

# Professor\_Bear\_Image\_Analysis\_Spatial\_Analysis

March 14, 2017

## 1 Professor Bear :: Image Analysis :: Spatial Analysis

### 1.1 Professor Bear github

Code for Professor Bear YouTube videos at <https://github.com/nikbearbrown>

### 1.2 Download Anaconda 4 for Python 2.7

Download Anaconda 4 for Python 2.7 version <https://www.continuum.io/downloads>

Anaconda 4.3.0 includes an easy installation of Python (2.7.13, 3.4.5, 3.5.2, and/or 3.6.0) and updates of over 100 pre-built and tested scientific and analytic Python packages. These packages include NumPy, Pandas, SciPy, Matplotlib, and Jupyter. Over 620 more packages are available.  
<https://docs.continuum.io/anaconda/pkg-docs>

### 1.3 iPython

Go to the directory that has your iPython notebook

At the command line type

*jupyter notebook notebookname*

*ipython notebook notebookname* will also work

For example,

*jupyter notebook Professor\_Bear\_Image\_Analysis\_Loading\_Histograms.ipynb*

```
In [1]: # Bring in python image analysis libraries
%matplotlib inline
import matplotlib.pyplot as plt
import matplotlib.image as mpimg
import numpy as np
from skimage import color
import skimage.filters as filters
from skimage.transform import hough_circle
from skimage.feature import peak_local_max
from skimage import feature
from skimage import morphology
from skimage.draw import circle_perimeter
from skimage import img_as_float, img_as_ubyte
from skimage import segmentation as seg
from skimage.morphology import watershed
```

```

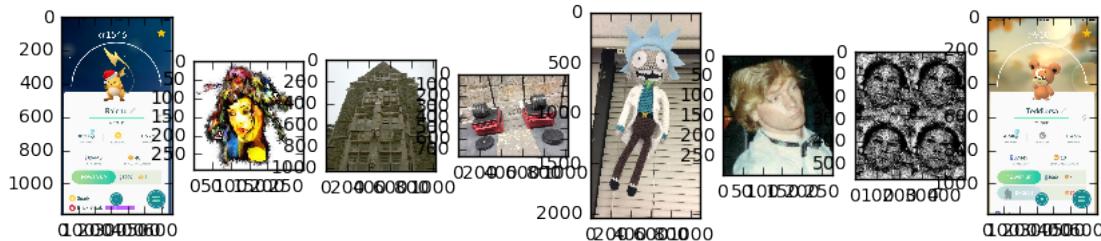
from scipy import ndimage as nd
from scipy.ndimage import convolve
from skimage import feature
import glob # for bulk file import

# Set defaults
plt.rcParams['image.cmap'] = 'gray' # Display grayscale images in...
plt.rcParams['image.interpolation'] = 'none' # Use nearest-neighbour
plt.rcParams['figure.figsize'] = 10, 10

# Import test images
imgpaths = glob.glob("./img/*.jpg") + glob.glob("./img/*.png")
# imgpaths = glob.glob("images/*.jpg") + glob.glob("images/*.png") Windows
# Windows has different relative paths than Mac/Unix
imgset = [mpimg.imread(x) for x in imgpaths]

# Display thumbnails of the images to ensure loading
plt.figure()
for i,img in enumerate(imgset):
    plt.subplot(1, len(imgset), i+1)
    plt.imshow(img, cmap = 'gray')

```



## 1.4 Spatial Analysis

### Spatial Analysis

```

In [2]: def histo(img):
    if img.ndim == 2: #grayscale
        plt.hist(img.flatten(), 256, range=(0,255), color='k', histtype='s'
    elif img.ndim == 3: # print rgb histo
        plt.hist(img.reshape(-1,3), 256, range=(0,255), color=['r','g','b'])
    else: #invalid
        print("Error: Not an image.")
    plt.xlim([0,255])

```

```

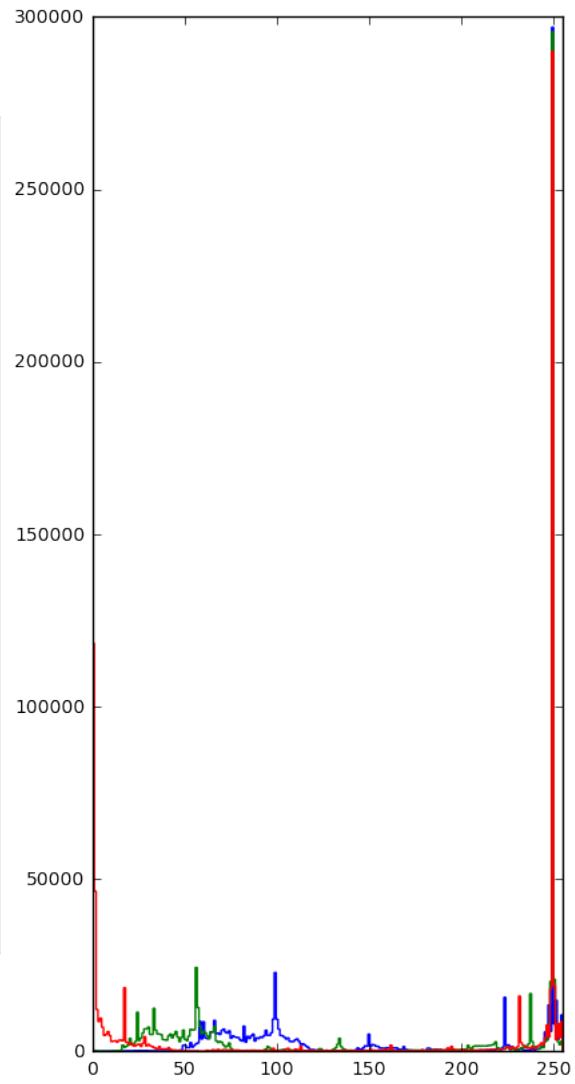
In [3]: #apply histo funct
for i,img in enumerate(imgset):

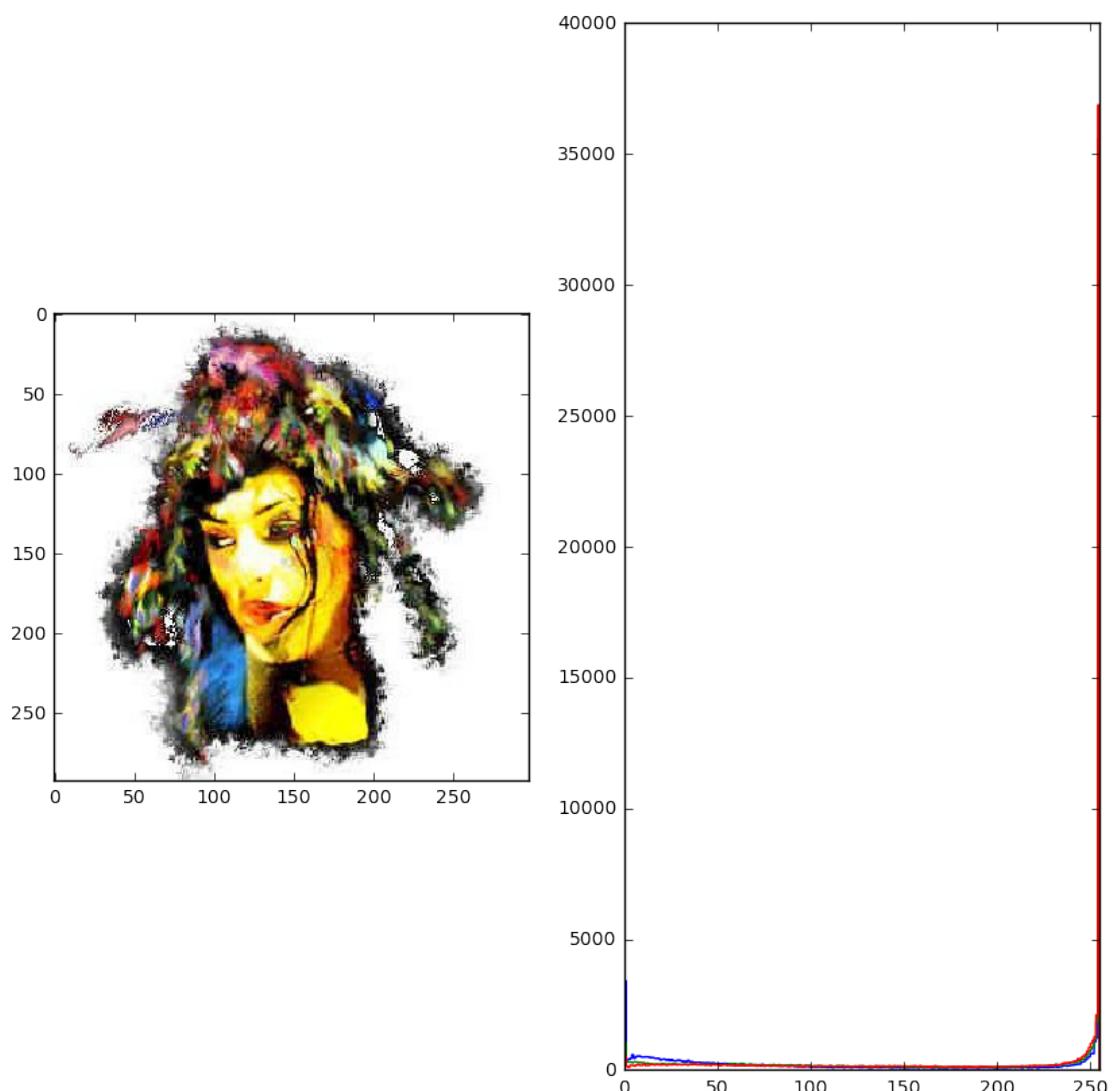
```

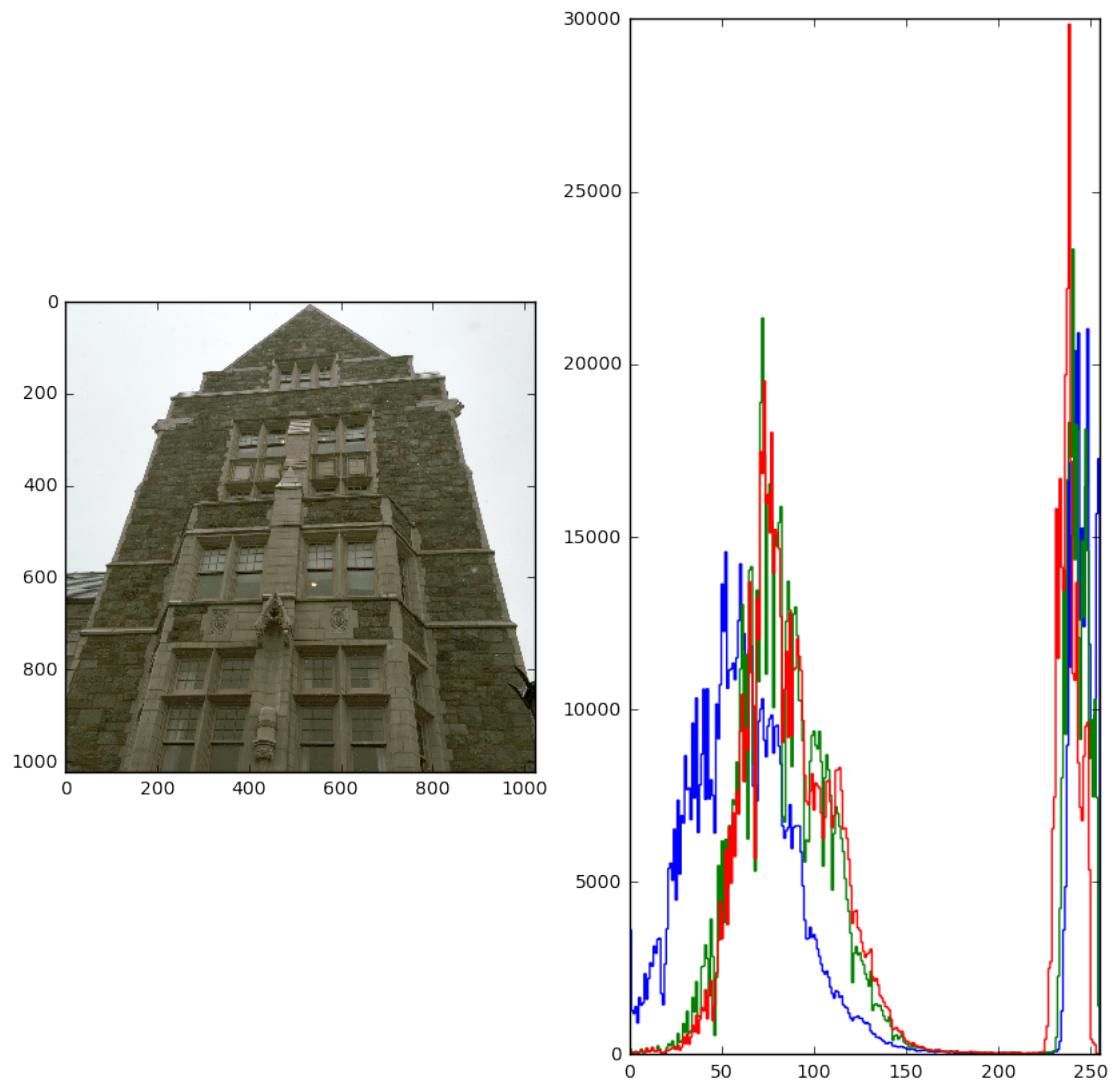
```

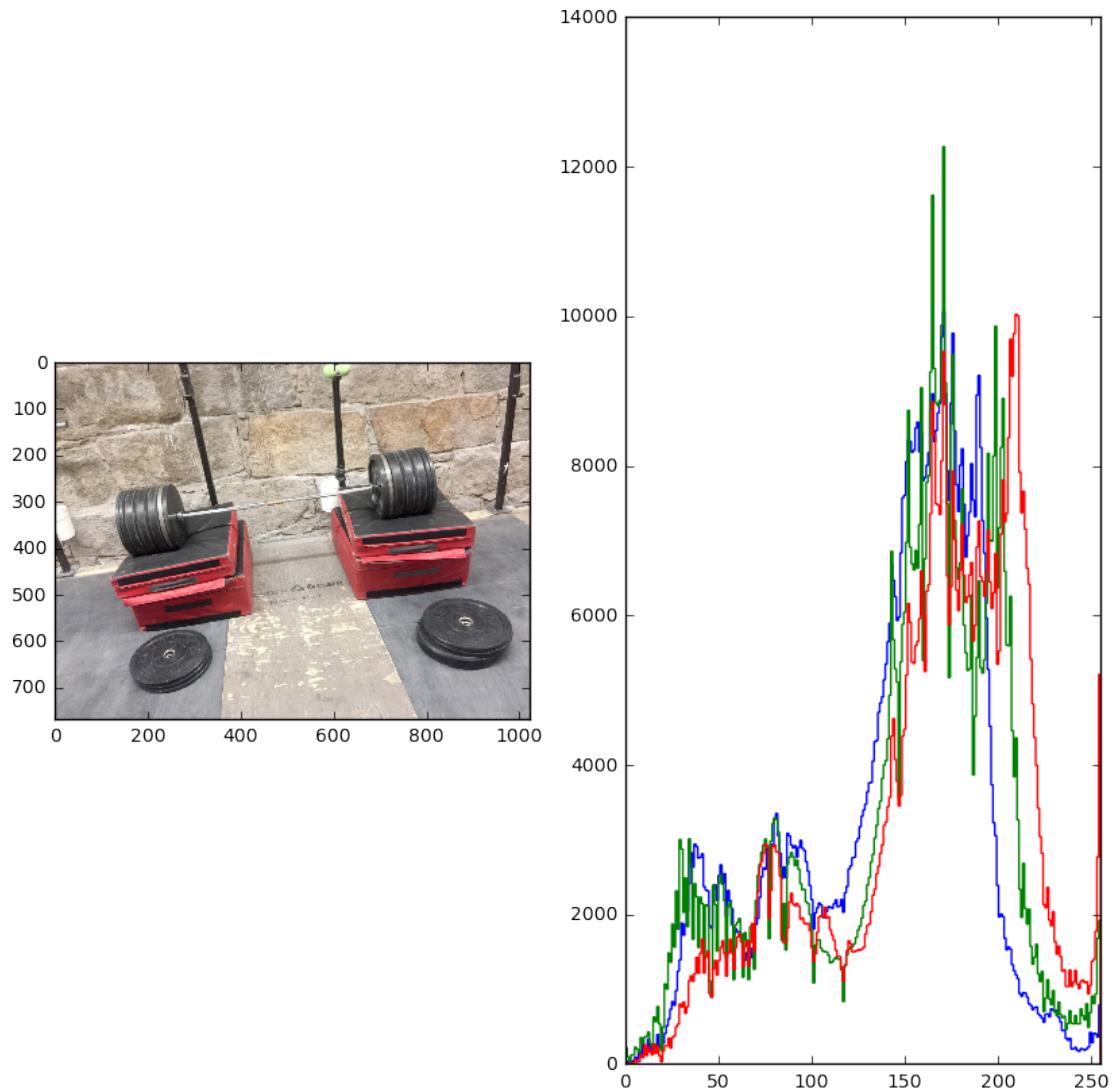
plt.figure()
plt.subplot(1, 2, 1)
plt.imshow(img, cmap='gray')
plt.subplot(1, 2, 2)
histo(img)

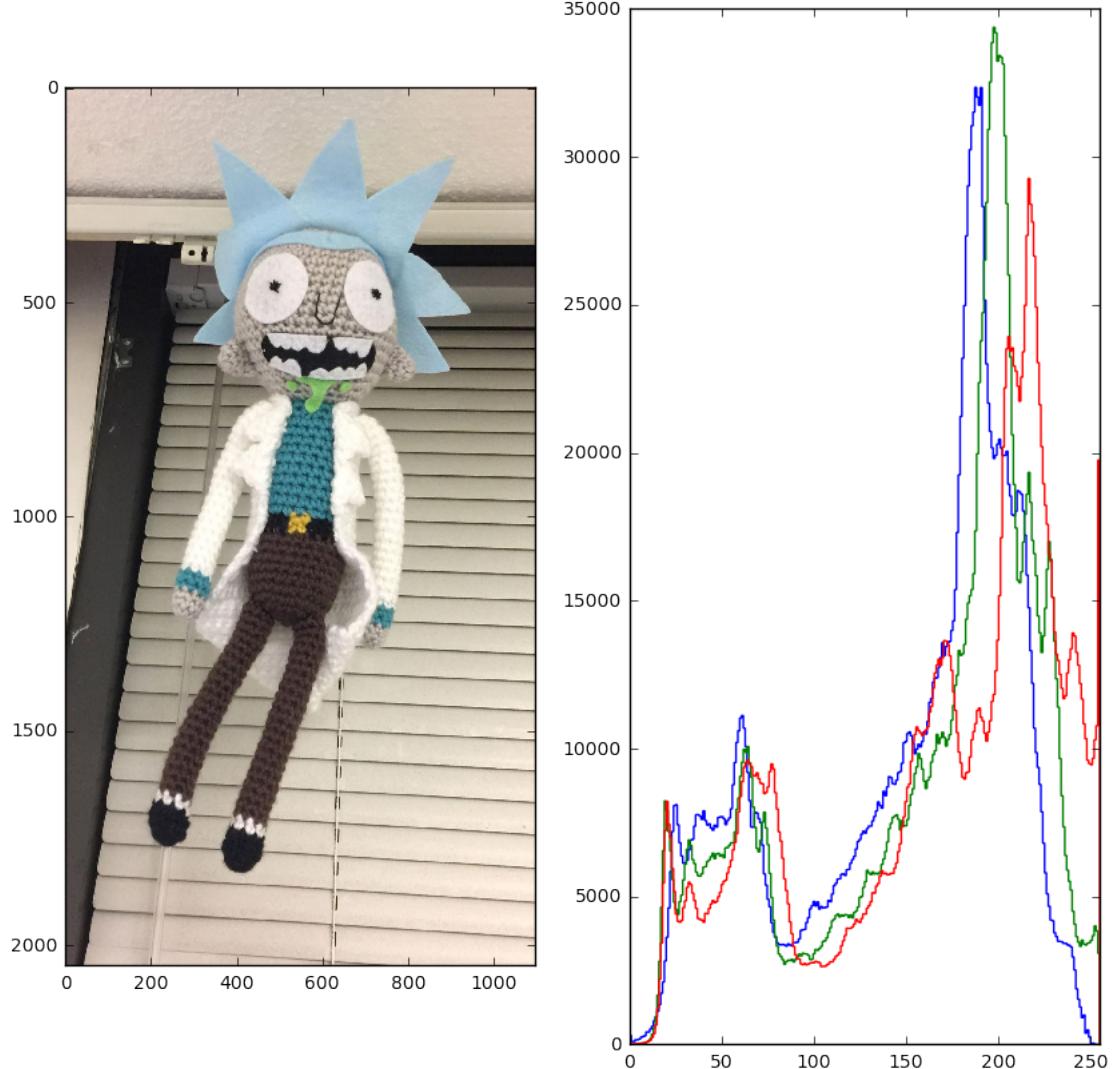
```

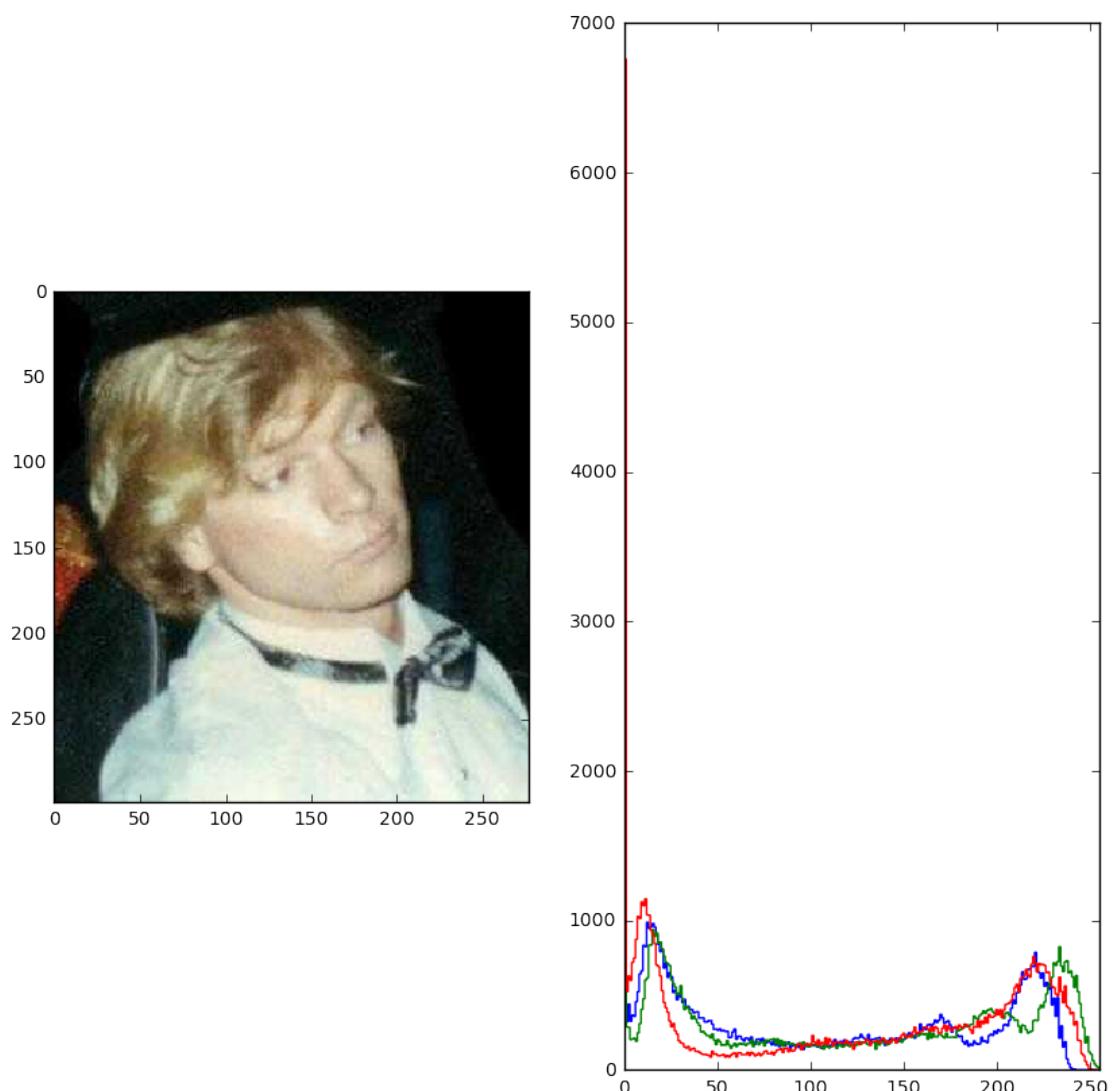


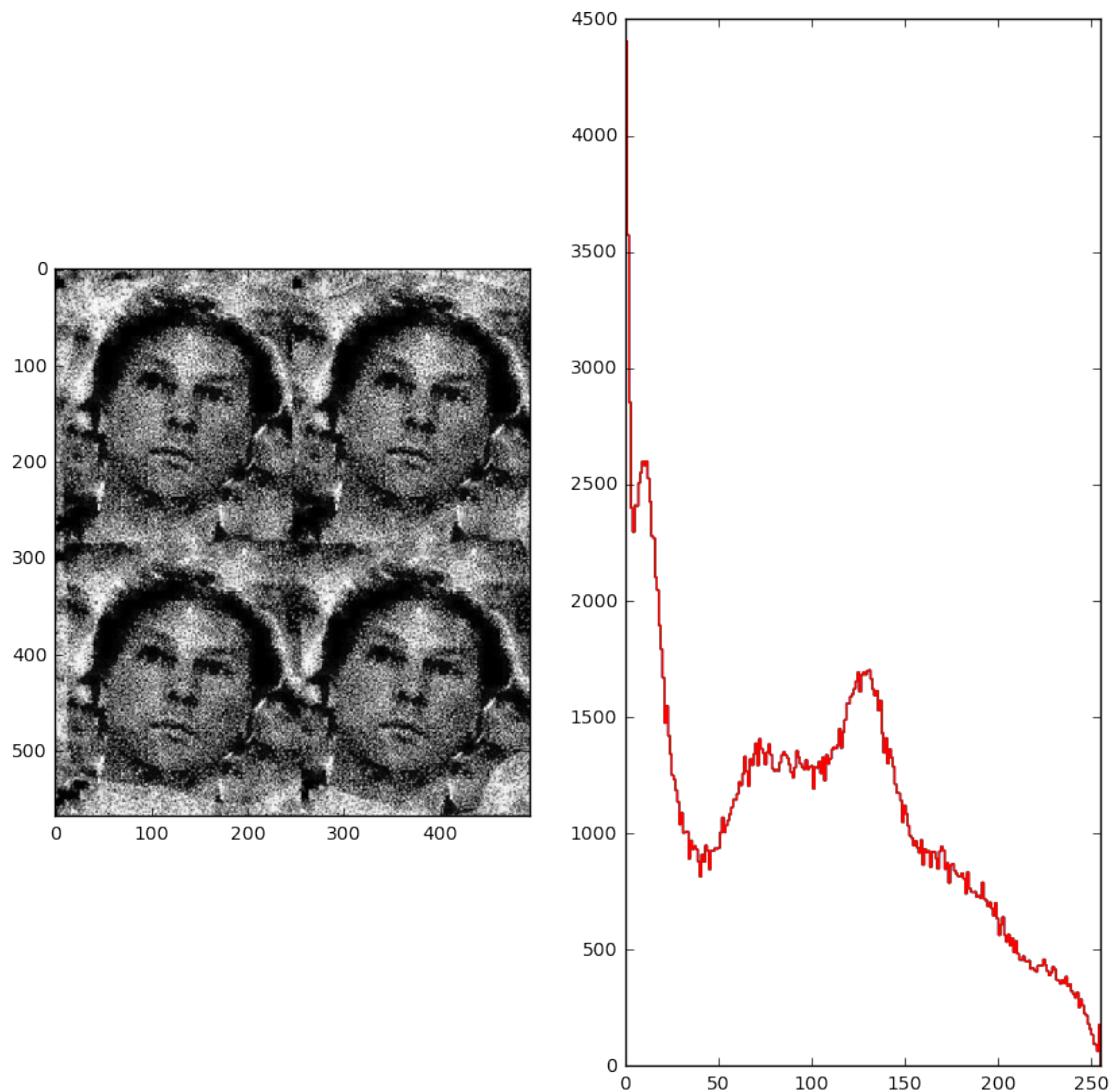


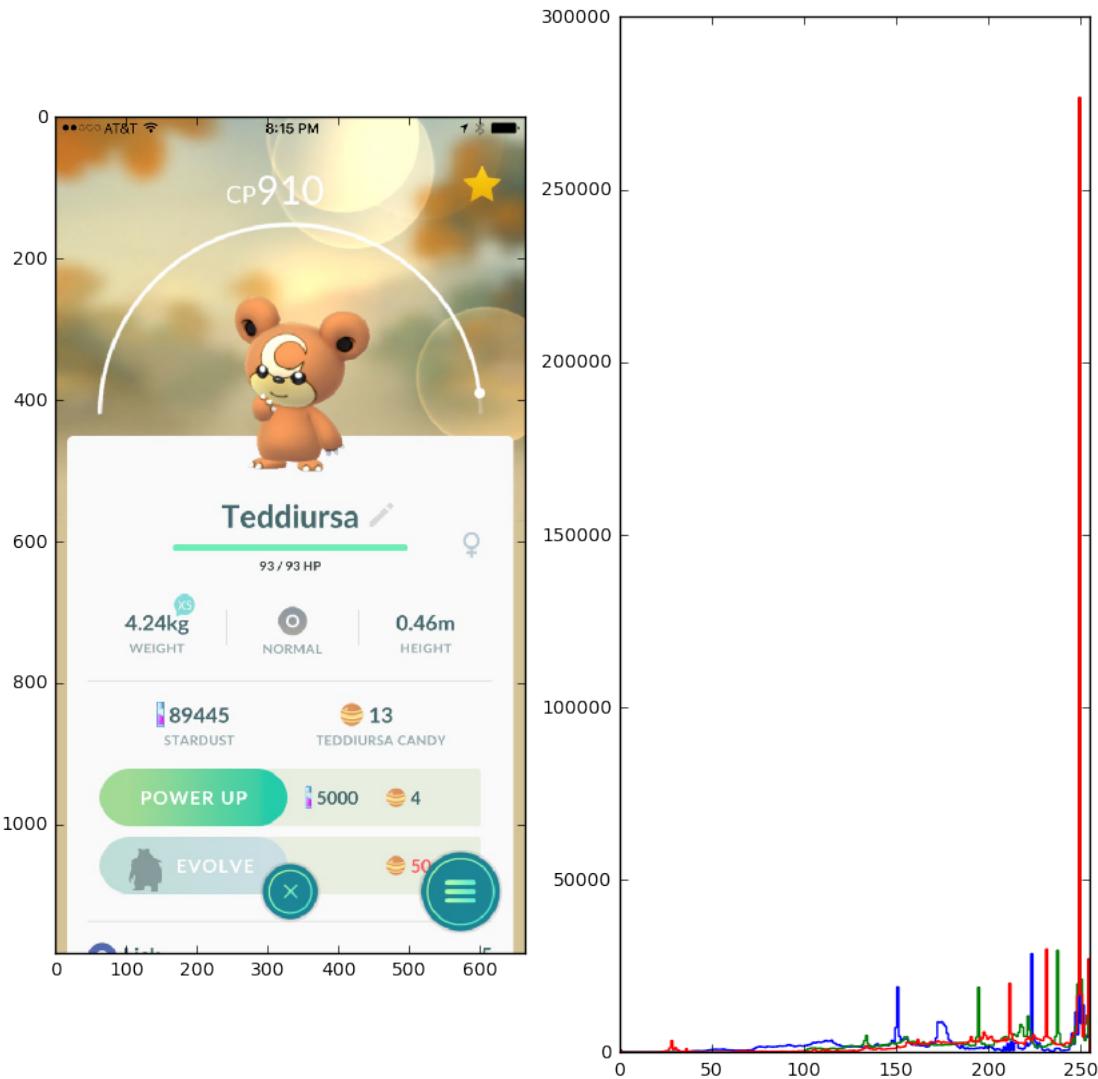








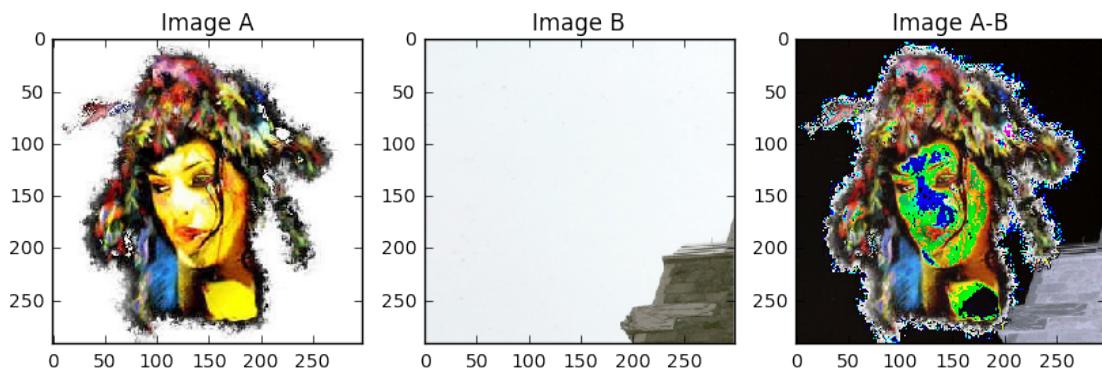
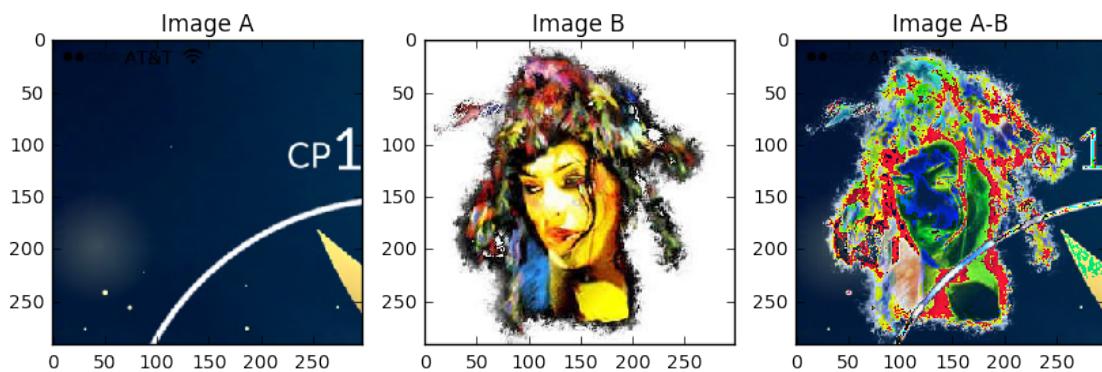


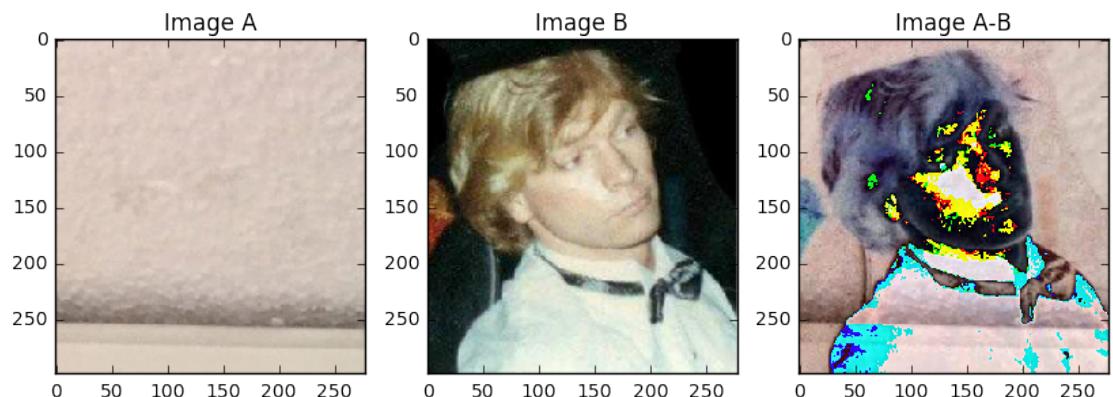
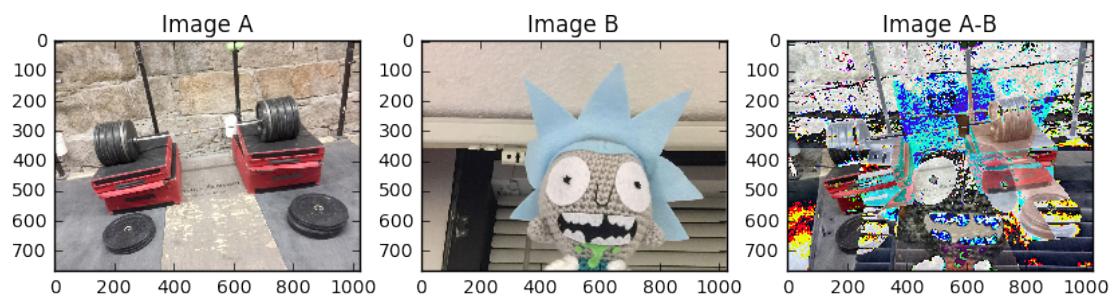
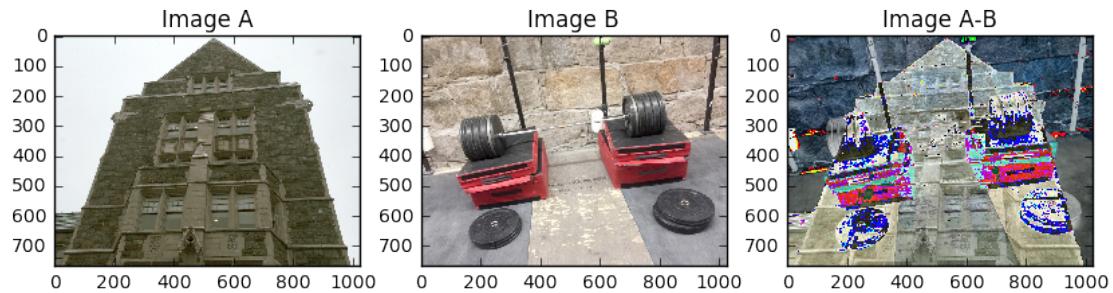


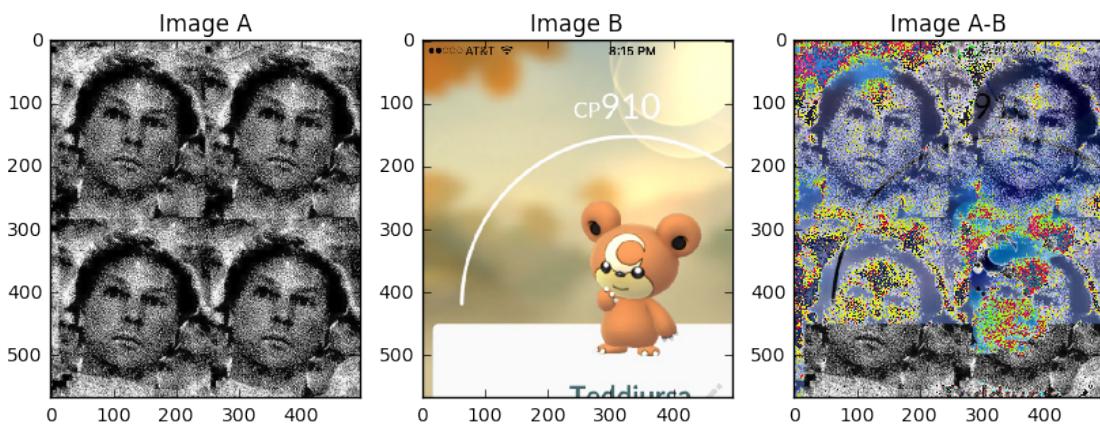
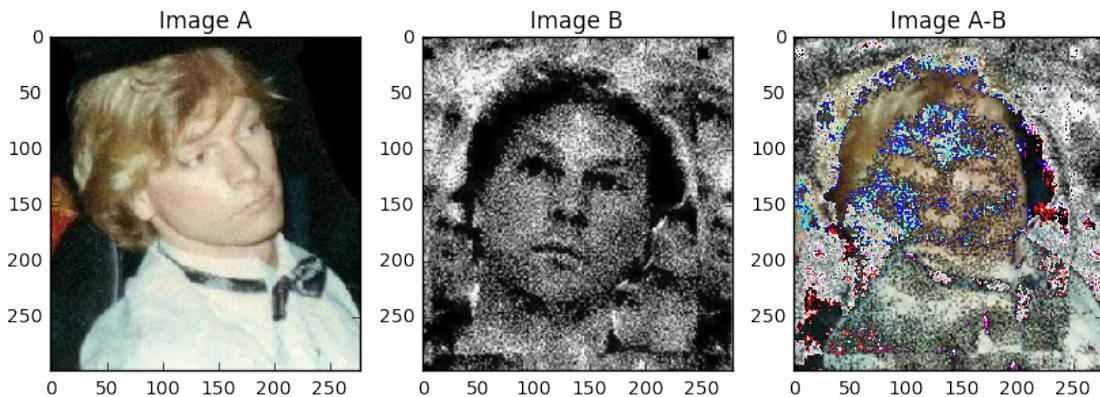
```
In [4]: # Find the absolute difference between two images. Crops to the shared region
def pairwise_difference(img_a, img_b):
    subset = np.minimum(img_a.shape, img_b.shape)
    img_a_subset = img_a[:subset[0], :subset[1]]
    img_b_subset = img_b[:subset[0], :subset[1]]
    return img_a_subset, img_b_subset, np.abs(img_a_subset - img_b_subset)
```

```
In [5]: # Find the absolute difference between two grayscale images. Crops to the shared region
def gray_pairwise_difference(img_a, img_b):
    subset = np.minimum(img_a.shape, img_b.shape)
    img_a_subset = img_a[:subset[0], :subset[1]]
    img_b_subset = img_b[:subset[0], :subset[1]]
    return img_a_subset, img_b_subset, np.abs(color.rgb2gray(img_a_subset) - color.rgb2gray(img_b_subset))
```

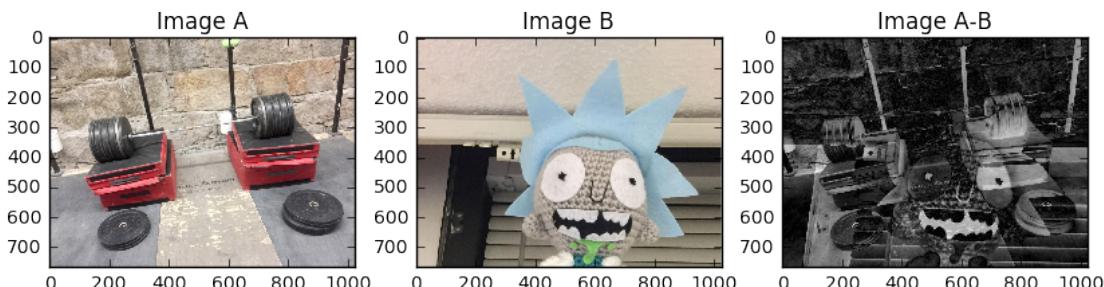
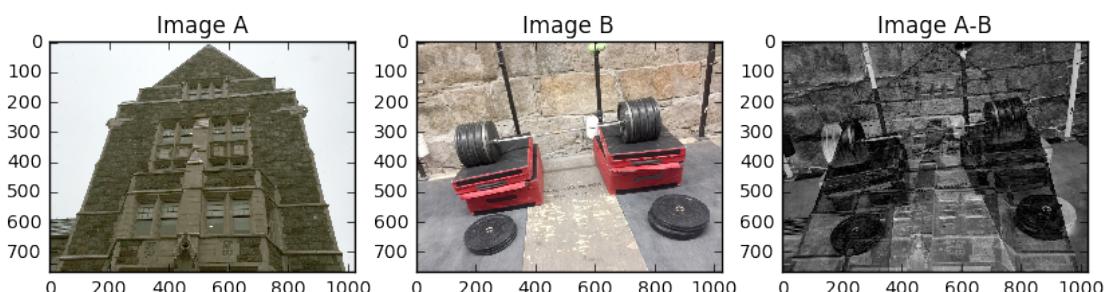
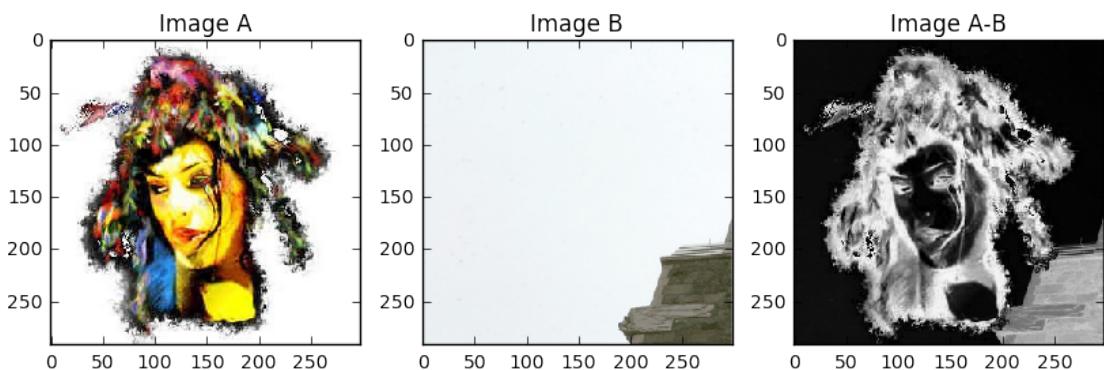
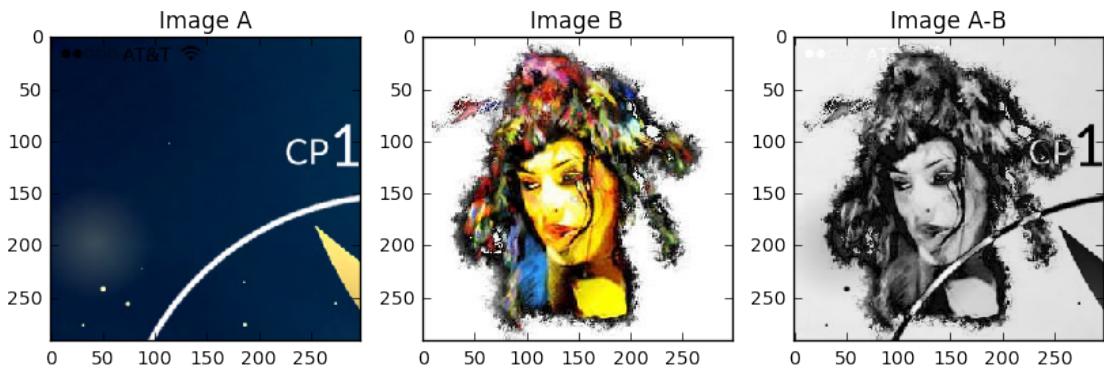
```
In [6]: for i in range(len(imgset)-1):
    a, b, d = pairwise_difference(imgset[(i)], imgset[(i+1)])
    plt.figure()
    plt.subplot(1, 3, 1)
    plt.title('Image A')
    plt.imshow(a)
    plt.subplot(1, 3, 2)
    plt.title('Image B')
    plt.imshow(b)
    plt.subplot(1, 3, 3)
    plt.title('Image A-B')
    plt.imshow(d)
```

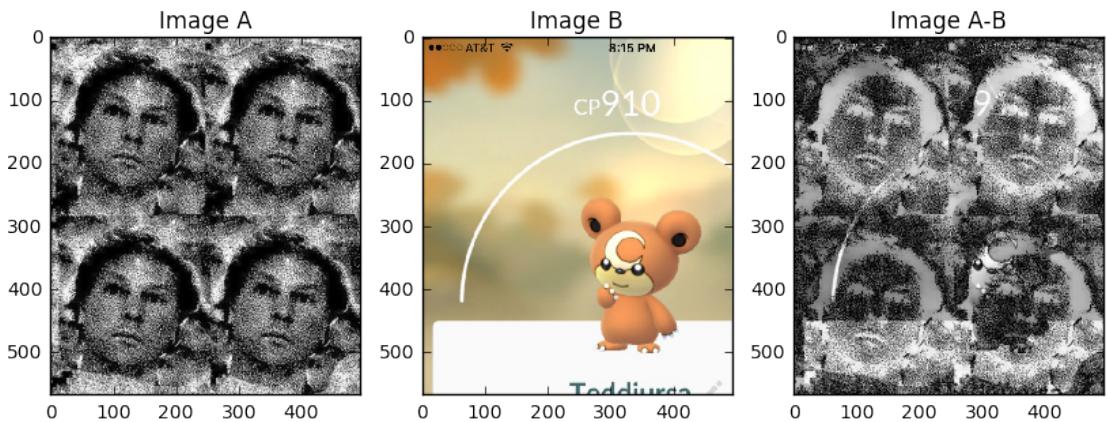
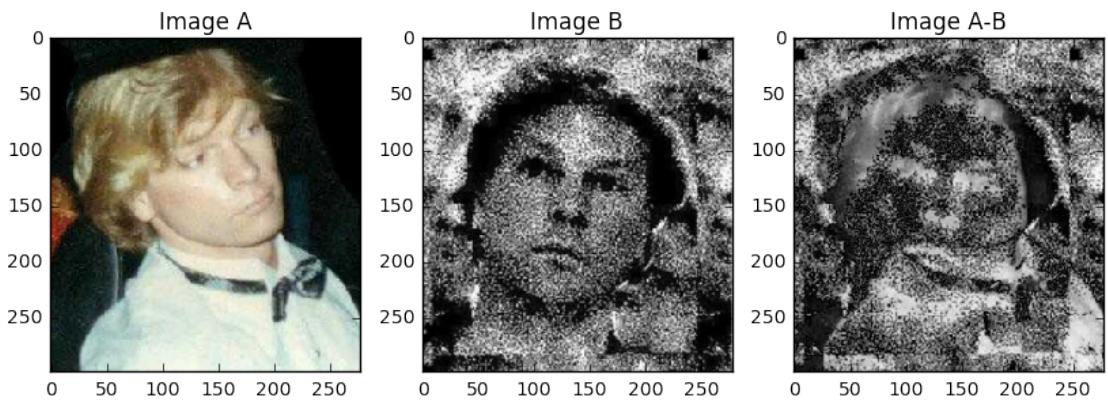
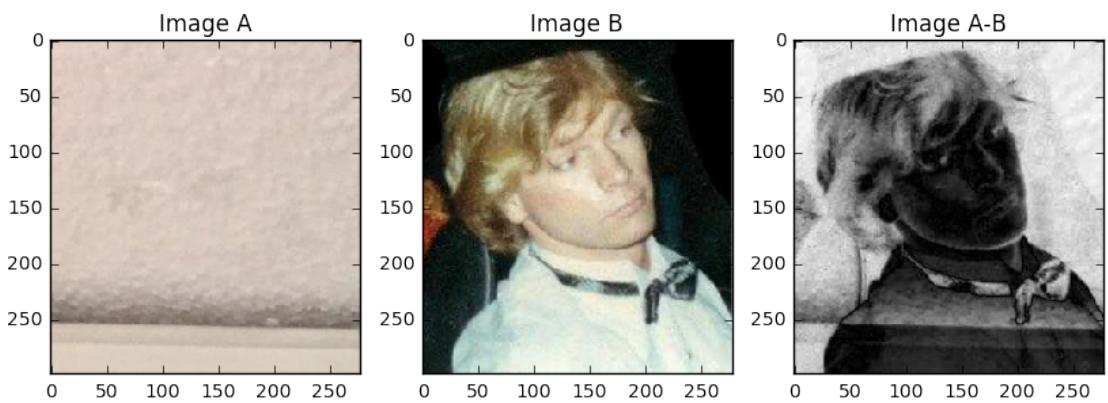






```
In [7]: for i in range(len(imgset)-1):
    a, b, d = gray_pairwise_difference(imgset[(i)], imgset[(i+1)])
    plt.figure()
    plt.subplot(1, 3, 1)
    plt.title('Image A')
    plt.imshow(a)
    plt.subplot(1, 3, 2)
    plt.title('Image B')
    plt.imshow(b)
    plt.subplot(1, 3, 3)
    plt.title('Image A-B')
    plt.imshow(d)
```





## 2 Python Tutorials

Python 101 Beginning Python [http://www.rexx.com/~dkuhlman/python\\_101/python\\_101.html](http://www.rexx.com/~dkuhlman/python_101/python_101.html)

The Official Python Tutorial - [<http://www.python.org/doc/current/tut/tut.html>](<http://www.python.org/doc/current/tut/tut.html>)

The Python Quick Reference - <http://rgruet.free.fr/PQR2.3.html>

YouTube Python Tutorials

Google Python Class - <http://www.youtube.com/watch?v=tKTZoB2Vjuk>

Python Fundamentals Training – Classes <http://www.youtube.com/watch?v=rKzZEtxIX14>

Python 2.7 Tutorial Derek Banas - [http://www.youtube.com/watch?v=UQi-L-\\_chcc](http://www.youtube.com/watch?v=UQi-L-_chcc)

Python Programming Tutorial thenewboston - <http://www.youtube.com/watch?v=4Mf0h3HphEA>

## 3 Evaluation

Install Anaconda 4 for Python 2.7 and get this notebook to run with a set of your images.