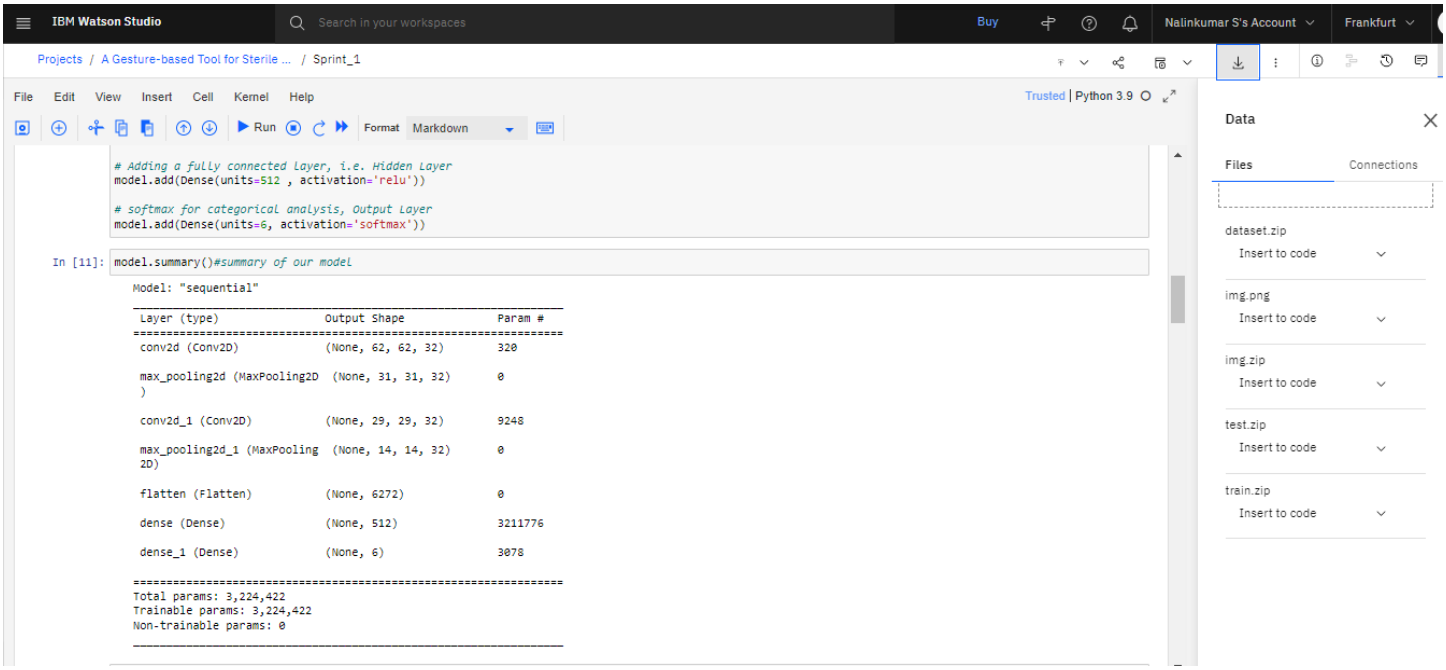
Project Development Phase

Sprint - 2

Date	5 November 2022
Team ID	PNT2022TMID35818
Project Name	A Gesture - Based Tool for Sterile Browsing of Radiology Images
Marks	4 Marks

IBM Watson Studio:



Link: https://eu-de.dataplatform.cloud.ibm.com/analytics/notebooks/v2/d149459d-0458-4e1d-8f52-14ca98b01fed/view?access_token=53480ae69f9a284a95e00291cde6c84220f256aabddafb9278b129e8914b93f8

In [1]:
```
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='2-lGYZzFg_1NYpm3Hc1FxjM8D0lxLUMvSScYXuek-ouj',
    ibm_auth_endpoint="https://iam.cloud.ibm.com/oidc/token",
    config=Config(signature_version='oauth'),
    endpoint_url='https://s3.private.eu.cloud-object-storage.appdomain.cloud')

bucket = 'agesturebasedtoolforsterilebrowsi-donotdelete-pr-bnlnbcqb2k7omr'
object_key = 'dataset.zip'

streaming_body_3 = 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.
# ibm_boto3 documentation: https://ibm.github.io/ibm-cos-sdk-python/
# pandas documentation: http://pandas.pydata.org/
```

In [2]:
```
from io import BytesIO
import zipfile
unzip=zipfile.ZipFile(BytesIO(streaming_body_3.read()),'r')
file_paths=unzip.namelist()
for path in file_paths:
    unzip.extract(path)
```

In [3]:
```
ls
```

```
dataset/
```

In [4]:
```
import numpy as np
import tensorflow as tf
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense,Flatten, Dropout
from tensorflow.keras.layers import Convolution2D,MaxPooling2D
from tensorflow.keras.preprocessing.image import ImageDataGenerator
```

In [5]:
```
train_datagen = ImageDataGenerator(rescale=1./255,
                                   shear_range=0.2,
                                   zoom_range=0.2,
                                   horizontal_flip=True)
test_datagen=ImageDataGenerator(rescale=1./255)
```

In [9]:
```
#performing data agumentation to train data
x_train = train_datagen.flow_from_directory(r'dataset/train',
                                            target_size=(64, 64),
                                            batch_size=3,
                                            color_mode='grayscale',
                                            class_mode='categorical')
#performing data agumentation to test data
x_test = test_datagen.flow_from_directory(r'dataset/test',
                                          target_size=(64, 64),
                                          batch_size=3,
                                          color_mode='grayscale',
                                          class_mode='categorical')
```

```
Found 594 images belonging to 6 classes.
Found 30 images belonging to 6 classes.
```

In [10]:
```
# Initializing the CNN
model = Sequential()

# First convolution layer and pooling
model.add(Convolution2D(32, (3, 3), input_shape=(64, 64, 1), activation='relu'))
model.add(MaxPooling2D(pool_size=(2, 2)))

# Second convolution layer and pooling
```

```
model.add(Convolution2D(32, (3, 3), activation='relu'))
# input_shape is going to be the pooled feature maps from the previous convolution layer
model.add(MaxPooling2D(pool_size=(2,2)))

# Flattening the layers i.e. input layer
model.add(Flatten())

# Adding a fully connected layer, i.e. Hidden Layer
model.add(Dense(units=512 , activation='relu'))

# softmax for categorical analysis, Output Layer
model.add(Dense(units=6, activation='softmax'))
```

In [11]:
```
model.summary()#summary of our model
```

```
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 conv2d (Conv2D)             (None, 62, 62, 32)        320

 max_pooling2d (MaxPooling2D  (None, 31, 31, 32)       0
 )

 conv2d_1 (Conv2D)           (None, 29, 29, 32)        9248

 max_pooling2d_1 (MaxPooling  (None, 14, 14, 32)       0
 2D)

 flatten (Flatten)           (None, 6272)              0

 dense (Dense)               (None, 512)               3211776

 dense_1 (Dense)             (None, 6)                 3078

=================================================================
Total params: 3,224,422
Trainable params: 3,224,422
Non-trainable params: 0
_________________________________________________________________
```

In [12]:
```
# Compiling the CNN
model.compile(optimizer='adam', loss='categorical_crossentropy', metrics=['accuracy'])
```

In [13]:
```
# Model Train
H = model.fit_generator(x_train,
                        steps_per_epoch = 198 ,
                        epochs = 25,
                        validation_data = x_test,
                        validation_steps = 10 )
```

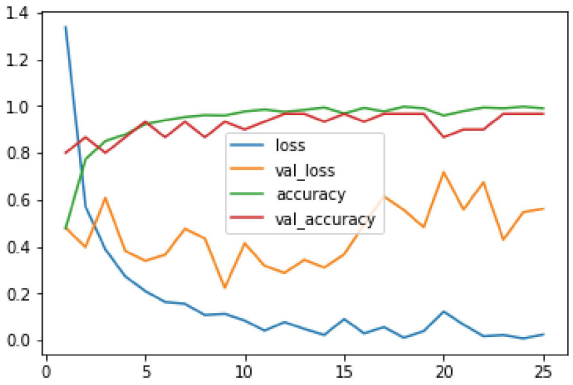
```
/tmp/wsuser/ipykernel_209/3754161595.py:2: UserWarning: `Model.fit_generator` is deprecated and will be removed in a fu
ture version. Please use `Model.fit`, which supports generators.
  H = model.fit_generator(x_train,
```

```
Epoch 1/25
198/198 [==============================] - 13s 60ms/step - loss: 1.3366 - accuracy: 0.4781 - val_loss: 0.4804 - val_acc
uracy: 0.8000
Epoch 2/25
198/198 [==============================] - 11s 57ms/step - loss: 0.5714 - accuracy: 0.7727 - val_loss: 0.3970 - val_acc
uracy: 0.8667
Epoch 3/25
198/198 [==============================] - 12s 61ms/step - loss: 0.3879 - accuracy: 0.8502 - val_loss: 0.6077 - val_acc
uracy: 0.8000
Epoch 4/25
198/198 [==============================] - 11s 57ms/step - loss: 0.2720 - accuracy: 0.8788 - val_loss: 0.3809 - val_acc
uracy: 0.8667
Epoch 5/25
198/198 [==============================] - 11s 58ms/step - loss: 0.2099 - accuracy: 0.9226 - val_loss: 0.3388 - val_acc
uracy: 0.9333
Epoch 6/25
198/198 [==============================] - 12s 61ms/step - loss: 0.1629 - accuracy: 0.9394 - val_loss: 0.3647 - val_acc
uracy: 0.8667
Epoch 7/25
198/198 [==============================] - 12s 59ms/step - loss: 0.1552 - accuracy: 0.9529 - val_loss: 0.4759 - val_acc
uracy: 0.9333
Epoch 8/25
198/198 [==============================] - 11s 56ms/step - loss: 0.1070 - accuracy: 0.9613 - val_loss: 0.4343 - val_acc
uracy: 0.8667
Epoch 9/25
198/198 [==============================] - 11s 55ms/step - loss: 0.1120 - accuracy: 0.9596 - val_loss: 0.2234 - val_acc
uracy: 0.9333
Epoch 10/25
198/198 [==============================] - 11s 53ms/step - loss: 0.0838 - accuracy: 0.9764 - val_loss: 0.4139 - val_acc
uracy: 0.9000
Epoch 11/25
198/198 [==============================] - 11s 56ms/step - loss: 0.0407 - accuracy: 0.9848 - val_loss: 0.3179 - val_acc
uracy: 0.9333
Epoch 12/25
198/198 [==============================] - 11s 56ms/step - loss: 0.0769 - accuracy: 0.9747 - val_loss: 0.2871 - val_acc
uracy: 0.9667
Epoch 13/25
198/198 [==============================] - 12s 58ms/step - loss: 0.0479 - accuracy: 0.9832 - val_loss: 0.3433 - val_acc
uracy: 0.9667
Epoch 14/25
198/198 [==============================] - 11s 56ms/step - loss: 0.0223 - accuracy: 0.9933 - val_loss: 0.3101 - val_acc
uracy: 0.9333
Epoch 15/25
198/198 [==============================] - 11s 57ms/step - loss: 0.0901 - accuracy: 0.9680 - val_loss: 0.3667 - val_acc
uracy: 0.9667
Epoch 16/25
198/198 [==============================] - 11s 58ms/step - loss: 0.0292 - accuracy: 0.9916 - val_loss: 0.4938 - val_acc
uracy: 0.9333
Epoch 17/25
198/198 [==============================] - 12s 58ms/step - loss: 0.0556 - accuracy: 0.9764 - val_loss: 0.6139 - val_acc
uracy: 0.9667
Epoch 18/25
198/198 [==============================] - 11s 57ms/step - loss: 0.0108 - accuracy: 0.9966 - val_loss: 0.5562 - val_acc
uracy: 0.9667
Epoch 19/25
198/198 [==============================] - 11s 56ms/step - loss: 0.0386 - accuracy: 0.9899 - val_loss: 0.4826 - val_acc
uracy: 0.9667
Epoch 20/25
198/198 [==============================] - 11s 57ms/step - loss: 0.1220 - accuracy: 0.9596 - val_loss: 0.7178 - val_acc
uracy: 0.8667
Epoch 21/25
198/198 [==============================] - 12s 59ms/step - loss: 0.0664 - accuracy: 0.9781 - val_loss: 0.5579 - val_acc
uracy: 0.9000
Epoch 22/25
198/198 [==============================] - 12s 59ms/step - loss: 0.0171 - accuracy: 0.9933 - val_loss: 0.6741 - val_acc
uracy: 0.9000
Epoch 23/25
198/198 [==============================] - 11s 57ms/step - loss: 0.0224 - accuracy: 0.9899 - val_loss: 0.4288 - val_acc
uracy: 0.9667
Epoch 24/25
198/198 [==============================] - 12s 60ms/step - loss: 0.0077 - accuracy: 0.9966 - val_loss: 0.5465 - val_acc
uracy: 0.9667
Epoch 25/25
198/198 [==============================] - 12s 59ms/step - loss: 0.0242 - accuracy: 0.9899 - val_loss: 0.5611 - val_acc
uracy: 0.9667
```

In [14]:
```
# Save the model
model.save('gesture.h5')
```

In [15]:
```
model_json = model.to_json()
with open("model-bw.json", "w") as json_file:
    json_file.write(model_json)
```

In [16]:
```
import matplotlib.pyplot as plt

plt.plot(np.arange(1, 25+1), H.history['loss'], label='loss')
plt.plot(np.arange(1, 25+1), H.history['val_loss'], label='val_loss')
plt.legend()
plt.savefig('loss.png')

plt.plot(np.arange(1, 25+1), H.history['accuracy'], label='accuracy')
plt.plot(np.arange(1, 25+1), H.history['val_accuracy'], label='val_accuracy')
plt.legend()
plt.savefig('accuracy.png')
```



Testing

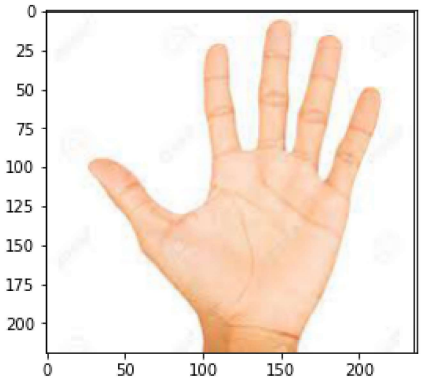
In [54]:
```
from tensorflow.keras.models import load_model
from tensorflow.keras.preprocessing import image
model_test = load_model("gesture.h5")

#Loading the model for testing
path = "img.png"
```

In [47]:
```
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='2-lGYZzFg_1NYpm3Hc1FxjM8D0lxLUMvSScYXuek-ouj',
    ibm_auth_endpoint="https://iam.cloud.ibm.com/oidc/token",
    config=Config(signature_version='oauth'),
    endpoint_url='https://s3.private.eu.cloud-object-storage.appdomain.cloud')

bucket = 'agesturebasedtoolforsterilebrowsi-donotdelete-pr-bnlnbcqb2k7omr'
object_key = 'img.zip'

streaming_body_4 = 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.
# ibm_boto3 documentation: https://ibm.github.io/ibm-cos-sdk-python/
# pandas documentation: http://pandas.pydata.org/
```

In [48]:
```
from io import BytesIO
import zipfile
```

```
unzip=zipfile.ZipFile(BytesIO(streaming_body_4.read()),'r')
file_paths=unzip.namelist()
for path in file_paths:
    unzip.extract(path)
```

In [49]:
```
import matplotlib.pyplot as plt
import matplotlib.image as mpimg
imgs = mpimg.imread(path)
imgplot = plt.imshow(imgs)
plt.show()
```



In [50]:
```
ls
```

```
accuracy.png  dataset/  gesture.h5  img.png  loss.png  model-bw.json
```

In [51]:
```
#loading of the image
img = image.load_img(path,
                     color_mode='grayscale',
                     target_size= (64,64))
x = image.img_to_array(img)

#image to array
x.shape
```

Out[51]:
```
(64, 64, 1)
```

In [52]:
```
x = np.expand_dims(x,axis = 0)

x.shape
```

Out[52]:
```
(1, 64, 64, 1)
```

In [64]:
```
pred = np.argmax(model.predict(x), axis=-1)

#predicting the classes

index=['0','1','2','3','4','5']
```

In [65]:
```
pred
```

Out[65]:
```
array([5])
```

In [66]:
```
result=str(index[pred[0]])

result
```

Out[66]:
```
'5'
```

In [67]:
```
p = []

for i in range(0,6):
    for j in range(0,5):
        path = "dataset/test/"+str(i)+"/"+str(j)+".jpg"
        img = image.load_img(path,color_mode = "grayscale",target_size= (64,64))
        x = image.img_to_array(img)
        x = np.expand_dims(x,axis = 0)
        pred = np.argmax(model.predict(x), axis=-1)
        p.append(pred)
```

```
print(p)
```

```
[array([0]), array([0]), array([0]), array([0]), array([0]), array([1]), array([1]), array([1]), array([1]), array
([1]), array([2]), array([2]), array([1]), array([2]), array([2]), array([3]), array([3]), array([3]), array([3]), arra
y([3]), array([4]), array([4]), array([4]), array([4]), array([4]), array([5]), array([5]), array([5]), array([5]), arr
ay([5])]
```

In [68]:

```
result = []
index=['0','1','2','3','4','5']
for i in p:
    result.append(index[i[0]])

print(result)
```

```
['0', '0', '0', '0', '0', '1', '1', '1', '1', '1', '2', '2', '1', '2', '2', '3', '3', '3', '3', '3', '4', '4', '4',
'4', '4', '5', '5', '5', '5', '5']
```

Team Members

Nalinkumar S
Ranjith S
Amuthayazhini K
Mithrha R