```
pwd
```

```
'C:\\Users\\vcvit\\Downloads'
```

```
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
```

```
train_datagen = ImageDataGenerator(rescale=1./255,
 shear_range=0.2,
 zoom_range=0.2,
 horizontal_flip=True)
#Image Data agumentation to the testing data
test_datagen=ImageDataGenerator(rescale=1./255)
```

```
x_train = train_datagen.flow_from_directory(r'C:\Users\vcvit\IBM
dataset\drive-download-20221029T044045Z-001\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'C:\Users\vcvit\IBM
dataset\drive-download-20221029T044045Z-001\test',
 target_size=(64, 64),
 batch_size=3,
 color_mode='grayscale',
 class_mode='categorical')
```

```
Found 594 images belonging to 6 classes.
Found 32 images belonging to 6 classes.
```

```
model = Sequential()
```

```
model.add(Convolution2D(32, (3, 3), input_shape=(64, 64,
1),activation='relu'))
model.add(MaxPooling2D(pool_size=(2, 2)))

model.add(Convolution2D(32, (3, 3), activation='relu'))

model.add(MaxPooling2D(pool_size=(2,2)))
model.add(Flatten())
model.add(Dense(units=512 , activation='relu'))
model.add(Dense(units=6, activation='softmax'))
model.summary()
```

```
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
_________________________________________________________________
```

```
model.compile(optimizer='adam', loss='categorical_crossentropy',
metrics=['accuracy'])

model.fit_generator(x_train,
 steps_per_epoch = 594/3 ,
 epochs = 25,
 validation_data = x_test,
 validation_steps = 30/3 )
```

```
Epoch 1/25

C:\Users\vcvit\AppData\Local\Temp/ipykernel_3416/4201019193.py:1:
UserWarning: `Model.fit_generator` is deprecated and will be removed
in a future version. Please use `Model.fit`, which supports
generators.
  model.fit_generator(x_train,

198/198 [==============================] - 8s 36ms/step - loss: 1.2040
- accuracy: 0.5118 - val_loss: 0.6905 - val_accuracy: 0.6667
Epoch 2/25
198/198 [==============================] - 6s 32ms/step - loss: 0.5467
- accuracy: 0.7929 - val_loss: 0.3817 - val_accuracy: 0.9000
Epoch 3/25
198/198 [==============================] - 6s 32ms/step - loss: 0.4141
- accuracy: 0.8316 - val_loss: 0.4031 - val_accuracy: 0.8667
Epoch 4/25
198/198 [==============================] - 7s 33ms/step - loss: 0.2951
- accuracy: 0.8771 - val_loss: 0.3963 - val_accuracy: 0.8667
```

```
Epoch 5/25
198/198 [==============================] - 7s 33ms/step - loss: 0.2100
- accuracy: 0.9175 - val_loss: 0.3942 - val_accuracy: 0.9000
Epoch 6/25
198/198 [==============================] - 6s 32ms/step - loss: 0.1410
- accuracy: 0.9562 - val_loss: 0.3120 - val_accuracy: 0.9333
Epoch 7/25
198/198 [==============================] - 6s 32ms/step - loss: 0.1467
- accuracy: 0.9495 - val_loss: 0.1402 - val_accuracy: 0.9667
Epoch 8/25
198/198 [==============================] - 6s 31ms/step - loss: 0.0866
- accuracy: 0.9697 - val_loss: 0.4492 - val_accuracy: 0.9333
Epoch 9/25
198/198 [==============================] - 7s 35ms/step - loss: 0.1134
- accuracy: 0.9630 - val_loss: 0.4419 - val_accuracy: 0.8667
Epoch 10/25
198/198 [==============================] - 7s 34ms/step - loss: 0.0387
- accuracy: 0.9865 - val_loss: 0.6564 - val_accuracy: 0.8333
Epoch 11/25
198/198 [==============================] - 7s 35ms/step - loss: 0.0773
- accuracy: 0.9764 - val_loss: 0.5005 - val_accuracy: 0.9333
Epoch 12/25
198/198 [==============================] - 6s 31ms/step - loss: 0.0987
- accuracy: 0.9613 - val_loss: 0.4435 - val_accuracy: 0.9000
Epoch 13/25
198/198 [==============================] - 6s 30ms/step - loss: 0.0981
- accuracy: 0.9663 - val_loss: 0.5405 - val_accuracy: 0.8667
Epoch 14/25
198/198 [==============================] - 6s 30ms/step - loss: 0.0706
- accuracy: 0.9832 - val_loss: 0.4459 - val_accuracy: 0.9333
Epoch 15/25
198/198 [==============================] - 7s 34ms/step - loss: 0.0379
- accuracy: 0.9832 - val_loss: 0.4742 - val_accuracy: 0.9333
Epoch 16/25
198/198 [==============================] - 7s 35ms/step - loss: 0.0415
- accuracy: 0.9848 - val_loss: 0.3934 - val_accuracy: 0.9333
Epoch 17/25
198/198 [==============================] - 7s 36ms/step - loss: 0.0470
- accuracy: 0.9865 - val_loss: 0.5609 - val_accuracy: 0.8667
Epoch 18/25
198/198 [==============================] - 6s 32ms/step - loss: 0.0515
- accuracy: 0.9865 - val_loss: 0.4843 - val_accuracy: 0.9000
Epoch 19/25
198/198 [==============================] - 6s 32ms/step - loss: 0.0815
- accuracy: 0.9764 - val_loss: 0.5890 - val_accuracy: 0.9000
Epoch 20/25
198/198 [==============================] - 6s 32ms/step - loss: 0.0204
- accuracy: 0.9933 - val_loss: 0.5386 - val_accuracy: 0.9000
Epoch 21/25
198/198 [==============================] - 7s 33ms/step - loss: 0.0090
```

```
- accuracy: 0.9966 - val_loss: 0.5351 - val_accuracy: 0.9000
Epoch 22/25
198/198 [==============================] - 6s 31ms/step - loss: 0.0882
- accuracy: 0.9714 - val_loss: 1.1277 - val_accuracy: 0.8667
Epoch 23/25
198/198 [==============================] - 6s 31ms/step - loss: 0.0483
- accuracy: 0.9781 - val_loss: 0.4079 - val_accuracy: 0.9333
Epoch 24/25
198/198 [==============================] - 6s 32ms/step - loss: 0.0528
- accuracy: 0.9848 - val_loss: 0.4773 - val_accuracy: 0.9333
Epoch 25/25
198/198 [==============================] - 6s 31ms/step - loss: 0.0476
- accuracy: 0.9798 - val_loss: 0.4216 - val_accuracy: 0.9333

<keras.callbacks.History at 0x23c3b7f45e0>
```

```
model.save('gesture.h5')
model_json = model.to_json()
with open("model-bw.json","w") as json_file:
    json_file.write(model_json)
```

```
from tensorflow.keras.models import load_model
from tensorflow.keras.preprocessing import image
mod = load_model("gesture.h5")
```

```
img = image.load_img(r"C:\Users\vcvit\IBM dataset\drive-download-
20221029T044045Z-001\test\
3\100.jpeg",grayscale=True,target_size=(64,64))
x = image.img_to_array(img)
x = np.expand_dims(x,axis = 0)
predict_x=mod.predict(x)
classes_x=np.argmax(predict_x,axis=1)
# pred = mod.predict_classes(x)
classes_x
```

```
C:\Users\vcvit\anaconda3\lib\site-packages\keras\utils\
image_utils.py:409: UserWarning: grayscale is deprecated. Please use
color_mode = "grayscale"
  warnings.warn(

1/1 [==============================] - 0s 163ms/step

array([3], dtype=int64)
```