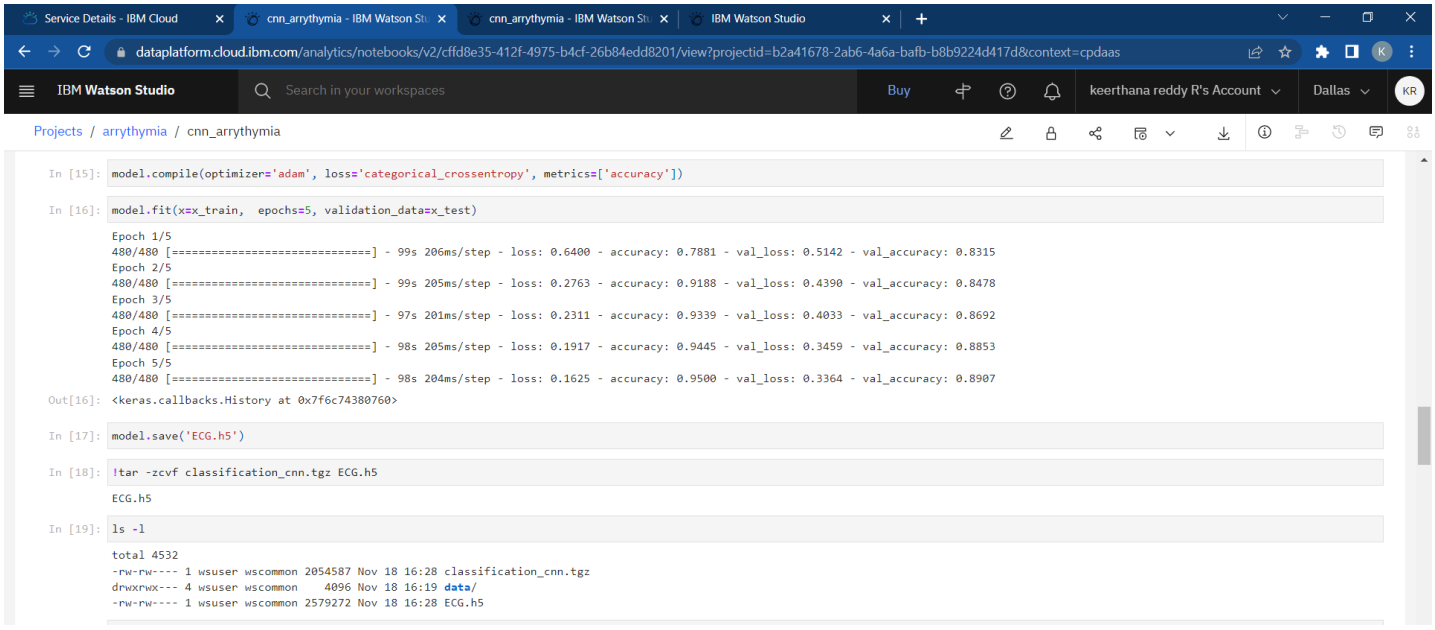
```
Found 15341 images belonging to 6 classes.
Found 6825 images belonging to 6 classes.
```

MODEL BUILDING:

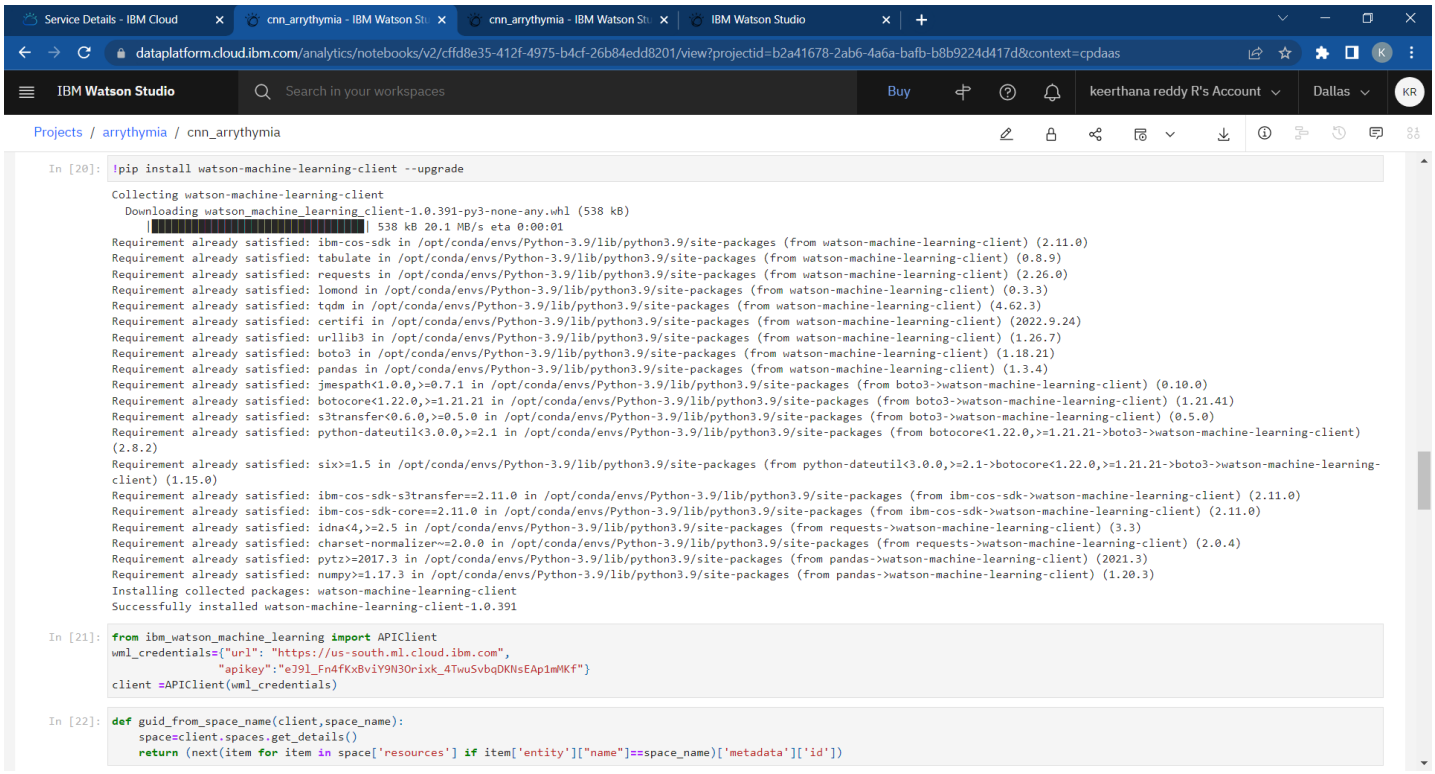


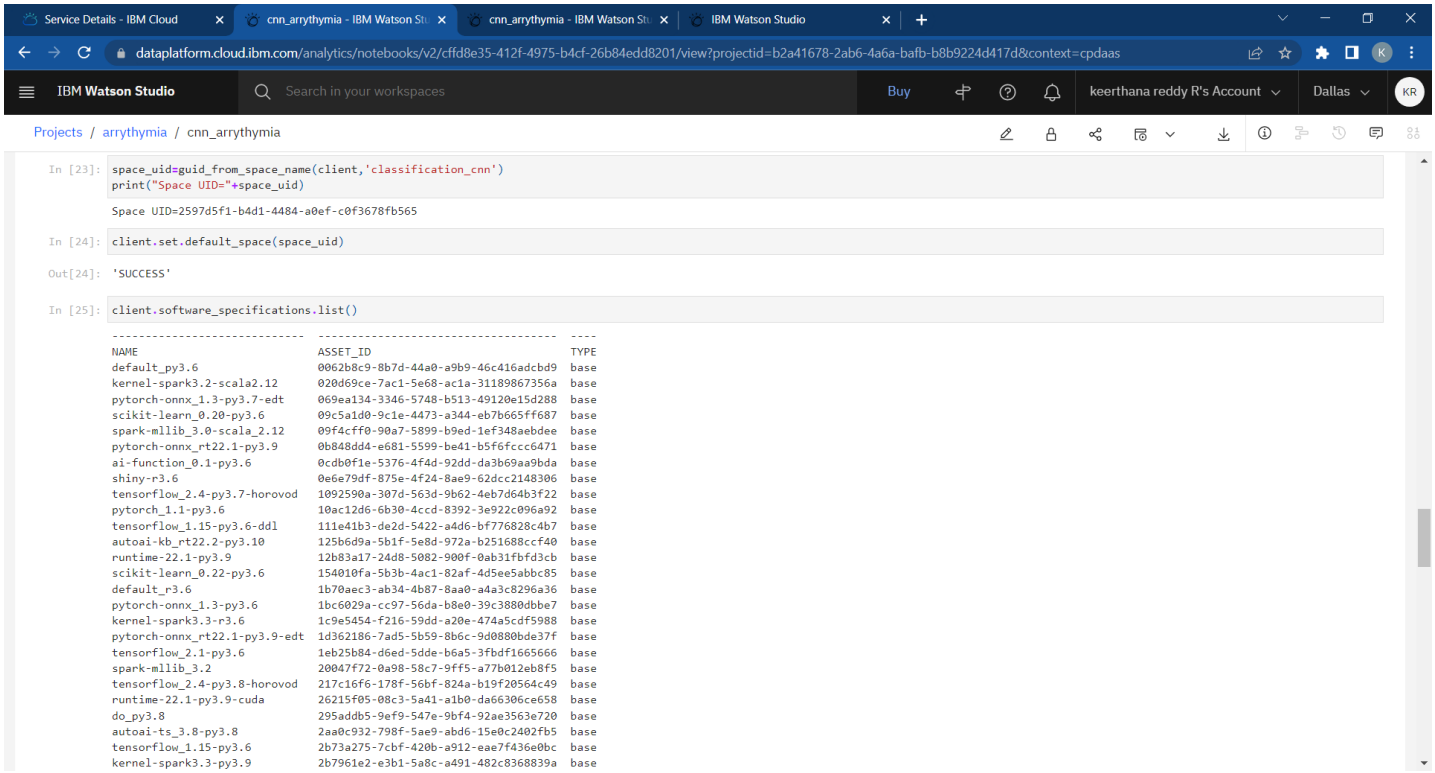


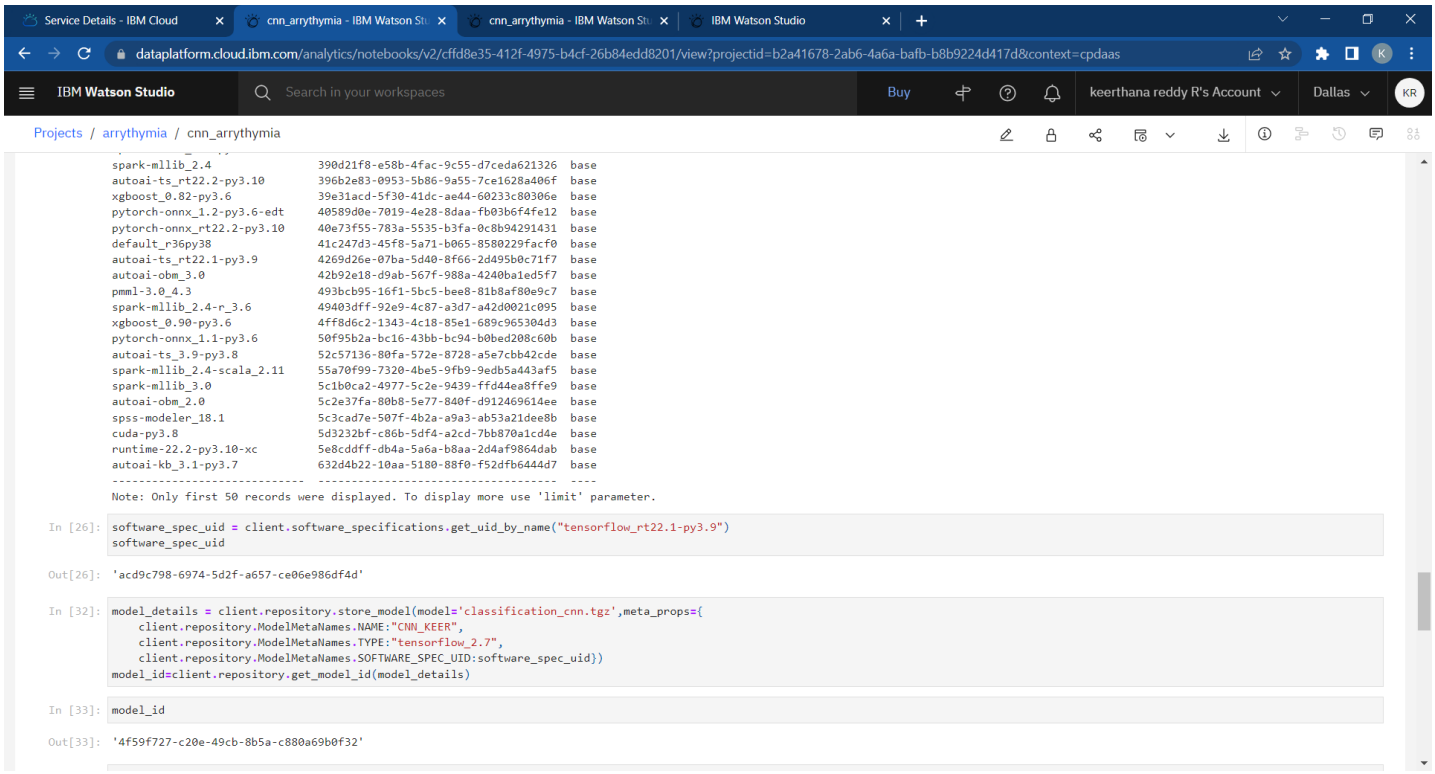
TRAINING THE MODEL IN CLOUD AND SAVING IT:



DEPLOYING THE MODEL IN IBM WATSON:







```
spark-mllib_2.4                 390d21f8-e58b-4fac-9c55-d7ceda621326  base
autoai-ts_rt22.2-py3.10         396b2e83-0953-5b86-9a55-7ce1628a406f  base
xgboost_0.82-py3.6              39e31acd-5f30-41dc-ae44-60233c80306e  base
pytorch-onnx_1.2-py3.6-edt      40589d0e-7019-4e28-8daa-fb03b6f4fe12  base
pytorch-onnx_rt22.2-py3.10      40e73f55-783a-5535-b3fa-0c8b94291431  base
default_r36py38                 41c247d3-45f8-5a71-b065-8580229facf0  base
autoai-ts_rt22.1-py3.9          4269d26e-07ba-5d40-8f66-2d495b0c71f7  base
autoai-obm_3.0                  42b92e18-d9ab-567f-988a-4240ba1ed5f7  base
pmml-3.0_4.3                    493bcb95-16f1-5bc5-bee8-81b8af80e9c7  base
spark-mllib_2.4-r_3.6           49403dff-92e9-4c87-a3d7-a42d0021c095  base
xgboost_0.90-py3.6              4ff8d6c2-1343-4c18-85e1-689c965304d3  base
pytorch-onnx_1.1-py3.6          50f95b2a-bc16-43bb-bc94-b0bed208c60b  base
autoai-ts_3.9-py3.8             52c57136-80fa-572e-8728-a5e7cbb42cde  base
spark-mllib_2.4-scala_2.11      55a70f99-7320-4be5-9fb9-9edb5a443af5  base
spark-mllib_3.0                 5c1b0ca2-4977-5c2e-9439-ffd44ea8ffe9  base
autoai-obm_2.0                  5c2e37fa-80b8-5e77-840f-d912469614ee  base
spss-modeler_18.1               5c3cad7e-507f-4b2a-a9a3-ab53a21dee8b  base
cuda-py3.8                      5d3232bf-c86b-5df4-a2cd-7bb870a1cd4e  base
runtime-22.2-py3.10-xc          5e8cddff-db4a-5a6a-b8aa-2d4af9864dab  base
autoai-kb_3.1-py3.7             632d4b22-10aa-5180-88f0-f52dfb6444d7  base
------------------------------  ------------------------------------  ----
Note: Only first 50 records were displayed. To display more use 'limit' parameter.
```

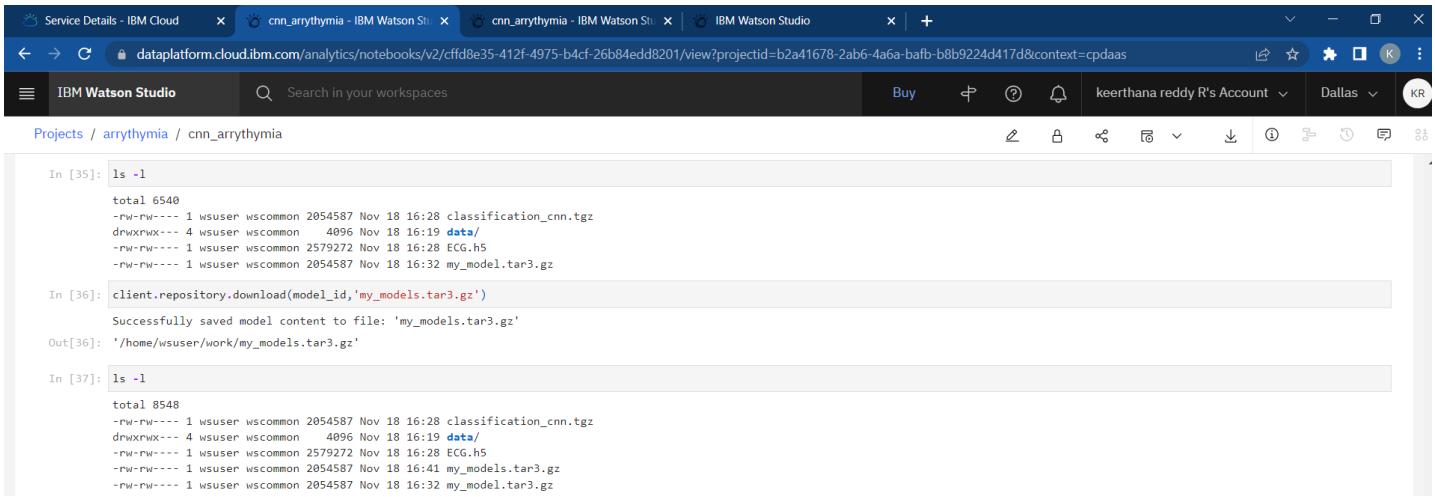
In [26]:
```
software_spec_uid = client.software_specifications.get_uid_by_name("tensorflow_rt22.1-py3.9")
software_spec_uid
```

Out[26]:
```
'acd9c798-6974-5d2f-a657-ce06e986df4d'
```

In [32]:
```
model_details = client.repository.store_model(model='classification_cnn.tgz',meta_props={
    client.repository.ModelMetaNames.NAME:"CNN_KEER",
    client.repository.ModelMetaNames.TYPE:"tensorflow_2.7",
    client.repository.ModelMetaNames.SOFTWARE_SPEC_UID:software_spec_uid})
model_id=client.repository.get_model_id(model_details)
```

In [33]:
```
model_id
```

Out[33]:
```
'4f59f727-c20e-49cb-8b5a-c880a69b0f32'
```



In [35]:
```
ls -l
```

```
total 6540
-rw-rw---- 1 wsuser wscommon 2054587 Nov 18 16:28 classification_cnn.tgz
drwxrwx--- 4 wsuser wscommon    4096 Nov 18 16:19 data/
-rw-rw---- 1 wsuser wscommon 2579272 Nov 18 16:28 ECG.h5
-rw-rw---- 1 wsuser wscommon 2054587 Nov 18 16:32 my_model.tar3.gz
```

In [36]:
```
client.repository.download(model_id,'my_models.tar3.gz')
```

```
Successfully saved model content to file: 'my_models.tar3.gz'
```

Out[36]:
```
'/home/wsuser/work/my_models.tar3.gz'
```

In [37]:
```
ls -l
```

```
total 8548
-rw-rw---- 1 wsuser wscommon 2054587 Nov 18 16:28 classification_cnn.tgz
drwxrwx--- 4 wsuser wscommon    4096 Nov 18 16:19 data/
-rw-rw---- 1 wsuser wscommon 2579272 Nov 18 16:28 ECG.h5
-rw-rw---- 1 wsuser wscommon 2054587 Nov 18 16:41 my_models.tar3.gz
-rw-rw---- 1 wsuser wscommon 2054587 Nov 18 16:32 my_model.tar3.gz
```

TESTING ON IBM:

In [38]:
```
from keras.models import load_model
from keras.preprocessing import image
```

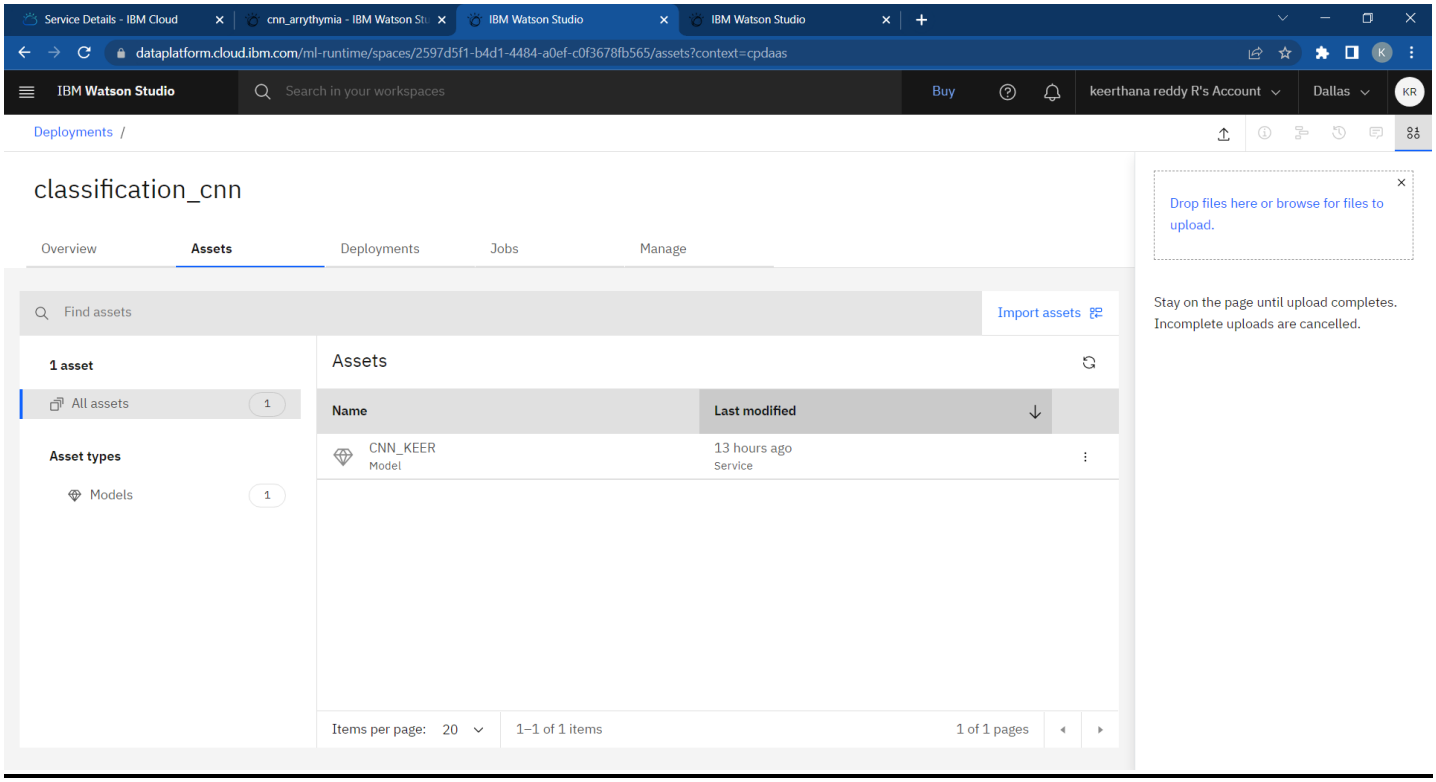
In [40]:
```
model=load_model('/home/wsuser/work/ECG.h5')
```

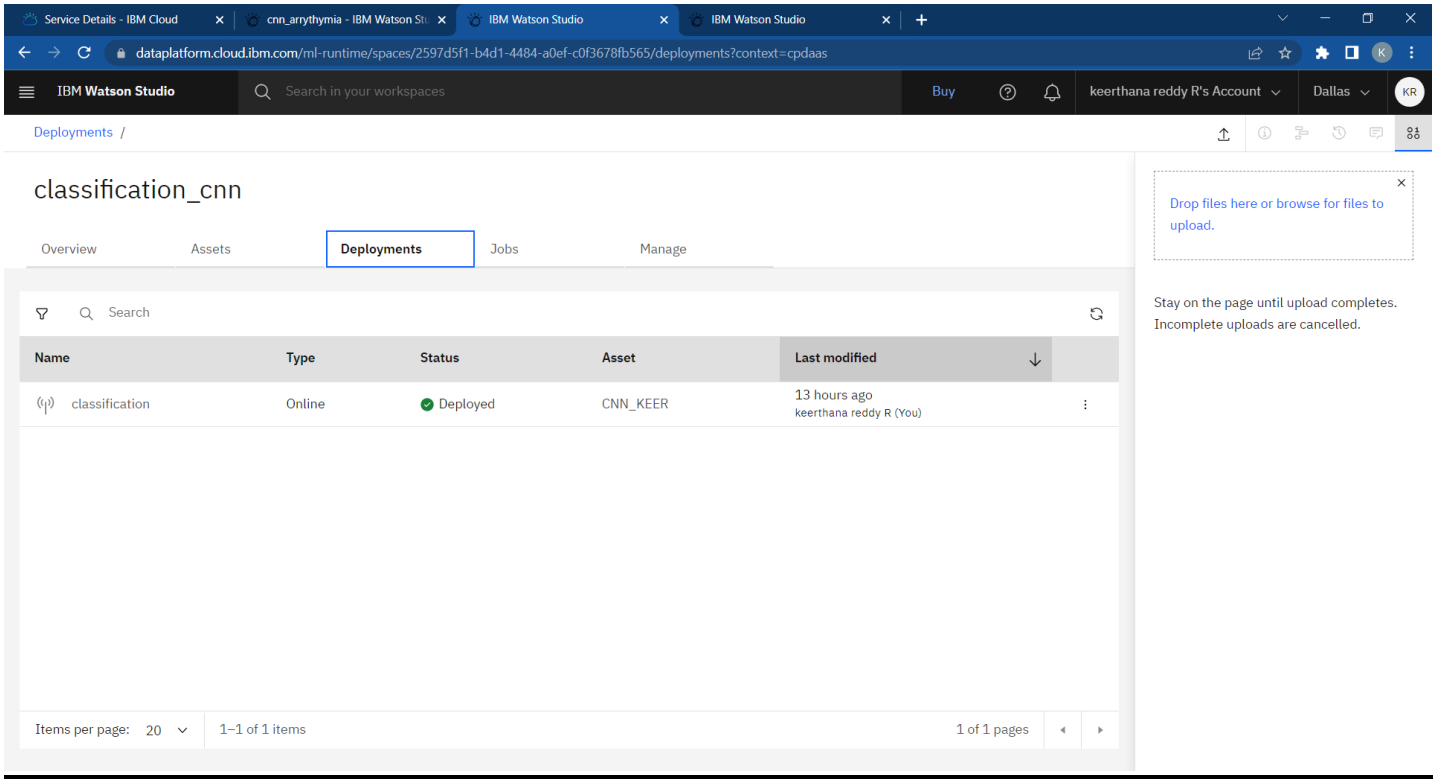
```
-rw-rw---- 1 wsuser wscommon 2054587 Nov 18 16:32 my_model.tar3.gz
```

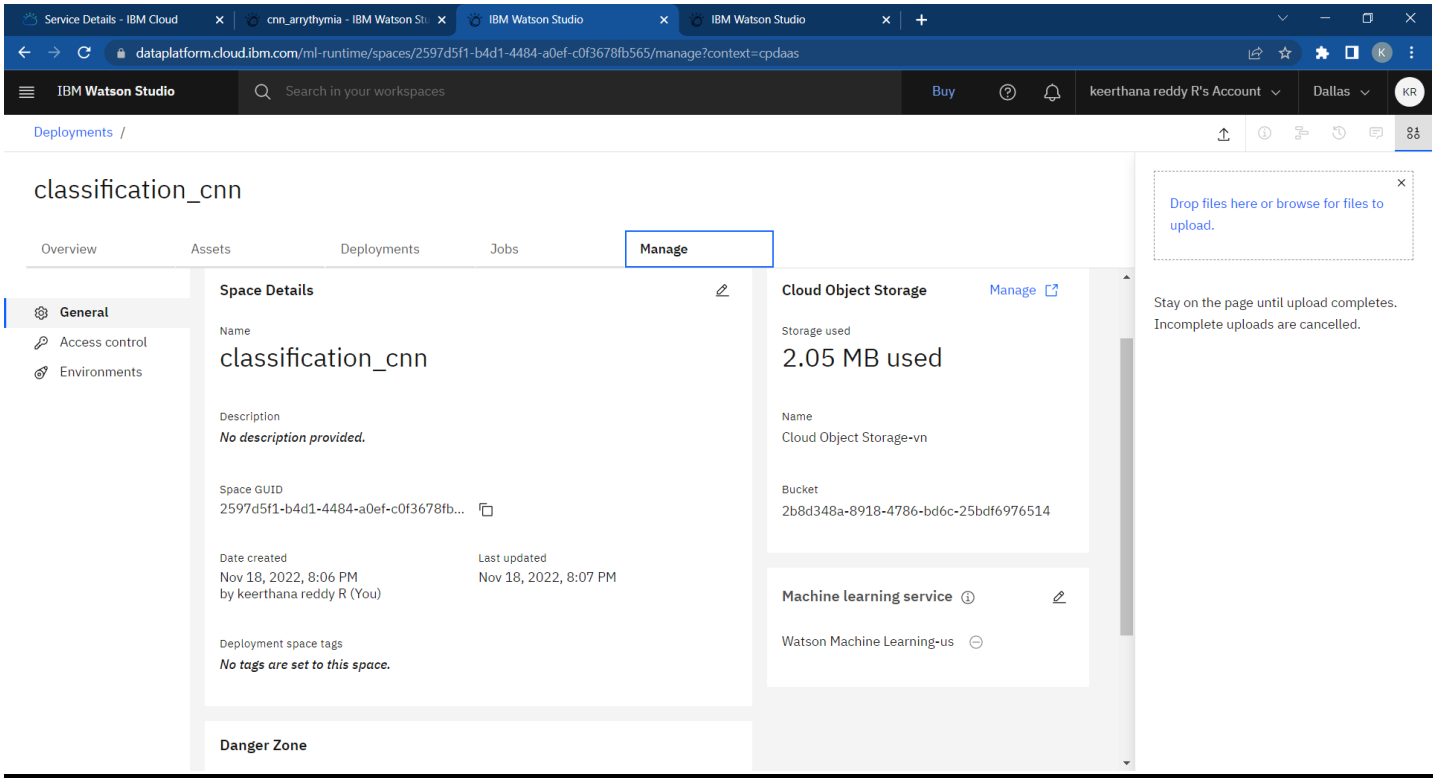
In [46]:
```
img=image.load_img('/home/wsuser/work/data/test/Left Bundle Branch Block/fig_5906.png', target_size=(64,64))
x=image.img_to_array(img)
x=np.expand_dims(x,axis=0)
pred=model.predict(x)
pred_classes=['Left bundle branch block', 'Normal', 'Premature atrial contraction', 'Premature ventricular contraction','Right bundle branch block','Ventricular fibrillation']
classes_x=np.argmax(pred)
print(pred)
print(pred_classes[classes_x])
```

```
[[1. 0. 0. 0. 0. 0.]]
Left bundle branch block
```

DEPLOYMENTS:






Service Details - IBM Cloud
cnn_arrythymia - IBM Watson Stu
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dataplatform.cloud.ibm.com/ml-runtime/spaces/2597d5f1-b4d1-4484-a0ef-c0f3678fb565/manage?context=cpdaas
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KR
Deployments /
classification_cnn
Overview
Assets
Deployments
Jobs
Manage
General
Access control
Environments
Space Details
Name
classification_cnn
Description
No description provided.
Space GUID
2597d5f1-b4d1-4484-a0ef-c0f3678fb...
Date created
Nov 18, 2022, 8:06 PM
by keerthana reddy R (You)
Last updated
Nov 18, 2022, 8:07 PM
Deployment space tags
No tags are set to this space.
Danger Zone
Cloud Object Storage
Manage
Storage used
2.05 MB used
Name
Cloud Object Storage-vn
Bucket
2b8d348a-8918-4786-bd6c-25bdf6976514
Machine learning service
Watson Machine Learning-us
Drop files here or browse for files to upload.
Stay on the page until upload completes.
Incomplete uploads are cancelled.