```
import os
os.environ['KAGGLE_USERNAME']= "zaid316"
os.environ['KAGGLE_KEY']="7c3212029705dc3e2be355f833cbdaaf"
```

```
!kaggle datasets download paultimothymooney/chest-xray-pneumonia
```

```
     Downloading chest-xray-pneumonia.zip to /Users/spikezaidspeigel/Desktop/dl lab
     100%|███████████████████████████████████████████▉| 2.29G/2.29G [11:06<00:00, 5.8
     100%|████████████████████████████████████████████| 2.29G/2.29G [11:06<00:00, 3.6
```

```
!unzip chest-xray-pneumonia.zip
```

```
       inflating: chest_xray/__MACOSX/._chest_xray
       inflating: chest_xray/__MACOSX/chest_xray/._.DS_Store
       inflating: chest_xray/__MACOSX/chest_xray/._test
       inflating: chest_xray/__MACOSX/chest_xray/._train
       inflating: chest_xray/__MACOSX/chest_xray/test/._.DS_Store
       inflating: chest_xray/__MACOSX/chest_xray/test/._NORMAL
       inflating: chest_xray/__MACOSX/chest_xray/test/._PNEUMONIA
       inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0001-0001.jpeg
       inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0003-0001.jpeg
       inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0005-0001.jpeg
       inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0006-0001.jpeg
       inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0007-0001.jpeg
       inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0009-0001.jpeg
       inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0010-0001.jpeg
       inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0011-0001-0001.jpeg
       inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0011-0001-0002.jpeg
       inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0011-0001.jpeg
       inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0013-0001.jpeg
       inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0015-0001.jpeg
       inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0016-0001.jpeg
       inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0017-0001.jpeg
       inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0019-0001.jpeg
       inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0021-0001.jpeg
       inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0022-0001.jpeg
       inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0023-0001.jpeg
       inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0025-0001.jpeg
       inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0027-0001.jpeg
       inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0028-0001.jpeg
       inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0029-0001.jpeg
       inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0030-0001.jpeg
       inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0031-0001.jpeg
       inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0033-0001-0001.jpeg
       inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0033-0001-0002.jpeg
       inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0033-0001.jpeg
       inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0035-0001.jpeg
       inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0036-0001.jpeg
       inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0037-0001.jpeg
       inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0039-0001.jpeg
       inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0041-0001.jpeg
       inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0043-0001.jpeg
```

```
    inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0046-0001.jpeg
    inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0049-0001.jpeg
    inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0050-0001.jpeg
    inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0059-0001.jpeg
    inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0061-0001.jpeg
    inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0063-0001.jpeg
    inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0065-0001.jpeg
    inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0067-0001.jpeg
    inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0069-0001.jpeg
    inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0070-0001.jpeg
    inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0071-0001.jpeg
    inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0073-0001.jpeg
    inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0075-0001.jpeg
    inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0077-0001.jpeg
    inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0079-0001.jpeg
    inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0081-0001.jpeg
    inflating: chest_xray/__MACOSX/chest_xray/test/NORMAL/._IM-0083-0001.jpeg
```

```
import numpy as np
import tensorflow as tf
from tensorflow.keras.layers import Input, Conv2D, MaxPooling2D, UpSampling2D, Flatten,
from tensorflow.keras.models import Model, Sequential
from sklearn.model_selection import train_test_split
from tensorflow.keras.utils import to_categorical
from tensorflow import keras


img_width, img_height = 64, 64
batchsize = 64
num_of_class = 2

train = keras.utils.image_dataset_from_directory(
    directory='/Users/spikezaidspeigel/Desktop/dl lab/chest_xray/chest_xray/train',
    labels='inferred',
    label_mode='categorical',
    batch_size=batchsize,
    image_size=(img_width, img_height))

test = keras. utils.image_dataset_from_directory(
    directory='/Users/spikezaidspeigel/Desktop/dl lab/chest_xray/chest_xray/test',
    labels='inferred',
    label_mode='categorical',
    batch_size=batchsize,
    image_size=(img_width, img_height))
```

```
    Found 5216 files belonging to 2 classes.
    Found 624 files belonging to 2 classes.
```

```
x_train = []
y_train = []
x_test = []
y_test = []

for feature, label in train:
    x_train.append(feature.numpy())
    y_train.append(label.numpy())

for feature, label in test:
    x_test.append(feature.numpy())
    y_test.append(label.numpy())

x_train = np.concatenate(x_train, axis=0)
x_test = np.concatenate(x_test, axis=0)
y_train = np.concatenate(y_train, axis=0)
y_test = np.concatenate(y_test, axis=0)


x_train=x_train/256
x_test=x_test/256


print(x_train.shape)
print(x_test.shape)
```

```
(5216, 64, 64, 3)
(624, 64, 64, 3)
```

```
input_shape = img_width, img_height, 3
input_img = Input(shape=input_shape)
x = Conv2D(32, (8, 8), activation='relu', padding='same')(input_img)
x = MaxPooling2D((2, 2), padding='same')(x)

x = Conv2D(16, (8, 8), activation='relu', padding='same')(x)
x = MaxPooling2D((2, 2), padding='same')(x)

x = Conv2D(8, (8, 8), activation='relu', padding='same')(x)
encoded = MaxPooling2D((2, 2), padding='same')(x)

x = Conv2D(8, (8, 8), activation='relu', padding='same')(encoded)
x = UpSampling2D((2, 2))(x)

x = Conv2D(16, (8, 8), activation='relu', padding='same')(x)
x = UpSampling2D((2, 2))(x)

x = Conv2D(32, (8, 8), activation='relu', padding='same')(x)
x = UpSampling2D((2, 2))(x)

decoded = Conv2D(3, (8, 8), activation='sigmoid', padding='same')(x)

autoencoder = Model(input_img, decoded)
autoencoder.compile(optimizer='adam', loss='mean_squared_error')
```

NOTE for everyone: we're using x_test as both the input and the target for validation during training. This is because the autoencoder aims to reconstruct the input images, so during validation, you want to compare the reconstructed images to the original input images to calculate the loss.

```
autoencoder.fit(x_train, x_train, epochs=5,batch_size=64, shuffle=True, validation_data=
```

```
Epoch 1/5
82/82 [==============================] - 273s 3s/step - loss: 0.0214 - val_loss: 0.
Epoch 2/5
82/82 [==============================] - 263s 3s/step - loss: 0.0102 - val_loss: 0.
Epoch 3/5
```

```
82/82 [==============================] - 241s 3s/step - loss: 0.0079 - val_loss: 0.
Epoch 4/5
82/82 [==============================] - 280s 3s/step - loss: 0.0068 - val_loss: 0.
Epoch 5/5
82/82 [==============================] - 247s 3s/step - loss: 0.0063 - val_loss: 0.
<keras.callbacks.History at 0x7f8ead18c5b0>
```