

```
import os
from kaggle.api.kaggle_api_extended import KaggleApi
```

```
api = KaggleApi()
api.authenticate()
```

```
dataset = 'gti-upm/leapgestrecog'
api.dataset_download_files(dataset, path='./', unzip=True)
```

➦ Dataset URL: <https://www.kaggle.com/datasets/gti-upm/leapgestrecog>

```
import tensorflow as tf
from tensorflow.keras.preprocessing.image import ImageDataGenerator
```

```
data_dir = './leapGestRecog'
```

```
datagen = ImageDataGenerator(rescale=1.0/255.0, validation_split=0.2)
```

```
train_generator = datagen.flow_from_directory(
    data_dir,
    target_size=(128, 128),
    batch_size=256,
    class_mode='categorical',
    subset='training')
```

➦ Found 32000 images belonging to 11 classes.

```
validation_generator = datagen.flow_from_directory(
    data_dir,
    target_size=(128, 128),
    batch_size=256,
    class_mode='categorical',
    subset='validation')
```

➦ Found 8000 images belonging to 11 classes.

```
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Conv2D, MaxPooling2D, Flatten, Dense, Dropout
```

```
model = Sequential([
    Conv2D(32, (3, 3), activation='relu', input_shape=(128, 128, 3)),
    MaxPooling2D((2, 2)),
    Conv2D(64, (3, 3), activation='relu'),
    MaxPooling2D((2, 2)),
    Flatten(),
    Dense(128, activation='relu'),
    Dropout(0.5),
    Dense(train_generator.num_classes, activation='softmax')])
```

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

```
history = model.fit(train_generator, validation_data=validation_generator, epochs=3)
```

➦ Epoch 1/3  
125/125 [=====] - 882s 7s/step - loss: 0.8610 - accuracy: 0.5792 - val\_loss: 4.3684  
Epoch 2/3  
125/125 [=====] - 484s 4s/step - loss: 0.6551 - accuracy: 0.5903 - val\_loss: 5.8680  
Epoch 3/3  
125/125 [=====] - 537s 4s/step - loss: 0.6157 - accuracy: 0.5895 - val\_loss: 7.4860

```
loss, accuracy = model.evaluate(validation_generator)
print(f'Validation Accuracy: {accuracy * 100:.2f}%')
```

```
⇒ 32/32 [=====] - 59s 2s/step - loss: 7.4860 - accuracy: 0.1000
   Validation Accuracy: 10.00%
```

```
model.save('hand_gesture_recognition_model.h5')
```