In [1]:
```python
from keras.layers import Input, Lambda, Dense, Flatten
from keras.models import Model
from keras.applications.resnet50 import ResNet50
#from keras.applications.vgg16 import VGG16
from keras.applications.vgg16 import preprocess_input
from keras.preprocessing import image
from keras.preprocessing.image import ImageDataGenerator
from keras.models import Sequential
import numpy as np
from glob import glob
import matplotlib.pyplot as plt
```

In [2]:
```python
IMAGE_SIZE = [224, 224]

train_path = 'E:\\chest_xray\\train\\'
valid_path = 'E:\\chest_xray\\test\\'
```

In [3]:
```python
resnet = ResNet50(input_shape=IMAGE_SIZE + [3], weights='imagenet', include_top=Fals
```

In [4]:
```python
for layer in resnet.layers:
    layer.trainable = False
```

In [5]:
```python
folders = glob('E:\\chest_xray\\train\\*')
```

In [6]:
```python
x = Flatten()(resnet.output)
```

In [7]:
```python
prediction = Dense(len(folders), activation='softmax')(x)
model = Model(inputs=resnet.input, outputs=prediction)
```

In [8]:
```python
model.summary()
```

```
Model: "functional_1"
_____
_____
Layer (type)                 Output Shape         Param #     Connected to
=================================================================
==============
input_1 (InputLayer)         [(None, 224, 224, 3) 0
_____
_____
conv1_pad (ZeroPadding2D)    (None, 230, 230, 3)  0           input_1[0][0]
_____
_____
conv1_conv (Conv2D)          (None, 112, 112, 64) 9472        conv1_pad[0][0]
_____
_____
conv1_bn (BatchNormalization) (None, 112, 112, 64) 256        conv1_conv[0][0]
_____
_____
conv1_relu (Activation)      (None, 112, 112, 64) 0           conv1_bn[0][0]
_____
_____
pool1_pad (ZeroPadding2D)    (None, 114, 114, 64) 0           conv1_relu[0][0]
```

```
_____
pool1_pool (MaxPooling2D)        (None, 56, 56, 64)    0         pool1_pad[0][0]
_____
conv2_block1_1_conv (Conv2D)     (None, 56, 56, 64)    4160      pool1_pool[0][0]
_____
conv2_block1_1_bn (BatchNormali  (None, 56, 56, 64)    256       conv2_block1_1_conv
[0][0]
_____
conv2_block1_1_relu (Activation  (None, 56, 56, 64)    0         conv2_block1_1_bn
[0][0]
_____
conv2_block1_2_conv (Conv2D)     (None, 56, 56, 64)    36928     conv2_block1_1_relu
[0][0]
_____
conv2_block1_2_bn (BatchNormali  (None, 56, 56, 64)    256       conv2_block1_2_conv
[0][0]
_____
conv2_block1_2_relu (Activation  (None, 56, 56, 64)    0         conv2_block1_2_bn
[0][0]
_____
conv2_block1_0_conv (Conv2D)     (None, 56, 56, 256)   16640     pool1_pool[0][0]
_____
conv2_block1_3_conv (Conv2D)     (None, 56, 56, 256)   16640     conv2_block1_2_relu
[0][0]
_____
conv2_block1_0_bn (BatchNormali  (None, 56, 56, 256)   1024      conv2_block1_0_conv
[0][0]
_____
conv2_block1_3_bn (BatchNormali  (None, 56, 56, 256)   1024      conv2_block1_3_conv
[0][0]
_____
conv2_block1_add (Add)           (None, 56, 56, 256)   0         conv2_block1_0_bn
[0][0]
                                                                 conv2_block1_3_bn
[0][0]
_____
conv2_block1_out (Activation)    (None, 56, 56, 256)   0         conv2_block1_add[0]
[0]
_____
conv2_block2_1_conv (Conv2D)     (None, 56, 56, 64)    16448     conv2_block1_out[0]
[0]
_____
conv2_block2_1_bn (BatchNormali  (None, 56, 56, 64)    256       conv2_block2_1_conv
[0][0]
_____
conv2_block2_1_relu (Activation  (None, 56, 56, 64)    0         conv2_block2_1_bn
[0][0]
_____
```

```
_____
conv2_block2_2_conv (Conv2D)    (None, 56, 56, 64)    36928      conv2_block2_1_relu
[0][0]
_____
_____
conv2_block2_2_bn (BatchNormali (None, 56, 56, 64)    256        conv2_block2_2_conv
[0][0]
_____
_____
conv2_block2_2_relu (Activation (None, 56, 56, 64)    0          conv2_block2_2_bn
[0][0]
_____
_____
conv2_block2_3_conv (Conv2D)    (None, 56, 56, 256)   16640      conv2_block2_2_relu
[0][0]
_____
_____
conv2_block2_3_bn (BatchNormali (None, 56, 56, 256)   1024       conv2_block2_3_conv
[0][0]
_____
_____
conv2_block2_add (Add)          (None, 56, 56, 256)   0          conv2_block1_out[0]
[0]
                                                                 conv2_block2_3_bn
[0][0]
_____
_____
conv2_block2_out (Activation)   (None, 56, 56, 256)   0          conv2_block2_add[0]
[0]
_____
_____
conv2_block3_1_conv (Conv2D)    (None, 56, 56, 64)    16448      conv2_block2_out[0]
[0]
_____
_____
conv2_block3_1_bn (BatchNormali (None, 56, 56, 64)    256        conv2_block3_1_conv
[0][0]
_____
_____
conv2_block3_1_relu (Activation (None, 56, 56, 64)    0          conv2_block3_1_bn
[0][0]
_____
_____
conv2_block3_2_conv (Conv2D)    (None, 56, 56, 64)    36928      conv2_block3_1_relu
[0][0]
_____
_____
conv2_block3_2_bn (BatchNormali (None, 56, 56, 64)    256        conv2_block3_2_conv
[0][0]
_____
_____
conv2_block3_2_relu (Activation (None, 56, 56, 64)    0          conv2_block3_2_bn
[0][0]
_____
_____
conv2_block3_3_conv (Conv2D)    (None, 56, 56, 256)   16640      conv2_block3_2_relu
[0][0]
_____
_____
conv2_block3_3_bn (BatchNormali (None, 56, 56, 256)   1024       conv2_block3_3_conv
[0][0]
_____
_____
conv2_block3_add (Add)          (None, 56, 56, 256)   0          conv2_block2_out[0]
```

```
[0]
                                                                     conv2_block3_3_bn
[0][0]
_____
_____
conv2_block3_out (Activation)   (None, 56, 56, 256)  0          conv2_block3_add[0]
[0]
_____
_____
conv3_block1_1_conv (Conv2D)    (None, 28, 28, 128)  32896      conv2_block3_out[0]
[0]
_____
_____
conv3_block1_1_bn (BatchNormali (None, 28, 28, 128)  512        conv3_block1_1_conv
[0][0]
_____
_____
conv3_block1_1_relu (Activation (None, 28, 28, 128)  0          conv3_block1_1_bn
[0][0]
_____
_____
conv3_block1_2_conv (Conv2D)    (None, 28, 28, 128)  147584     conv3_block1_1_relu
[0][0]
_____
_____
conv3_block1_2_bn (BatchNormali (None, 28, 28, 128)  512        conv3_block1_2_conv
[0][0]
_____
_____
conv3_block1_2_relu (Activation (None, 28, 28, 128)  0          conv3_block1_2_bn
[0][0]
_____
_____
conv3_block1_0_conv (Conv2D)    (None, 28, 28, 512)  131584     conv2_block3_out[0]
[0]
_____
_____
conv3_block1_3_conv (Conv2D)    (None, 28, 28, 512)  66048      conv3_block1_2_relu
[0][0]
_____
_____
conv3_block1_0_bn (BatchNormali (None, 28, 28, 512)  2048       conv3_block1_0_conv
[0][0]
_____
_____
conv3_block1_3_bn (BatchNormali (None, 28, 28, 512)  2048       conv3_block1_3_conv
[0][0]
_____
_____
conv3_block1_add (Add)          (None, 28, 28, 512)  0          conv3_block1_0_bn
[0][0]
                                                                     conv3_block1_3_bn
[0][0]
_____
_____
conv3_block1_out (Activation)   (None, 28, 28, 512)  0          conv3_block1_add[0]
[0]
_____
_____
conv3_block2_1_conv (Conv2D)    (None, 28, 28, 128)  65664      conv3_block1_out[0]
[0]
_____
_____
conv3_block2_1_bn (BatchNormali (None, 28, 28, 128)  512        conv3_block2_1_conv
```

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[0][0]
_____
_____
conv3_block2_1_relu (Activation (None, 28, 28, 128)  0          conv3_block2_1_bn
[0][0]
_____
_____
conv3_block2_2_conv (Conv2D)    (None, 28, 28, 128)  147584     conv3_block2_1_relu
[0][0]
_____
_____
conv3_block2_2_bn (BatchNormali (None, 28, 28, 128)  512        conv3_block2_2_conv
[0][0]
_____
_____
conv3_block2_2_relu (Activation (None, 28, 28, 128)  0          conv3_block2_2_bn
[0][0]
_____
_____
conv3_block2_3_conv (Conv2D)    (None, 28, 28, 512)  66048      conv3_block2_2_relu
[0][0]
_____
_____
conv3_block2_3_bn (BatchNormali (None, 28, 28, 512)  2048       conv3_block2_3_conv
[0][0]
_____
_____
conv3_block2_add (Add)          (None, 28, 28, 512)  0          conv3_block1_out[0]
[0]
                                                                conv3_block2_3_bn
[0][0]
_____
_____
conv3_block2_out (Activation)   (None, 28, 28, 512)  0          conv3_block2_add[0]
[0]
_____
_____
conv3_block3_1_conv (Conv2D)    (None, 28, 28, 128)  65664      conv3_block2_out[0]
[0]
_____
_____
conv3_block3_1_bn (BatchNormali (None, 28, 28, 128)  512        conv3_block3_1_conv
[0][0]
_____
_____
conv3_block3_1_relu (Activation (None, 28, 28, 128)  0          conv3_block3_1_bn
[0][0]
_____
_____
conv3_block3_2_conv (Conv2D)    (None, 28, 28, 128)  147584     conv3_block3_1_relu
[0][0]
_____
_____
conv3_block3_2_bn (BatchNormali (None, 28, 28, 128)  512        conv3_block3_2_conv
[0][0]
_____
_____
conv3_block3_2_relu (Activation (None, 28, 28, 128)  0          conv3_block3_2_bn
[0][0]
_____
_____
conv3_block3_3_conv (Conv2D)    (None, 28, 28, 512)  66048      conv3_block3_2_relu
[0][0]
_____
```

_____
conv3_block3_3_bn (BatchNormali (None, 28, 28, 512)   2048   conv3_block3_3_conv
[0][0]
_____

_____
conv3_block3_add (Add)   (None, 28, 28, 512)   0   conv3_block2_out[0]
[0]
                                                                  conv3_block3_3_bn

[0][0]
_____

_____
conv3_block3_out (Activation)   (None, 28, 28, 512)   0   conv3_block3_add[0]
[0]
_____

_____
conv3_block4_1_conv (Conv2D)   (None, 28, 28, 128)   65664   conv3_block3_out[0]
[0]
_____

_____
conv3_block4_1_bn (BatchNormali (None, 28, 28, 128)   512   conv3_block4_1_conv
[0][0]
_____

_____
conv3_block4_1_relu (Activation (None, 28, 28, 128)   0   conv3_block4_1_bn
[0][0]
_____

_____
conv3_block4_2_conv (Conv2D)   (None, 28, 28, 128)   147584   conv3_block4_1_relu
[0][0]
_____

_____
conv3_block4_2_bn (BatchNormali (None, 28, 28, 128)   512   conv3_block4_2_conv
[0][0]
_____

_____
conv3_block4_2_relu (Activation (None, 28, 28, 128)   0   conv3_block4_2_bn
[0][0]
_____

_____
conv3_block4_3_conv (Conv2D)   (None, 28, 28, 512)   66048   conv3_block4_2_relu
[0][0]
_____

_____
conv3_block4_3_bn (BatchNormali (None, 28, 28, 512)   2048   conv3_block4_3_conv
[0][0]
_____

_____
conv3_block4_add (Add)   (None, 28, 28, 512)   0   conv3_block3_out[0]
[0]
                                                                  conv3_block4_3_bn

[0][0]
_____

_____
conv3_block4_out (Activation)   (None, 28, 28, 512)   0   conv3_block4_add[0]
[0]
_____

_____
conv4_block1_1_conv (Conv2D)   (None, 14, 14, 256)   131328   conv3_block4_out[0]
[0]
_____

_____
conv4_block1_1_bn (BatchNormali (None, 14, 14, 256)   1024   conv4_block1_1_conv
[0][0]
_____

```
_____
conv4_block1_1_relu (Activation (None, 14, 14, 256)  0          conv4_block1_1_bn
[0][0]
_____
_____
conv4_block1_2_conv (Conv2D)    (None, 14, 14, 256)  590080     conv4_block1_1_relu
[0][0]
_____
_____
conv4_block1_2_bn (BatchNormali (None, 14, 14, 256)  1024       conv4_block1_2_conv
[0][0]
_____
_____
conv4_block1_2_relu (Activation (None, 14, 14, 256)  0          conv4_block1_2_bn
[0][0]
_____
_____
conv4_block1_0_conv (Conv2D)    (None, 14, 14, 1024) 525312     conv3_block4_out[0]
[0]
_____
_____
conv4_block1_3_conv (Conv2D)    (None, 14, 14, 1024) 263168     conv4_block1_2_relu
[0][0]
_____
_____
conv4_block1_0_bn (BatchNormali (None, 14, 14, 1024) 4096       conv4_block1_0_conv
[0][0]
_____
_____
conv4_block1_3_bn (BatchNormali (None, 14, 14, 1024) 4096       conv4_block1_3_conv
[0][0]
_____
_____
conv4_block1_add (Add)          (None, 14, 14, 1024) 0          conv4_block1_0_bn
[0][0]
                                                                conv4_block1_3_bn
[0][0]
_____
_____
conv4_block1_out (Activation)   (None, 14, 14, 1024) 0          conv4_block1_add[0]
[0]
_____
_____
conv4_block2_1_conv (Conv2D)    (None, 14, 14, 256)  262400     conv4_block1_out[0]
[0]
_____
_____
conv4_block2_1_bn (BatchNormali (None, 14, 14, 256)  1024       conv4_block2_1_conv
[0][0]
_____
_____
conv4_block2_1_relu (Activation (None, 14, 14, 256)  0          conv4_block2_1_bn
[0][0]
_____
_____
conv4_block2_2_conv (Conv2D)    (None, 14, 14, 256)  590080     conv4_block2_1_relu
[0][0]
_____
_____
conv4_block2_2_bn (BatchNormali (None, 14, 14, 256)  1024       conv4_block2_2_conv
[0][0]
_____
_____
conv4_block2_2_relu (Activation (None, 14, 14, 256)  0          conv4_block2_2_bn
```

```
[0][0]
_____
_____
conv4_block2_3_conv (Conv2D)     (None, 14, 14, 1024) 263168      conv4_block2_2_relu
[0][0]
_____
_____
conv4_block2_3_bn (BatchNormali (None, 14, 14, 1024) 4096        conv4_block2_3_conv
[0][0]
_____
_____
conv4_block2_add (Add)           (None, 14, 14, 1024) 0          conv4_block1_out[0]
[0]
                                                                 conv4_block2_3_bn

[0][0]
_____
_____
conv4_block2_out (Activation)    (None, 14, 14, 1024) 0          conv4_block2_add[0]
[0]
_____
_____
conv4_block3_1_conv (Conv2D)     (None, 14, 14, 256)  262400     conv4_block2_out[0]
[0]
_____
_____
conv4_block3_1_bn (BatchNormali (None, 14, 14, 256)  1024        conv4_block3_1_conv
[0][0]
_____
_____
conv4_block3_1_relu (Activation (None, 14, 14, 256)  0           conv4_block3_1_bn
[0][0]
_____
_____
conv4_block3_2_conv (Conv2D)     (None, 14, 14, 256)  590080     conv4_block3_1_relu
[0][0]
_____
_____
conv4_block3_2_bn (BatchNormali (None, 14, 14, 256)  1024        conv4_block3_2_conv
[0][0]
_____
_____
conv4_block3_2_relu (Activation (None, 14, 14, 256)  0           conv4_block3_2_bn
[0][0]
_____
_____
conv4_block3_3_conv (Conv2D)     (None, 14, 14, 1024) 263168     conv4_block3_2_relu
[0][0]
_____
_____
conv4_block3_3_bn (BatchNormali (None, 14, 14, 1024) 4096        conv4_block3_3_conv
[0][0]
_____
_____
conv4_block3_add (Add)           (None, 14, 14, 1024) 0          conv4_block2_out[0]
[0]
                                                                 conv4_block3_3_bn

[0][0]
_____
_____
conv4_block3_out (Activation)    (None, 14, 14, 1024) 0          conv4_block3_add[0]
[0]
_____
_____
conv4_block4_1_conv (Conv2D)     (None, 14, 14, 256)  262400     conv4_block3_out[0]
```

```
[0]
_____
_____
conv4_block4_1_bn (BatchNormali (None, 14, 14, 256)  1024       conv4_block4_1_conv
[0][0]
_____
_____
conv4_block4_1_relu (Activation (None, 14, 14, 256)  0          conv4_block4_1_bn
[0][0]
_____
_____
conv4_block4_2_conv (Conv2D)    (None, 14, 14, 256)  590080     conv4_block4_1_relu
[0][0]
_____
_____
conv4_block4_2_bn (BatchNormali (None, 14, 14, 256)  1024       conv4_block4_2_conv
[0][0]
_____
_____
conv4_block4_2_relu (Activation (None, 14, 14, 256)  0          conv4_block4_2_bn
[0][0]
_____
_____
conv4_block4_3_conv (Conv2D)    (None, 14, 14, 1024) 263168     conv4_block4_2_relu
[0][0]
_____
_____
conv4_block4_3_bn (BatchNormali (None, 14, 14, 1024) 4096       conv4_block4_3_conv
[0][0]
_____
_____
conv4_block4_add (Add)          (None, 14, 14, 1024) 0          conv4_block3_out[0]
[0]
                                                                conv4_block4_3_bn
[0][0]
_____
_____
conv4_block4_out (Activation)   (None, 14, 14, 1024) 0          conv4_block4_add[0]
[0]
_____
_____
conv4_block5_1_conv (Conv2D)    (None, 14, 14, 256)  262400     conv4_block4_out[0]
[0]
_____
_____
conv4_block5_1_bn (BatchNormali (None, 14, 14, 256)  1024       conv4_block5_1_conv
[0][0]
_____
_____
conv4_block5_1_relu (Activation (None, 14, 14, 256)  0          conv4_block5_1_bn
[0][0]
_____
_____
conv4_block5_2_conv (Conv2D)    (None, 14, 14, 256)  590080     conv4_block5_1_relu
[0][0]
_____
_____
conv4_block5_2_bn (BatchNormali (None, 14, 14, 256)  1024       conv4_block5_2_conv
[0][0]
_____
_____
conv4_block5_2_relu (Activation (None, 14, 14, 256)  0          conv4_block5_2_bn
[0][0]
_____
_____
```

```
_____
conv4_block5_3_conv (Conv2D)    (None, 14, 14, 1024) 263168    conv4_block5_2_relu
[0][0]
_____
_____
conv4_block5_3_bn (BatchNormali (None, 14, 14, 1024) 4096      conv4_block5_3_conv
[0][0]
_____
_____
conv4_block5_add (Add)          (None, 14, 14, 1024) 0         conv4_block4_out[0]
[0]
                                                              conv4_block5_3_bn
[0][0]
_____
_____
conv4_block5_out (Activation)   (None, 14, 14, 1024) 0         conv4_block5_add[0]
[0]
_____
_____
conv4_block6_1_conv (Conv2D)    (None, 14, 14, 256)  262400    conv4_block5_out[0]
[0]
_____
_____
conv4_block6_1_bn (BatchNormali (None, 14, 14, 256)  1024      conv4_block6_1_conv
[0][0]
_____
_____
conv4_block6_1_relu (Activation (None, 14, 14, 256)  0         conv4_block6_1_bn
[0][0]
_____
_____
conv4_block6_2_conv (Conv2D)    (None, 14, 14, 256)  590080    conv4_block6_1_relu
[0][0]
_____
_____
conv4_block6_2_bn (BatchNormali (None, 14, 14, 256)  1024      conv4_block6_2_conv
[0][0]
_____
_____
conv4_block6_2_relu (Activation (None, 14, 14, 256)  0         conv4_block6_2_bn
[0][0]
_____
_____
conv4_block6_3_conv (Conv2D)    (None, 14, 14, 1024) 263168    conv4_block6_2_relu
[0][0]
_____
_____
conv4_block6_3_bn (BatchNormali (None, 14, 14, 1024) 4096      conv4_block6_3_conv
[0][0]
_____
_____
conv4_block6_add (Add)          (None, 14, 14, 1024) 0         conv4_block5_out[0]
[0]
                                                              conv4_block6_3_bn
[0][0]
_____
_____
conv4_block6_out (Activation)   (None, 14, 14, 1024) 0         conv4_block6_add[0]
[0]
_____
_____
conv5_block1_1_conv (Conv2D)    (None, 7, 7, 512)    524800    conv4_block6_out[0]
[0]
_____
```

_____

conv5_block1_1_bn (BatchNormali	(None, 7, 7, 512)	2048	conv5_block1_1_conv [0][0]

_____

conv5_block1_1_relu (Activation	(None, 7, 7, 512)	0	conv5_block1_1_bn [0][0]

_____

conv5_block1_2_conv (Conv2D)	(None, 7, 7, 512)	2359808	conv5_block1_1_relu [0][0]

_____

conv5_block1_2_bn (BatchNormali	(None, 7, 7, 512)	2048	conv5_block1_2_conv [0][0]

_____

conv5_block1_2_relu (Activation	(None, 7, 7, 512)	0	conv5_block1_2_bn [0][0]

_____

conv5_block1_0_conv (Conv2D)	(None, 7, 7, 2048)	2099200	conv4_block6_out[0][0]

_____

conv5_block1_3_conv (Conv2D)	(None, 7, 7, 2048)	1050624	conv5_block1_2_relu [0][0]

_____

conv5_block1_0_bn (BatchNormali	(None, 7, 7, 2048)	8192	conv5_block1_0_conv [0][0]

_____

conv5_block1_3_bn (BatchNormali	(None, 7, 7, 2048)	8192	conv5_block1_3_conv [0][0]

_____

conv5_block1_add (Add)	(None, 7, 7, 2048)	0	conv5_block1_0_bn [0][0]
			conv5_block1_3_bn [0][0]

_____

conv5_block1_out (Activation)	(None, 7, 7, 2048)	0	conv5_block1_add[0][0]

_____

conv5_block2_1_conv (Conv2D)	(None, 7, 7, 512)	1049088	conv5_block1_out[0][0]

_____

conv5_block2_1_bn (BatchNormali	(None, 7, 7, 512)	2048	conv5_block2_1_conv [0][0]

_____

conv5_block2_1_relu (Activation	(None, 7, 7, 512)	0	conv5_block2_1_bn [0][0]

_____

conv5_block2_2_conv (Conv2D)	(None, 7, 7, 512)	2359808	conv5_block2_1_relu [0][0]

_____

conv5_block2_2_bn (BatchNormali	(None, 7, 7, 512)	2048	conv5_block2_2_conv

```
[0][0]
_____
_____
conv5_block2_2_relu (Activation (None, 7, 7, 512)     0           conv5_block2_2_bn
[0][0]
_____
_____
conv5_block2_3_conv (Conv2D)    (None, 7, 7, 2048)    1050624     conv5_block2_2_relu
[0][0]
_____
_____
conv5_block2_3_bn (BatchNormali (None, 7, 7, 2048)    8192        conv5_block2_3_conv
[0][0]
_____
_____
conv5_block2_add (Add)          (None, 7, 7, 2048)    0           conv5_block1_out[0]
[0]
                                                                  conv5_block2_3_bn
[0][0]
_____
_____
conv5_block2_out (Activation)   (None, 7, 7, 2048)    0           conv5_block2_add[0]
[0]
_____
_____
conv5_block3_1_conv (Conv2D)    (None, 7, 7, 512)     1049088     conv5_block2_out[0]
[0]
_____
_____
conv5_block3_1_bn (BatchNormali (None, 7, 7, 512)     2048        conv5_block3_1_conv
[0][0]
_____
_____
conv5_block3_1_relu (Activation (None, 7, 7, 512)     0           conv5_block3_1_bn
[0][0]
_____
_____
conv5_block3_2_conv (Conv2D)    (None, 7, 7, 512)     2359808     conv5_block3_1_relu
[0][0]
_____
_____
conv5_block3_2_bn (BatchNormali (None, 7, 7, 512)     2048        conv5_block3_2_conv
[0][0]
_____
_____
conv5_block3_2_relu (Activation (None, 7, 7, 512)     0           conv5_block3_2_bn
[0][0]
_____
_____
conv5_block3_3_conv (Conv2D)    (None, 7, 7, 2048)    1050624     conv5_block3_2_relu
[0][0]
_____
_____
conv5_block3_3_bn (BatchNormali (None, 7, 7, 2048)    8192        conv5_block3_3_conv
[0][0]
_____
_____
conv5_block3_add (Add)          (None, 7, 7, 2048)    0           conv5_block2_out[0]
[0]
                                                                  conv5_block3_3_bn
[0][0]
_____
_____
conv5_block3_out (Activation)   (None, 7, 7, 2048)    0           conv5_block3_add[0]
```

```
[0]
_____
_____
flatten (Flatten)              (None, 100352)        0          conv5_block3_out[0]
[0]
_____
_____
dense (Dense)                  (None, 2)             200706     flatten[0][0]
================================================================================
==============
Total params: 23,788,418
Trainable params: 200,706
Non-trainable params: 23,587,712
_____
_____
```

In [9]:
```python
model.compile(
    loss='categorical_crossentropy',
    optimizer='adam',
    metrics=['accuracy']
)
```

In [10]:
```python
from keras.preprocessing.image import ImageDataGenerator

train_datagen = ImageDataGenerator(rescale = 1./255,
                                   shear_range = 0.2,
                                   zoom_range = 0.2,
                                   horizontal_flip = True)

test_datagen = ImageDataGenerator(rescale = 1./255)
```

In [11]:
```python
training_set = train_datagen.flow_from_directory('E:\\chest_xray\\train',
                                                 target_size = (224, 224),
                                                 batch_size = 32,
                                                 class_mode = 'categorical')
```

Found 5216 images belonging to 2 classes.

In [12]:
```python
test_set = test_datagen.flow_from_directory('E:\\chest_xray\\test',
                                            target_size = (224, 224),
                                            batch_size = 32,
                                            class_mode = 'categorical')
```

Found 624 images belonging to 2 classes.

In [13]:
```python
r = model.fit_generator(
    training_set,
    validation_data=test_set,
    epochs=5,
    steps_per_epoch=len(training_set),
    validation_steps=len(test_set)
)
```

```
WARNING:tensorflow:From C:\Users\MCHOME\AppData\Local\Temp/ipykernel_6240/675562961.
py:6: Model.fit_generator (from tensorflow.python.keras.engine.training) is deprecat
ed and will be removed in a future version.
Instructions for updating:
Please use Model.fit, which supports generators.
```

```
Epoch 1/5
163/163 [==============================] - 1504s 9s/step - loss: 0.7508 - accuracy:
0.7855 - val_loss: 0.3806 - val_accuracy: 0.8462
Epoch 2/5
163/163 [==============================] - 1519s 9s/step - loss: 0.3852 - accuracy:
0.8453 - val_loss: 0.3322 - val_accuracy: 0.8622
Epoch 3/5
163/163 [==============================] - 1496s 9s/step - loss: 0.2706 - accuracy:
0.8880 - val_loss: 0.3185 - val_accuracy: 0.8670
Epoch 4/5
163/163 [==============================] - 1518s 9s/step - loss: 0.3044 - accuracy:
0.8788 - val_loss: 0.4384 - val_accuracy: 0.8205
Epoch 5/5
163/163 [==============================] - 1511s 9s/step - loss: 0.3262 - accuracy:
0.8773 - val_loss: 0.4390 - val_accuracy: 0.8333
```
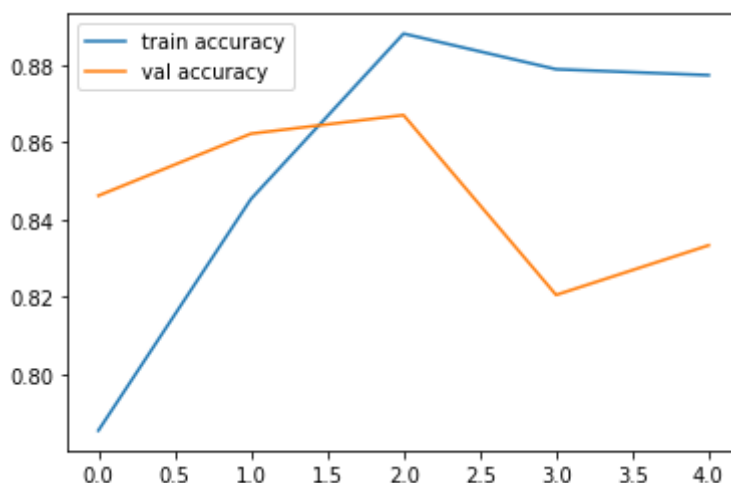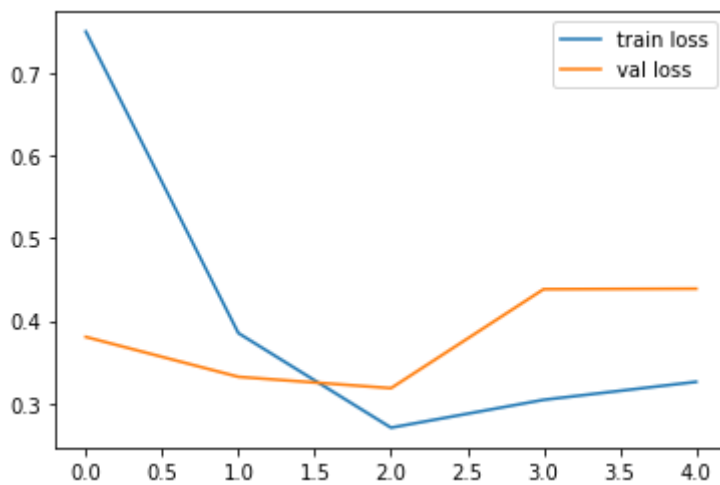
In [14]:
```python
plt.plot(r.history['loss'], label='train loss')
plt.plot(r.history['val_loss'], label='val loss')
plt.legend()
plt.show()
plt.savefig('LossVal_loss')

# plot the accuracy
plt.plot(r.history['accuracy'], label='train accuracy')
plt.plot(r.history['val_accuracy'], label='val accuracy')
plt.legend()
plt.show()
plt.savefig('AccVal_accuracy')
```



```
<Figure size 432x288 with 0 Axes>
```

In [15]:
```python
import tensorflow as tf
```

```python
from keras.models import load_model

model.save('E:\\chest_xray\\val\\model_resnet50.h5')
```

In [ ]:

In [ ]:

In [ ]: