```
!pip install kaggle
```

```
Requirement already satisfied: kaggle in
/usr/local/lib/python3.11/dist-packages (1.7.4.5)
Requirement already satisfied: bleach in
/usr/local/lib/python3.11/dist-packages (from kaggle) (6.2.0)
Requirement already satisfied: certifi>=14.05.14 in
/usr/local/lib/python3.11/dist-packages (from kaggle) (2025.4.26)
Requirement already satisfied: charset-normalizer in
/usr/local/lib/python3.11/dist-packages (from kaggle) (3.4.2)
Requirement already satisfied: idna in /usr/local/lib/python3.11/dist-
packages (from kaggle) (3.10)
Requirement already satisfied: protobuf in
/usr/local/lib/python3.11/dist-packages (from kaggle) (5.29.5)
Requirement already satisfied: python-dateutil>=2.5.3 in
/usr/local/lib/python3.11/dist-packages (from kaggle) (2.9.0.post0)
Requirement already satisfied: python-slugify in
/usr/local/lib/python3.11/dist-packages (from kaggle) (8.0.4)
Requirement already satisfied: requests in
/usr/local/lib/python3.11/dist-packages (from kaggle) (2.32.3)
Requirement already satisfied: setuptools>=21.0.0 in
/usr/local/lib/python3.11/dist-packages (from kaggle) (75.2.0)
Requirement already satisfied: six>=1.10 in
/usr/local/lib/python3.11/dist-packages (from kaggle) (1.17.0)
Requirement already satisfied: text-unidecode in
/usr/local/lib/python3.11/dist-packages (from kaggle) (1.3)
Requirement already satisfied: tqdm in /usr/local/lib/python3.11/dist-
packages (from kaggle) (4.67.1)
Requirement already satisfied: urllib3>=1.15.1 in
/usr/local/lib/python3.11/dist-packages (from kaggle) (2.4.0)
Requirement already satisfied: webencodings in
/usr/local/lib/python3.11/dist-packages (from kaggle) (0.5.1)
```

```
from google.colab import files
files.upload()
```

```
<IPython.core.display.HTML object>
```

```
Saving kaggle.json to kaggle.json
```

```
{'kaggle.json':
b'{"username":"makkmak12","key":"c2e0b01024d5688fae2e5f4e2dcd1210"}'}
```

```
!mkdir -p ~/.kaggle
!cp kaggle.json ~/.kaggle/
!chmod 600 ~/.kaggle/kaggle.json
```

```
!kaggle datasets download -d darshan1504/covid19-detection-xray-
dataset
```

```
Dataset URL: https://www.kaggle.com/datasets/darshan1504/covid19-detection-xray-dataset
License(s): Attribution 4.0 International (CC BY 4.0)
Downloading covid19-detection-xray-dataset.zip to /content
 63% 118M/186M [00:00<00:00, 1.24GB/s]
100% 186M/186M [00:00<00:00, 950MB/s]
```

```
# Step 5: Unzip the dataset
import zipfile

with zipfile.ZipFile("covid19-detection-xray-dataset.zip", 'r') as zip_ref:
    zip_ref.extractall("covid_xray_dataset")
```

```
!ls covid19-detection-xray-dataset.zip-dataset-images
```

```
ls: cannot access 'covid19-detection-xray-dataset.zip-dataset-images': No such file or directory
```

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

IMG_SIZE=224
BATCH_SIZE=32

train_datagen=ImageDataGenerator(rescale=1./255,validation_split=0.2)

train_generator=train_datagen.flow_from_directory(
    '/content/covid_xray_dataset/TrainData',
    target_size=(IMG_SIZE,IMG_SIZE),
    batch_size=BATCH_SIZE,
    class_mode='categorical',
    subset='training'
)
```

```
Found 1667 images belonging to 5 classes.
```

```
val_generator=train_datagen.flow_from_directory(
    '/content/covid_xray_dataset/TrainData',
    target_size=(IMG_SIZE,IMG_SIZE),
    batch_size=BATCH_SIZE,
    class_mode='categorical', # Changed from 'categorical' to 'sparse'
    subset='validation'
)
```

```
Found 416 images belonging to 5 classes.
```

```
class_indices=train_generator.class_indices
class_names=list(class_indices.keys())
print(class_indices)
```

```
{'BacterialPneumonia': 0, 'COVID-19': 1, 'Normal': 2,
'OversampledAugmentedCOVID-19': 3, 'ViralPneumonia': 4}

model=keras.Sequential([
    layers.Conv2D(32,(3,3),activation='relu',
input_shape=(IMG_SIZE,IMG_SIZE,3)),
    layers.MaxPooling2D((2,2)),
    layers.Conv2D(64,(3,3),activation='relu'),
    layers.MaxPooling2D((2,2)),
    layers.Conv2D(128,(3,3),activation='relu'),
    layers.MaxPooling2D((2,2)),
    layers.Flatten(),
    layers.Dense(128,activation='relu'),
    layers.Dense(5,activation='softmax')
])

/usr/local/lib/python3.11/dist-packages/keras/src/layers/
convolutional/base_conv.py:107: UserWarning: Do not pass an
`input_shape`/`input_dim` argument to a layer. When using Sequential
models, prefer using an `Input(shape)` object as the first layer in
the model instead.
  super().__init__(activity_regularizer=activity_regularizer,
**kwargs)

model.summary()

Model: "sequential_1"

┏━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━
┓
┃ Layer (type)                         ┃ Output Shape                ┃
Param # ┃
┡━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━
┩
│ conv2d_3 (Conv2D)                    │ (None, 222, 222, 32)        │
896 │
├──────────────────────────────────────┼─────────────────────────────┼─────────────────
┤
│ max_pooling2d_3 (MaxPooling2D)       │ (None, 111, 111, 32)        │
0 │
├──────────────────────────────────────┼─────────────────────────────┼─────────────────
┤
│ conv2d_4 (Conv2D)                    │ (None, 109, 109, 64)        │
18,496 │
├──────────────────────────────────────┼─────────────────────────────┼─────────────────
┤
│ max_pooling2d_4 (MaxPooling2D)       │ (None, 54, 54, 64)          │
0 │
├──────────────────────────────────────┼─────────────────────────────┼─────────────────
┤
```

```
| conv2d_5 (Conv2D)                    | (None, 52, 52, 128)    |
73,856 |
├──────────────────────────────────────┼─────────────────────────┼──────────
──────┤
| max_pooling2d_5 (MaxPooling2D)       | (None, 26, 26, 128)    |
0 |
├──────────────────────────────────────┼─────────────────────────┼──────────
──────┤
| flatten_1 (Flatten)                  | (None, 86528)          |
0 |
├──────────────────────────────────────┼─────────────────────────┼──────────
──────┤
| dense_2 (Dense)                      | (None, 128)            |
11,075,712 |
├──────────────────────────────────────┼─────────────────────────┼──────────
──────┤
| dense_3 (Dense)                      | (None, 5)              |
645 |
└──────────────────────────────────────┴─────────────────────────┴──────────
──────┘

 Total params: 11,169,605 (42.61 MB)

 Trainable params: 11,169,605 (42.61 MB)

 Non-trainable params: 0 (0.00 B)
```

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

model.fit(train_generator,epochs=10,validation_data=val_generator,batc
h_size=BATCH_SIZE)
```

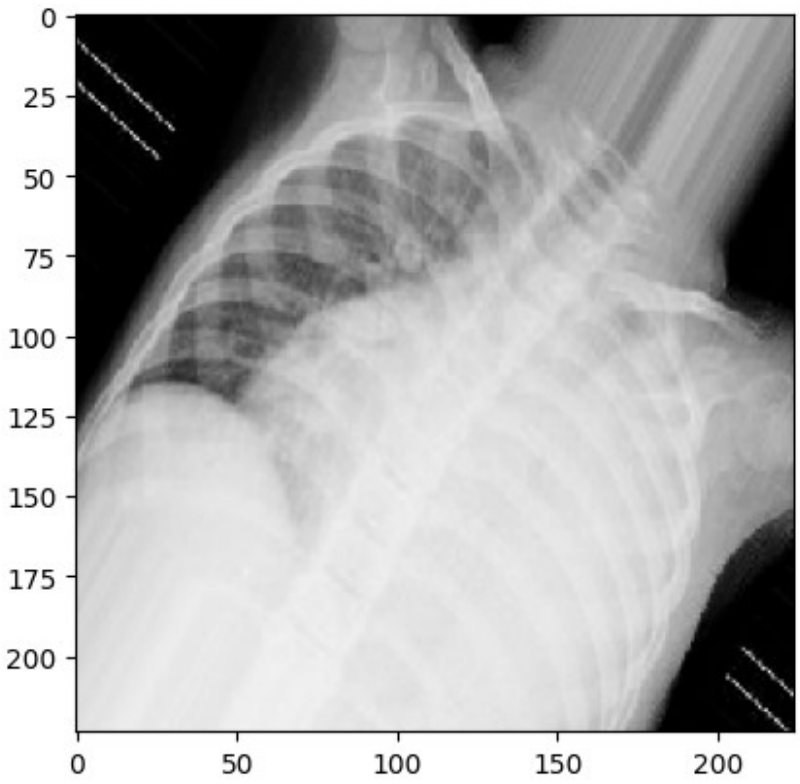
```
Epoch 1/10
53/53 ━━━━━━━━━━━━━━━━━━━━ 0s 103ms/step - accuracy: 0.4287 - loss:
1.9822

/usr/local/lib/python3.11/dist-packages/keras/src/trainers/
data_adapters/py_dataset_adapter.py:121: UserWarning: Your `PyDataset`
class should call `super().__init__(**kwargs)` in its constructor.
`**kwargs` can include `workers`, `use_multiprocessing`,
`max_queue_size`. Do not pass these arguments to `fit()`, as they will
be ignored.
  self._warn_if_super_not_called()

 53/53 ━━━━━━━━━━━━━━━━━━━━ 15s 157ms/step - accuracy: 0.4303 - loss:
1.9715 - val_accuracy: 0.6274 - val_loss: 0.9632
Epoch 2/10
53/53 ━━━━━━━━━━━━━━━━━━━━ 4s 81ms/step - accuracy: 0.6472 - loss:
0.9196 - val_accuracy: 0.7115 - val_loss: 0.8171
Epoch 3/10
```

```
53/53 ━━━━━━━━━━━━━━━━━━━━ 4s 74ms/step - accuracy: 0.6858 - loss:
0.8140 - val_accuracy: 0.6875 - val_loss: 0.7735
Epoch 4/10
53/53 ━━━━━━━━━━━━━━━━━━━━ 5s 92ms/step - accuracy: 0.7782 - loss:
0.5857 - val_accuracy: 0.6731 - val_loss: 0.8381
Epoch 5/10
53/53 ━━━━━━━━━━━━━━━━━━━━ 5s 84ms/step - accuracy: 0.8295 - loss:
0.4613 - val_accuracy: 0.6755 - val_loss: 0.9800
Epoch 6/10
53/53 ━━━━━━━━━━━━━━━━━━━━ 4s 76ms/step - accuracy: 0.8881 - loss:
0.2937 - val_accuracy: 0.7019 - val_loss: 1.1231
Epoch 7/10
53/53 ━━━━━━━━━━━━━━━━━━━━ 5s 85ms/step - accuracy: 0.9368 - loss:
0.1790 - val_accuracy: 0.6875 - val_loss: 1.3692
Epoch 8/10
53/53 ━━━━━━━━━━━━━━━━━━━━ 4s 74ms/step - accuracy: 0.9710 - loss:
0.0855 - val_accuracy: 0.7067 - val_loss: 1.6299
Epoch 9/10
53/53 ━━━━━━━━━━━━━━━━━━━━ 4s 73ms/step - accuracy: 0.9961 - loss:
0.0301 - val_accuracy: 0.6923 - val_loss: 2.0457
Epoch 10/10
53/53 ━━━━━━━━━━━━━━━━━━━━ 5s 87ms/step - accuracy: 0.9889 - loss:
0.0437 - val_accuracy: 0.6875 - val_loss: 2.0800

<keras.src.callbacks.history.History at 0x7866e02ed590>
```

```
model.save('/content/covid_xray_dataset/TrainData_model.h5')
```

```
WARNING:absl:You are saving your model as an HDF5 file via
`model.save()` or `keras.saving.save_model(model)`. This file format
is considered legacy. We recommend using instead the native Keras
format, e.g. `model.save('my_model.keras')` or
`keras.saving.save_model(model, 'my_model.keras')`.
```

```
from tensorflow.keras.preprocessing import image
import matplotlib.pyplot as plt
import numpy as np

test_image_path="/content/covid_xray_dataset/TrainData/BacterialPneumo
nia/_105_2462475.jpeg"
img=image.load_img(test_image_path,target_size=(224,224))
plt.imshow(img)
plt.axis()
plt.show()
```




```
img_array=image.img_to_array(img)
img_array=np.expand_dims(img_array,axis=0)
img_array/=255

prediction=model.predict(img_array)
print(prediction)
ind=np.argmax(prediction)
print(class_names[ind])
```

```
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 32ms/step
[[9.9999869e-01 3.8841603e-20 6.4284700e-13 1.2228895e-22 1.2857869e-
06]]
BacterialPneumonia
```