

Projects / CNN_ECG_VJ / CNN_ECG



```
In [32]: pwd

Out[32]: '/home/vsuser/work'

In [33]: !pip install keras
!pip install tensorflow
```

Requirement already satisfied: keras in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (2.7.0)
Requirement already satisfied: tensorflow in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (2.7.2)
Requirement already satisfied: protobuf<3.9.2 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow) (3.19.1)
Requirement already satisfied: wheel<1.0,>=0.32.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow) (0.37.0)
Requirement already satisfied: wrapt>=1.11.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow) (1.12.1)
Requirement already satisfied: flatbuffers<3.0,>=1.12 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow) (2.0)
Requirement already satisfied: gast<0.5.0,>=0.2.1 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow) (0.4.0)
Requirement already satisfied: google-pasta>=0.1.1 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow) (0.2.0)
Requirement already satisfied: absl-py>=0.4.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow) (0.12.0)
Requirement already satisfied: opt-einsum>=2.3.2 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow) (3.3.0)
Requirement already satisfied: keras-preprocessing>=1.1.1 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow) (1.1.2)
Requirement already satisfied: tensorboard>=2.7 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow) (2.7.0)
Requirement already satisfied: numpy>=1.14.5 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow) (1.20.3)
Requirement already satisfied: grpcio<2.0,>=1.24.3 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow) (1.42.0)
Requirement already satisfied: six>=1.12.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow) (1.15.0)
Requirement already satisfied: typing-extensions>=3.6.6 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow) (4.1.1)
Requirement already satisfied: astunparse>=1.6.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow) (1.6.3)
Requirement already satisfied: keras<2.8,>=2.7.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow) (2.7.0)
Requirement already satisfied: h5py>=2.9.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow) (3.2.1)
Requirement already satisfied: tensorflow-estimator<2.8,>=2.7.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow) (2.7.0)
Requirement already satisfied: termcolor>=1.1.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow) (1.1.0)
Requirement already satisfied: tensorflow-io-gcs-filesystem>=0.21.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow) (0.23.1)
Requirement already satisfied: markdown>=2.6.8 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorboard>=2.7->tensorflow) (3.3.3)
Requirement already satisfied: setuptools>=41.0.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorboard>=2.7->tensorflow) (58.0.4)
Requirement already satisfied: tensorboard-data-server<0.7.0,>=0.6.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorboard>=2.7->tensorflow) (0.6.1)
Requirement already satisfied: google-auth-oauthlib<0.5,>=0.4.1 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorboard>=2.7->tensorflow) (0.4.4)
Requirement already satisfied: werkzeug>=0.11.15 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorboard>=2.7->tensorflow) (2.0.2)
Requirement already satisfied: google-auth<3,>=1.6.3 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorboard>=2.7->tensorflow) (1.23.0)
Requirement already satisfied: tensorboard-plugin-wit>=1.6.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorboard>=2.7->tensorflow) (1.6.0)
Requirement already satisfied: requests<3,>=2.21.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorboard>=2.7->tensorflow) (2.26.0)
Requirement already satisfied: pyasn1-modules>=0.2.1 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from google-auth<3,>=1.6.3->tensorboard>=2.7->tensorflow) (0.2.8)
Requirement already satisfied: rsa<5,>=3.1.4 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from google-auth<3,>=1.6.3->tensorboard>=2.7->tensorflow) (4.7.2)
Requirement already satisfied: cachetools<5.0,>=2.0.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from google-auth<3,>=1.6.3->tensorboard>=2.7->tensorflow) (4.2.2)
Requirement already satisfied: requests-oauthlib>=0.7.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from google-auth-oauthlib<0.5,>=0.4.1->tensorboard>=2.7->tensorflow) (1.3.0)
Requirement already satisfied: pyasn1<0.5.0,>=0.4.6 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from pyasn1-modules>=0.2.1->google-auth<3,>=1.6.3->tensorboard>=2.7->tensorflow) (0.4.8)
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: charset-normalizer>=2.0.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from requests<3,>=2.21.0->tensorboard>=2.7->tensorflow) (2.0.4)

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```
client=APIClient(uml_credentials)
```

```
In [58]: def guid_from_space_name(client, space_name):  
        space = client.spaces.get_details()  
        return(next(item for item in space['resources'] if item['entity']["name"] == space_name)['metadata']['id'])
```

```
In [59]: space_uid = guid_from_space_name( client, 'CNN_ECG' )  
print("Space UID = " + space_uid)  
  
Space UID = 92524340-d705-4a82-b97d-1b201e39e889
```

```
In [60]: client.set.default_space(space_uid)
```

```
Out[60]: 'SUCCESS'
```

```
In [85]: client.software_specifications.list()
```

NAME	ASSET_ID	TYPE
default_py3.6	0062b8c9-8b7d-44a0-a9b9-46c416adcbd9	base
kernel-spark3.2-scala2.12	020d69ce-7ac1-5e68-ac1a-3118967356a	base
pytorch-onnx_1.3-py3.7-edt	069ea134-3346-5748-b513-49120e15d288	base
scikit-learn_0.20-py3.6	09c5a1d0-9c1e-4473-a344-eb7b665ff6b7	base
spark-mllib_3.0-scala_2.12	09f4cff0-90a7-5899-b9ed-1ef348aebdee	base
pytorch-onnx_rt22.1-py3.9	0b848dd4-e681-5599-be41-b5f6fccc6471	base
ai-function_0.1-py3.6	0cdb0f1e-5376-4f4d-92dd-da3b69aa9bda	base
shiny-r3.6	0e6e79df-875e-4f24-8ae9-62dcc2148306	base
tensorflow_2.4-py3.7-horovod	1092590a-307d-563d-9b62-4eb7d64b3f22	base
pytorch_1.1-py3.6	10ac12d6-6b30-4ccd-8392-3e922c096a92	base
tensorflow_1.15-py3.6-ddl	111e41b3-de2d-5422-a4d6-bf776828c4b7	base
autoai-kb_rt22.2-py3.10	125b6d9a-5b1f-5e8d-972a-b251668ccf40	base
runtime-22.1-py3.9	12b83a17-24d8-5082-900f-0ab31fbfd3cb	base
scikit-learn_0.22-py3.6	154010fa-5b3b-4ac1-82af-4d5ee5abbc85	base
default_r3.6	1b70aec3-ab34-4b67-8aa0-e4a3c8296a36	base
pytorch-onnx_1.3-py3.6	1bc6029a-cc97-56da-b8e0-39c3800dbbe7	base
kernel-spark3.3-r3.6	1c9e5454-f216-59dd-a20e-474a5cdf5988	base
pytorch-onnx_rt22.1-py3.9-edt	1d362186-7ad5-5b59-8b6c-9d0880bde37f	base
tensorflow_2.1-py3.6	1eb25b84-d6ed-5dde-b6a5-3fbdff166566	base
spark-mllib_3.2	20047f72-0a98-58c7-9ff5-a77b012eb8f5	base
tensorflow_2.4-py3.8-horovod	217c16f6-178f-56bf-824a-b19f20564c49	base
runtime-22.1-py3.9-cuda	26215f05-08c3-5a41-a1b0-da66306ce658	base
do_py3.8	295addb5-9ef9-547e-9bf4-92ae3563e720	base
autoai-ts_3.8-py3.8	2aa0c932-798f-5ae9-abd6-15e0c2402fb5	base
tensorflow_1.15-py3.6	2b73e275-7cbf-420b-e912-eeef7436e0bc	base
kernel-spark3.3-py3.9	2b7961e2-e3b1-5a8c-a491-482c8368839a	base
pytorch_1.2-py3.6	2c8ef57d-2687-4b7d-acce-01f94976dac1	base
spark-mllib_2.3	2e51f700-bca0-4b0d-88dc-5c6791338875	base
pytorch-onnx_1.1-py3.6-edt	32983cea-3f32-4400-8965-dde874a8d67e	base
spark-mllib_3.0-py37	36507ebe-8770-55ba-ab2a-eafe787600e9	base

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```
client.repository.ModelMetaNames.SOFTWARE_SPEC_UID:software_spec_uid))
model_id=client.repository.get_model_id(model_details)
```

In [66]: model_id

Out[66]: '328afef1-2c1f-4e75-9983-ff2c54af92ad'

In [67]: client.repository.download(model_id,'my_model.tar.gz')

Successfully saved model content to file: 'my_model.tar.gz'

Out[67]: '/home/wsuser/work/my_model.tar.gz'

```
In [68]: from tensorflow.keras.models import load_model
from tensorflow.keras.preprocessing import image
```

In [69]: model=load_model('ECG.h5')

In [74]: pwd

Out[74]: '/home/wsuser/work'

In [76]: ls

data/ ECG-arrhythmia-classification-model_new.tgz ECG.h5 my_model.tar.gz

In []: img=image.load_img(r'/home/wsuser/work/Unknown_image.png',target_size=(64,64))

```
In [ ]: import numpy as np
x=image.img_to_array(img)
x=np.expand_dims(x,axis=0)
```

In []: pred = model.predict(x)

In [99]: pred[0]

1

In []: index=['left Bundle Branch block','Normal','Premature Atrial Contraction','Premature Ventricular Contraction','Right Bundle Branch Block','Ventricular Fibrillation']

In [100]: a = index[pred[0]]
print(a)

Normal

In []:

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```
480/480 [=====] - 51s 106ms/step - loss: 0.1322 - accuracy: 0.9593 - val_loss: 0.2763 - val_accuracy: 0.9253
Epoch 9/10
480/480 [=====] - 50s 104ms/step - loss: 0.1193 - accuracy: 0.9630 - val_loss: 0.2545 - val_accuracy: 0.9242
Epoch 10/10
480/480 [=====] - 52s 108ms/step - loss: 0.1061 - accuracy: 0.9676 - val_loss: 0.3888 - val_accuracy: 0.9029
```

Out[52]: <keras.callbacks.History at 0x7f990829abb0>

In [53]: model.save('ECG.h5')

In [83]: !tar -czvf ECG-arrhythmia-classification-model_new.tgz ECG.h5

ECG.h5

In [84]: ls -l

```
data/
ECG-arrhythmia-classification-model_new.tgz
ECG.h5
my_model.tar.gz
```

In [56]: !pip install watson-machine-learning-client --upgrade

```
Collecting watson-machine-learning-client
  Downloading watson_machine_learning_client-1.0.391-py3-none-any.whl (538 kB)
    538 kB 23.6 MB/s eta 0:00:01
Requirement already satisfied: certifi in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from watson-machine-learning-client) (2022.9.24)
Requirement already satisfied: tqdm in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from watson-machine-learning-client) (4.62.3)
Requirement already satisfied: urllib3 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from watson-machine-learning-client) (1.26.7)
Requirement already satisfied: pandas in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from watson-machine-learning-client) (1.3.4)
Requirement already satisfied: lmond in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from watson-machine-learning-client) (0.3.3)
Requirement already satisfied: boto3 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from watson-machine-learning-client) (1.18.21)
Requirement already satisfied: requests in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from watson-machine-learning-client) (2.26.0)
Requirement already satisfied: tabulate in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from watson-machine-learning-client) (0.8.9)
Requirement already satisfied: ibm-cos-sdk in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from watson-machine-learning-client) (2.11.0)
Requirement already satisfied: botocore<1.22.0,>=1.21.21 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from boto3->watson-machine-learning-client) (1.21.41)
Requirement already satisfied: s3transfer<0.6.0,>=0.5.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from boto3->watson-machine-learning-client) (0.5.0)
Requirement already satisfied: jmespath<1.0.0,>=0.7.1 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from boto3->watson-machine-learning-client) (0.10.0)
Requirement already satisfied: python-dateutil<3.0.0,>=2.1 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from botocore<1.22.0,>=1.21.21->boto3->watson-machine-learning-client) (2.8.2)
Requirement already satisfied: six>=1.5 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from python-dateutil<3.0.0,>=2.1->botocore<1.22.0,>=1.21.21->boto3->watson-machine-learning-client) (1.15.0)
Requirement already satisfied: ibm-cos-sdk-s3transfer==2.11.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from ibm-cos-sdk->watson-machine-learning-client) (2.11.0)
Requirement already satisfied: ibm-cos-sdk-core==2.11.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from ibm-cos-sdk->watson-machine-learning-client) (2.11.0)
Requirement already satisfied: idna<4,>=2.5 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from requests->watson-machine-learning-client) (3.3)
Requirement already satisfied: charset-normalizer==2.0.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from requests->watson-machine-learning-client) (2.0.4)
Requirement already satisfied: pytz>=2017.3 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from pandas->watson-machine-learning-client) (2021.3)
Requirement already satisfied: numpy>=1.17.3 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from pandas->watson-machine-learning-client) (1.20.3)
Installing collected packages: watson-machine-learning-client
Successfully installed watson-machine-learning-client-1.0.391
```

In [57]: from ibm_watson_machine_learning import APIClient
wml_credentials={

IBM Watson Studio

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Asset types

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Data assets4

Notebooks1

Notebooks

Name	Language	Last modified
<div>CNN_ECG Notebook</div>	Python 3.9	20 hours ago Modified by you

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Data in this project

Drop data files here or browse for files to upload