PCA

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In [157]:
```
from core.util import get_histogram
import matplotlib.pyplot as plt
import numpy as np
import Image
import os
import scipy

def pca(img):
    h, w = img.shape
    mu = np.mean(img, axis=0)
    dif = img-mu

    cm = np.dot(dif.T, dif) / (h-1)
    [U, S, V] = np.linalg.svd(cm)
    return dif, U, S
```

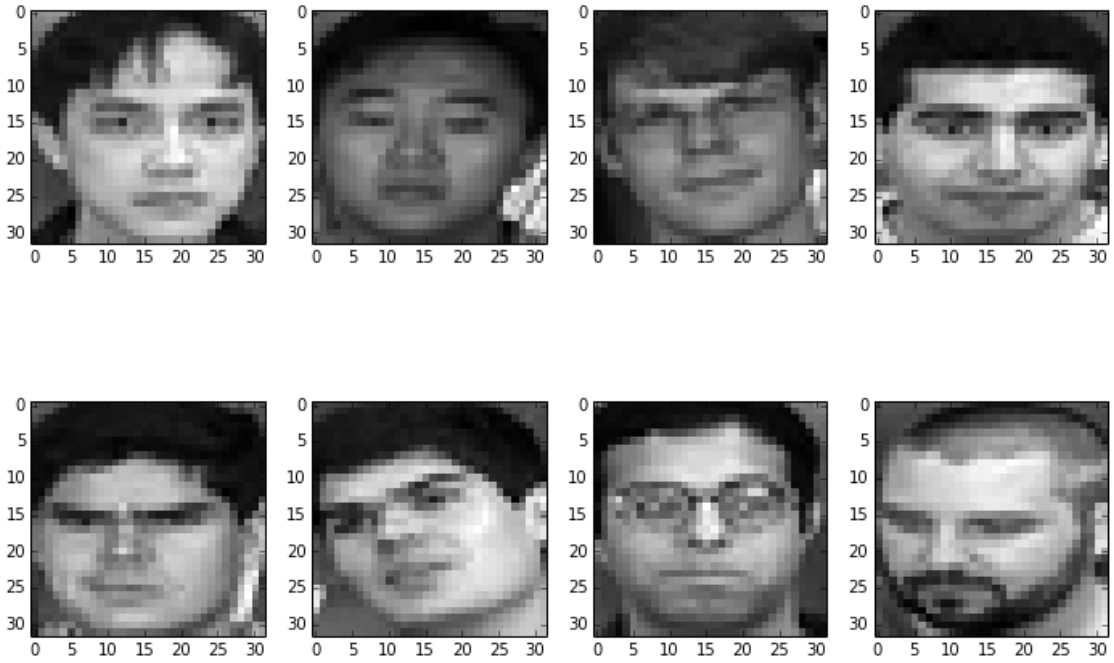
1 Running PCA in a face dataset - for performance purposes I'm using only the first 50 faces and resizing every image to 32x32

In [171]:
```
PATH = '../images/cropped_faces/'
img = list()
shape = (32, 32)
cont = 50

for path in os.listdir(PATH):
    i = np.array(Image.open(PATH+path).convert('L').resize(shape, Image.ANTIALIAS))
    img.append(i.flatten())
    cont -= 1

    if(cont<=0):
        break

img = np.array(img)

dif, U, S = pca(img)
```

2 Displaying some face samples from the dataset

In [181]:
```
plt.subplot('241')
plt.imshow(img[0,:].reshape(shape))

plt.subplot('242')
```

```
plt.imshow(img[1,:].reshape(shape))

plt.subplot('243')
plt.imshow(img[2,:].reshape(shape))

plt.subplot('244')
plt.imshow(img[3,:].reshape(shape))

plt.subplot('245')
plt.imshow(img[4,:].reshape(shape))

plt.subplot('246')
plt.imshow(img[5,:].reshape(shape))

plt.subplot('247')
plt.imshow(img[6,:].reshape(shape))

plt.subplot('248')
plt.imshow(img[7,:].reshape(shape))

plt.show()
```



3 Run PCA and visualize the eigenvectors which are in this case eigenfaces

3.1 Displaying the two first eigenvectors

```
In [167]: im = U[:, 0]
          maxv = np.abs(im).max()
```

```
im = im.reshape(shape) / maxv

plt.subplot('121')
plt.imshow(im, 'gray')

im = U[:, 1]
maxv = np.abs(im).max()
im = im.reshape(shape) / maxv

plt.subplot('122')
plt.imshow(im, 'gray')

plt.show()
```