Image Classification

In [13]:
```
# image importing resources
import cv2
import glob
from PIL import Image

%matplotlib notebook
import matplotlib.pyplot as plt
import numpy as np
import time

# building a neural network model
import tensorflow as tf
from keras.layers import Activation, Dense
from keras.models import Sequential
#modules for metrics
from keras import optimizers
from keras import metrics
from sklearn.metrics import r2_score
from sklearn.metrics import mean_squared_error
from sklearn.model_selection import train_test_split
```

In [14]:
```
#importing the Normal chest xray folder
cv_img = [] # array to store all the images
y_Vals = [] # array to store their associated label
for img in glob.glob("train/NORMAL/*.jpeg"):
    normal = cv2.imread(img)
    resized = cv2.resize(normal,(200,200),interpolation = cv2.INTER_AREA) # resizing image
    cv_img.append(resized) #add normal images into the general image array
    y_Vals.append("N")
```

In [16]:
```
#importing the Pneumonia chest xray folder
for img in glob.glob("train/PNEUMONIA/*.jpeg"):
    pneumonia = cv2.imread(img)
    resized2 = cv2.resize(pneumonia,(200,200),interpolation = cv2.INTER_AREA)# resizing image
    cv_img.append(resized2) #add pneumonia images into the general image array
    y_Vals.append("P")
```

In [17]:
```
cv_img = np.array(cv_img) # converting image list to an array
```

```
cv_img[1].shape
```

Out[17]:
```
(200, 200, 3)
```

In [18]:
```
# splitting data, using 80% for training
X_train, X_test, y_train, y_test = train_test_split(cv_img, y_Vals, random_state=0, train_size=0.8)
```

In [19]:
```
import numpy as np
from tensorflow import keras
from tensorflow.keras import layers
import pandas as pd

# Model / data parameters
num_classes = 2 # normal or pneumonia
input_shape = (200, 200, 3) # size of each image

# Scale images to the [0 - 1] range
X_train = X_train.astype("float32") / 255
X_test = X_test.astype("float32") / 255


print("x_train shape:", X_train.shape)
print(X_train.shape[0], "train samples")
print(X_test.shape[0], "test samples")


# convert class vectors to binary class matrices
# Converting every 'N' and 'P ' to [01] = N or [10] = P
numbers, labels = pd.factorize(y_train)
y_train = tf.keras.utils.to_categorical(numbers, num_classes=2)

numbers, labels = pd.factorize(y_test)
y_test = tf.keras.utils.to_categorical(numbers, num_classes=2)
```

```
x_train shape: (4172, 200, 200, 3)
4172 train samples
1044 test samples
```

In [20]:
```
# creating the CNN Model
model = keras.Sequential(
    [
        keras.Input(shape=input_shape),
        layers.Conv2D(32, kernel_size=(3, 3), activation="relu"),
        layers.MaxPooling2D(pool_size=(2, 2)),
```

```
        layers.Conv2D(64, kernel_size=(3, 3), activation="relu"),
        layers.MaxPooling2D(pool_size=(2, 2)),
        layers.Flatten(),
        layers.Dropout(0.5),
        layers.Dense(num_classes, activation="softmax"),
    ]
)
```

In [21]:
```
batch_size = 150
epochs = 15
model.compile(loss="categorical_crossentropy", optimizer="adam", metrics=["accuracy"])
model.fit(X_train, y_train, batch_size=batch_size, epochs=epochs, validation_split=0.1, verbose=0)
```

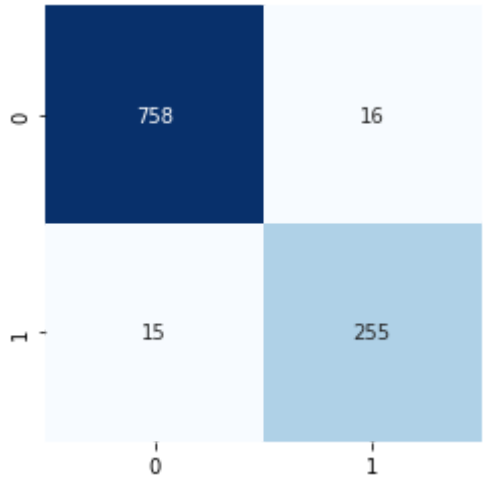
Out[21]:
```
<tensorflow.python.keras.callbacks.History at 0x1babdd8eb48>
```

In [22]:
```
score = model.evaluate(X_test, y_test, verbose=0)
print("Test loss:", score[0])
print("Test accuracy:", score[1])
```

```
Test loss: 0.07971697474804874
Test accuracy: 0.9703065
```

In [23]:
```
from sklearn.metrics import confusion_matrix
import seaborn as sns
%matplotlib inline
y_pred = model.predict(X_test)
y_pred_c = np.argmax(y_pred, axis=1)
y_test_c = np.argmax(y_test, axis=1)
matrix_confusion = confusion_matrix(y_test_c, y_pred_c)

sns.heatmap(matrix_confusion, square=True, annot=True, cmap='Blues', fmt='d', cbar=False )
plt.show()
```


758
16
15
255
0
1
0
1