```
!pip install opendatasets
```

```
Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/
Collecting opendatasets
  Downloading opendatasets-0.1.22-py3-none-any.whl (15 kB)
Requirement already satisfied: tqdm in /usr/local/lib/python3.10/dist-packages (from opendatasets) (4.65.0)
Requirement already satisfied: kaggle in /usr/local/lib/python3.10/dist-packages (from opendatasets) (1.5.13)
Requirement already satisfied: click in /usr/local/lib/python3.10/dist-packages (from opendatasets) (8.1.3)
Requirement already satisfied: six>=1.10 in /usr/local/lib/python3.10/dist-packages (from kaggle->opendatasets) (1.16.0)
Requirement already satisfied: certifi in /usr/local/lib/python3.10/dist-packages (from kaggle->opendatasets) (2022.12.7)
Requirement already satisfied: python-dateutil in /usr/local/lib/python3.10/dist-packages (from kaggle->opendatasets) (2.8.2)
Requirement already satisfied: requests in /usr/local/lib/python3.10/dist-packages (from kaggle->opendatasets) (2.27.1)
Requirement already satisfied: python-slugify in /usr/local/lib/python3.10/dist-packages (from kaggle->opendatasets) (8.0.1)
Requirement already satisfied: urllib3 in /usr/local/lib/python3.10/dist-packages (from kaggle->opendatasets) (1.26.15)
Requirement already satisfied: text-unidecode>=1.3 in /usr/local/lib/python3.10/dist-packages (from python-slugify->kaggle->opendat
Requirement already satisfied: charset-normalizer~=2.0.0 in /usr/local/lib/python3.10/dist-packages (from requests->kaggle->opendat
Requirement already satisfied: idna<4,>=2.5 in /usr/local/lib/python3.10/dist-packages (from requests->kaggle->opendatasets) (3.4)
Installing collected packages: opendatasets
Successfully installed opendatasets-0.1.22
```

```
import numpy as np
import tensorflow as tf
import pandas as pd
import matplotlib.pyplot as plt
import matplotlib.image as mpimg
from keras.preprocessing.image import ImageDataGenerator
from tensorflow.keras.optimizers import RMSprop
from keras.preprocessing import image
from google.colab import files
import opendatasets as od

%matplotlib inline
```

```
od.download("https://www.kaggle.com/datasets/paultimothymooney/chest-xray-pneumonia")
```

```
Please provide your Kaggle credentials to download this dataset. Learn more: http://bit.ly/kaggle-creds
Your Kaggle username: saratdantu
Your Kaggle Key: ··········
Downloading chest-xray-pneumonia.zip to ./chest-xray-pneumonia
100%|██████████| 2.29G/2.29G [00:29<00:00, 83.4MB/s]
```

```
model = tf.keras.models.Sequential([

    # Note the input shape is the desired size of the image 300x300 with 3 bytes color
    # This is the first convolution
    tf.keras.layers.Conv2D(16, (3,3), activation='relu', input_shape=(300, 300, 3)),
    tf.keras.layers.MaxPooling2D(2, 2),

    # The second convolution
    tf.keras.layers.Conv2D(32, (3,3), activation='relu'),
    tf.keras.layers.MaxPooling2D(2,2),

    # The third convolution
    tf.keras.layers.Conv2D(64, (3,3), activation='relu'),
    tf.keras.layers.MaxPooling2D(2,2),

    # The fourth convolution
    tf.keras.layers.Conv2D(64, (3,3), activation='relu'),
    tf.keras.layers.MaxPooling2D(2,2),

    # The fifth convolution
    tf.keras.layers.Conv2D(64, (3,3), activation='relu'),
    tf.keras.layers.MaxPooling2D(2,2),


    tf.keras.layers.Flatten(),
    tf.keras.layers.Dense(512, activation='relu'), # 512 neuron hidden layer
    # Only 1 output neuron. It will contain a value from 0-1 where 0 for ('normal') clas and 1 for ('pneumonia') class
    tf.keras.layers.Dense(1, activation='sigmoid')
])

# to get the summary of the model
model.summary()

# configure the model for traning by adding metrics
model.compile(loss='binary_crossentropy', optimizer=RMSprop(lr=0.001), metrics = ['accuracy'])
```

```
Model: "sequential_1"
_________________________________________________________________
```

```
 Layer (type)                Output Shape              Param #
=================================================================
 conv2d_5 (Conv2D)           (None, 298, 298, 16)      448

 max_pooling2d_5 (MaxPooling  (None, 149, 149, 16)     0
 2D)

 conv2d_6 (Conv2D)           (None, 147, 147, 32)      4640

 max_pooling2d_6 (MaxPooling  (None, 73, 73, 32)       0
 2D)

 conv2d_7 (Conv2D)           (None, 71, 71, 64)        18496

 max_pooling2d_7 (MaxPooling  (None, 35, 35, 64)       0
 2D)

 conv2d_8 (Conv2D)           (None, 33, 33, 64)        36928

 max_pooling2d_8 (MaxPooling  (None, 16, 16, 64)       0
 2D)

 conv2d_9 (Conv2D)           (None, 14, 14, 64)        36928

 max_pooling2d_9 (MaxPooling  (None, 7, 7, 64)         0
 2D)

 flatten_1 (Flatten)         (None, 3136)              0

 dense_2 (Dense)             (None, 512)               1606144

 dense_3 (Dense)             (None, 1)                 513

=================================================================
Total params: 1,704,097
Trainable params: 1,704,097
Non-trainable params: 0
_________________________________________________________________
WARNING:absl:`lr` is deprecated in Keras optimizer, please use `learning_rate` or use the legacy optimizer, e.g.,tf.keras.optimizer
```

```
train_datagen = ImageDataGenerator(
    rescale=1/255,
    rotation_range=20,  # Rotate images randomly within the range of 20 degrees
    width_shift_range=0.1,  # Shift images horizontally within the range of 0.1
    height_shift_range=0.1,  # Shift images vertically within the range of 0.1
    shear_range=0.1,  # Apply shear transformation within the range of 0.1
    zoom_range=0.1,  # Zoom images randomly within the range of 0.1
    horizontal_flip=True  # Flip images horizontally
)
test_datagen = ImageDataGenerator(rescale = 1/255)

train_generator = train_datagen.flow_from_directory(
    '/content/chest-xray-pneumonia/chest_xray/chest_xray/train',
    target_size = (300,300),
    batch_size = 128,
    class_mode = 'binary'
)

validation_generator = test_datagen.flow_from_directory(
    '/content/chest-xray-pneumonia/chest_xray/chest_xray/val',
    target_size = (300, 300),
    batch_size = 128,
    class_mode = 'binary'
)

# training the model
history = model.fit(
    train_generator,
    steps_per_epoch = 3,
    epochs = 3,
    validation_data = validation_generator
)
```

```
Found 5216 images belonging to 2 classes.
Found 16 images belonging to 2 classes.
Epoch 1/3
3/3 [==============================] - 62s 18s/step - loss: 0.5707 - accuracy: 0.7578 - val_loss: 0.6463 - val_accuracy: 0.6875
Epoch 2/3
3/3 [==============================] - 61s 19s/step - loss: 0.5189 - accuracy: 0.7760 - val_loss: 0.6622 - val_accuracy: 0.6250
Epoch 3/3
3/3 [==============================] - 65s 21s/step - loss: 0.5007 - accuracy: 0.7656 - val_loss: 0.6373 - val_accuracy: 0.6250
```

```
# load new unseen dataset
eval_datagen = ImageDataGenerator(rescale = 1/255)
```

```
test_generator = eval_datagen.flow_from_directory(
    '/content/chest-xray-pneumonia/chest_xray/chest_xray/test',
    target_size = (300, 300),
    batch_size = 128,
    class_mode = 'binary'
)

eval_result = model.evaluate_generator(test_generator, 624)
print('loss rate at evaluation data :', eval_result[0])
print('accuracy rate at evaluation data :', eval_result[1])
```

```
Found 624 images belonging to 2 classes.
<ipython-input-23-834598b3137a>:11: UserWarning: `Model.evaluate_generator` is deprecated and will be removed in a future version.
  eval_result = model.evaluate_generator(test_generator, 624)
WARNING:tensorflow:Your input ran out of data; interrupting training. Make sure that your dataset or generator can generate at leas
loss rate at evaluation data : 0.4321640133857727
accuracy rate at evaluation data : 0.8541666865348816
```

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

Choose Files IM-0117-0001.jpeg

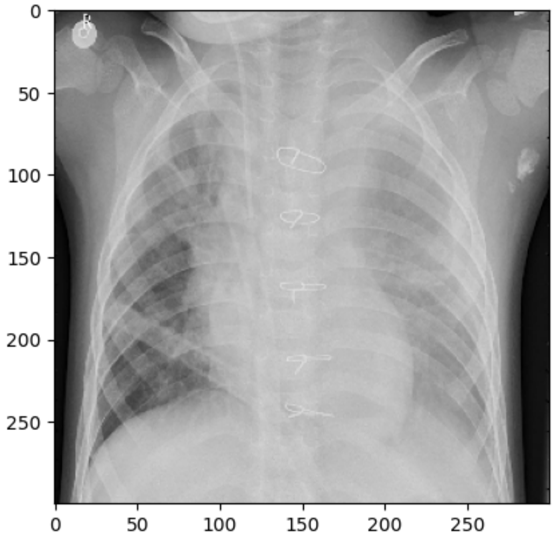
- **IM-0117-0001.jpeg**(image/jpeg) - 406305 bytes, last modified: 6/8/2023 - 100% done

```
Saving IM-0117-0001.jpeg to IM-0117-0001.jpeg
```

```
for fn in uploaded.keys():
  # predict images
  path = '/content/person3_bacteria_10.jpeg'
  img = tf.keras.utils.load_img(path, target_size=(300,300))
  x = tf.keras.utils.img_to_array(img)
  x = np.expand_dims(x, axis =0)

  images = np.vstack([x])
  classes = model.predict(images, batch_size = 10)
  print(classes[0])
  if classes[0]> 0.5:
    print(fn + ' is pneumonia')
    plt.imshow(img)
  else:
    print(fn + 'is normal')
    plt.imshow(img)
```

```
1/1 [==============================] - 0s 56ms/step
[1.]
IM-0117-0001.jpeg is pneumonia
```



✓ 0s completed at 11:21 AM ● ✕