

Professor_Bear_Image_Analysis_Hough

March 14, 2017

1 Professor Bear :: Image Analysis :: Hough transforms

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
```

```

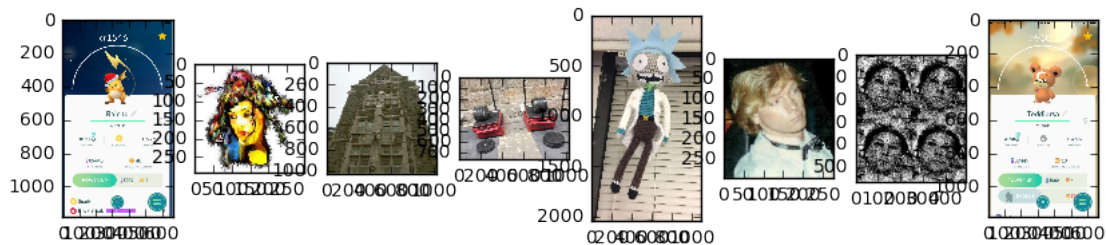
from scipy import ndimage as nd
from scipy.ndimage import convolve
from skimage import feature
import glob # for bulk file import

# Set defaults
plt.rcParams['image.cmap'] = 'gray' # Display grayscale images in... grayscale
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("img/*.jpg") + glob.glob("img/*.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 Hough transforms

The Hough transform (https://en.wikipedia.org/wiki/Hough_transform) is a feature extraction technique used in image analysis, computer vision, and digital image processing. The purpose of the technique is to find imperfect instances of objects within a certain class of shapes by a voting procedure. This voting procedure is carried out in a parameter space, from which object candidates are obtained as local maxima in a so-called accumulator space that is explicitly constructed by the algorithm for computing the Hough transform.

Take a look at How Hough Transform works <https://youtu.be/4zHbI-fFIII> for more detail on the idea behind the Hough transform.

```

In [2]: # Plot the circular Hough transforms of an image at the given radii.
def plot_circle_hough(img, radii, sigma):
    edges = feature.canny(img, sigma)
    hough = hough_circle(edges, radii)

```

```

plt.figure()
plt.subplot(1, 2, 1)
plt.imshow(imgbw)
plt.subplot(1, 2, 2)
plt.imshow(edges)
plt.figure()
for j in range(len(hough)):
    plt.subplot(1, len(hough), j+1)
    plt.imshow(hough[j, :, :])

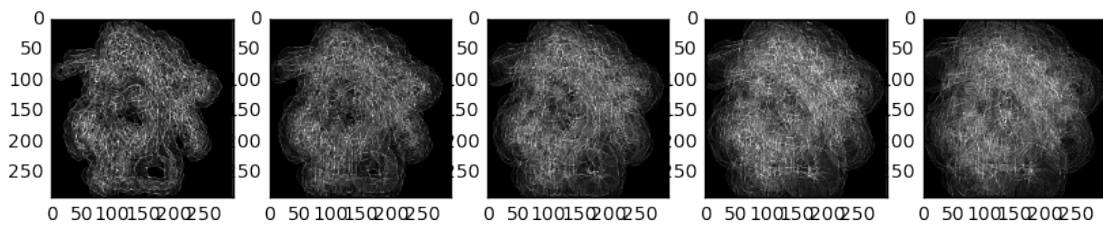
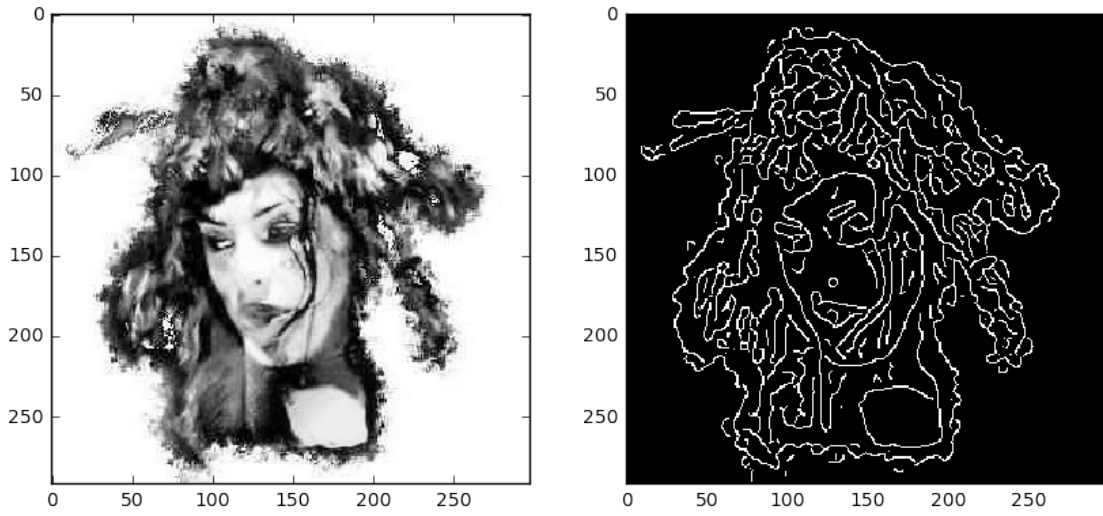
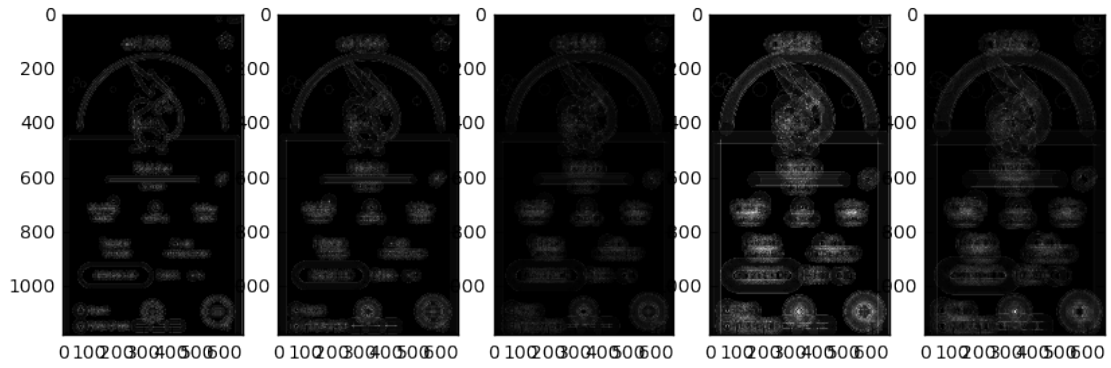
```

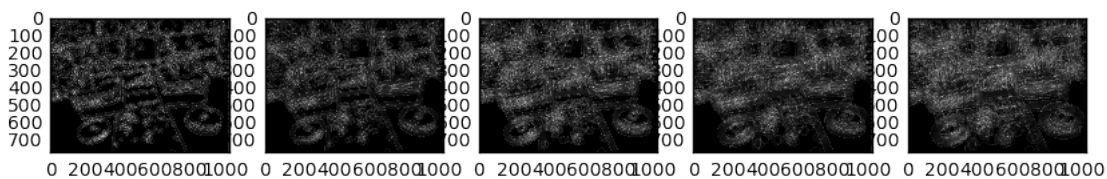
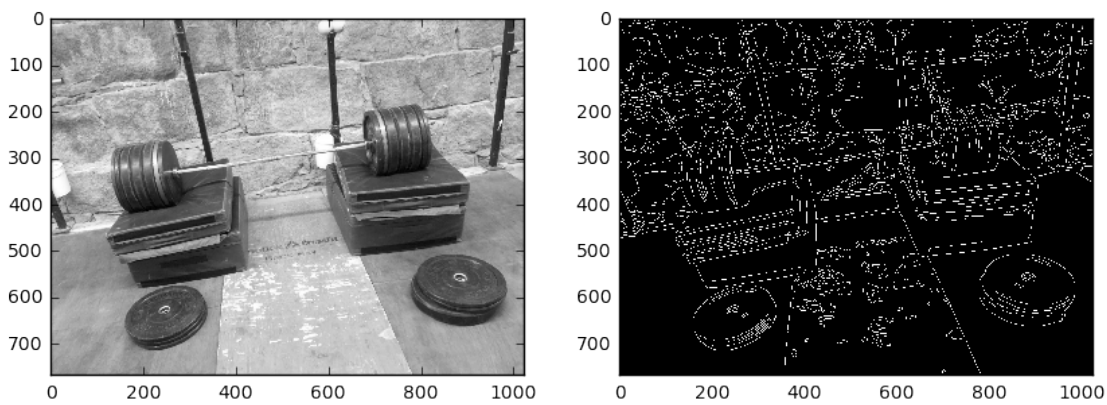
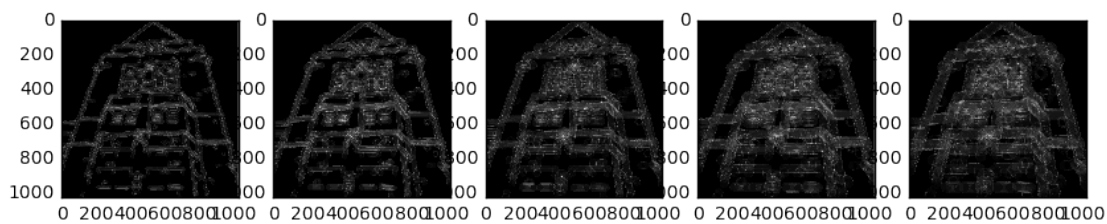
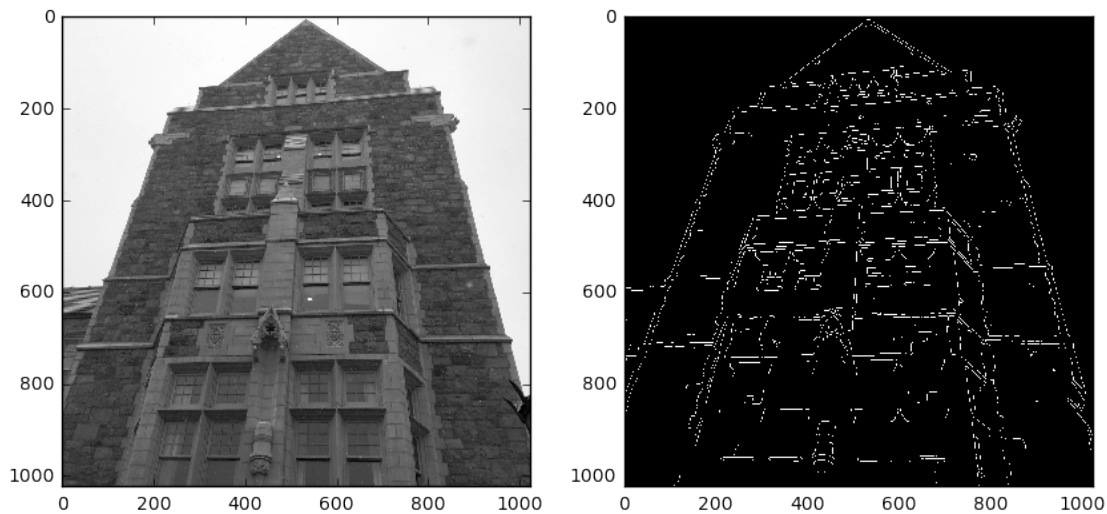
```

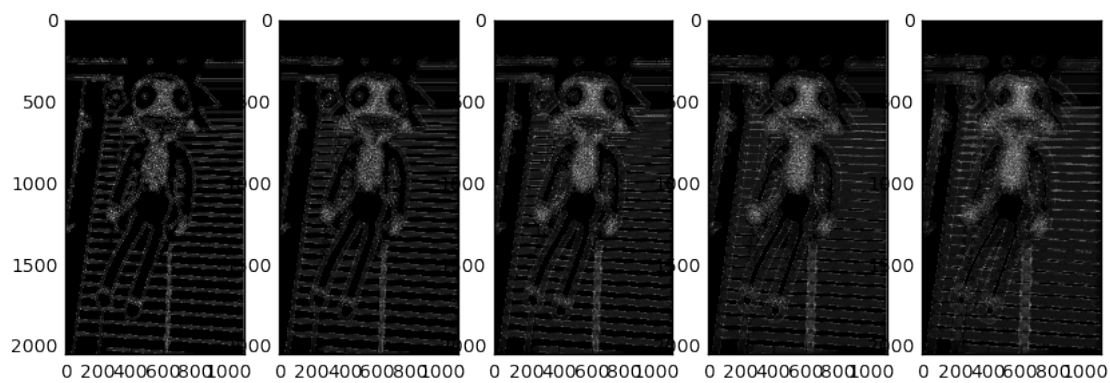
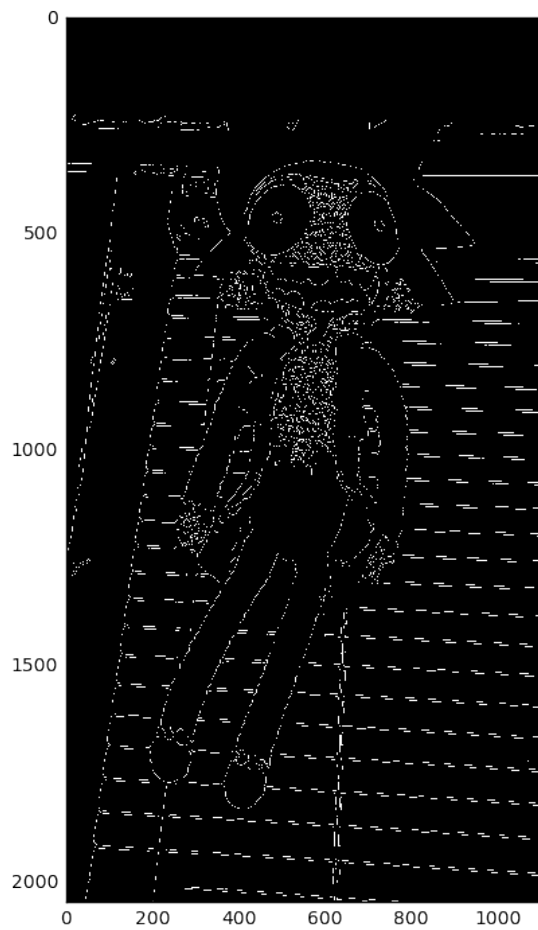
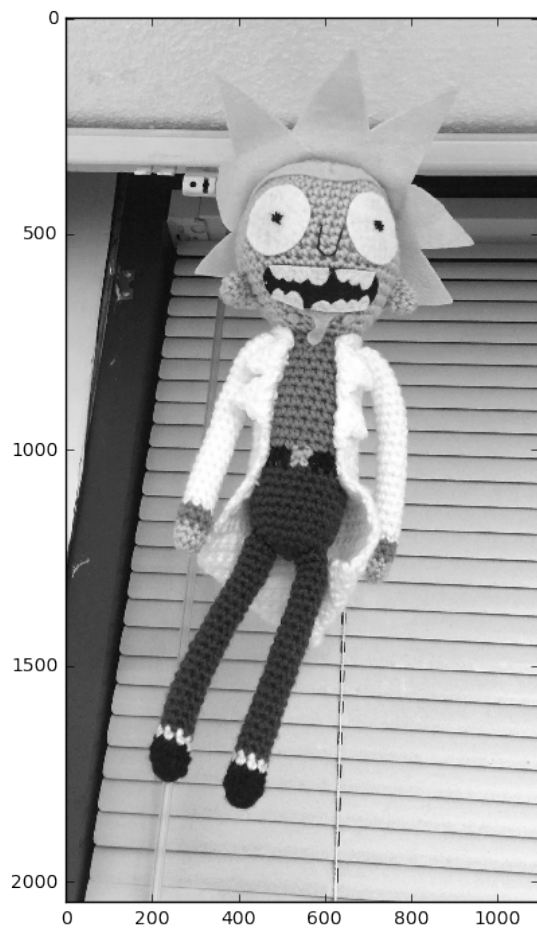
In [3]: # Apply to test images
radii = np.arange(10, 35, 5)
sigma = 2.0
for i, img in enumerate(imgset):
    imgbw = img_as_float(color.rgb2grey(img)) # downsample to make it easier
    plot_circle_hough(imgbw, radii, sigma)

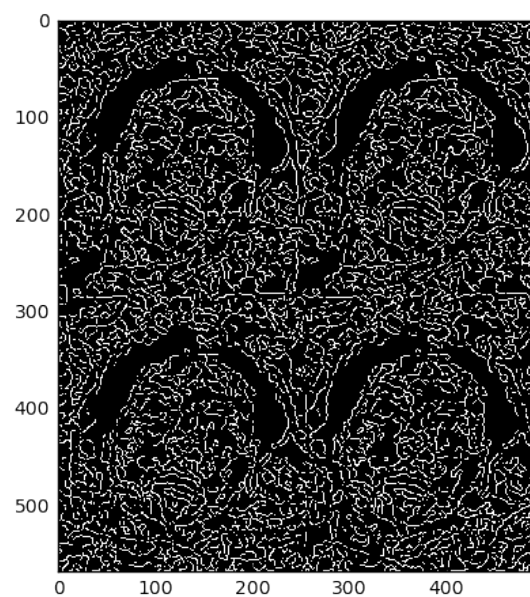
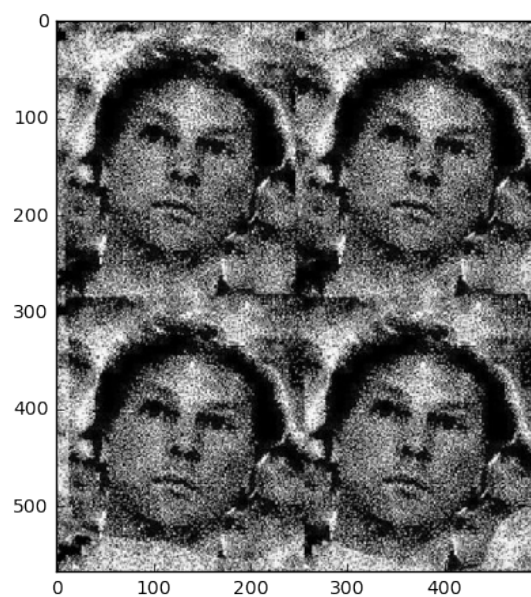
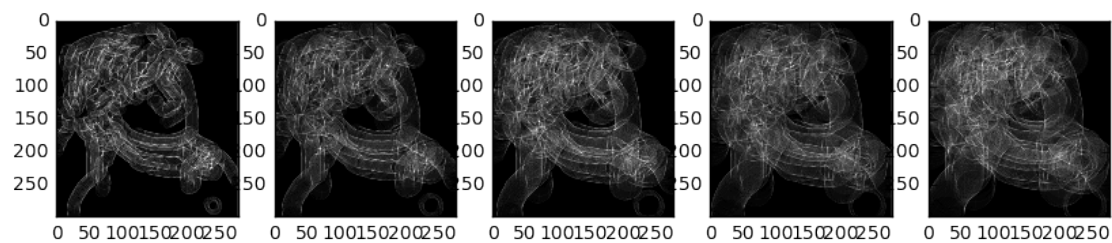
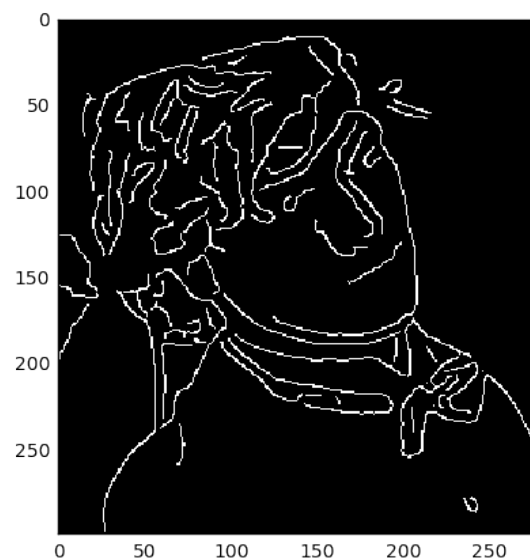
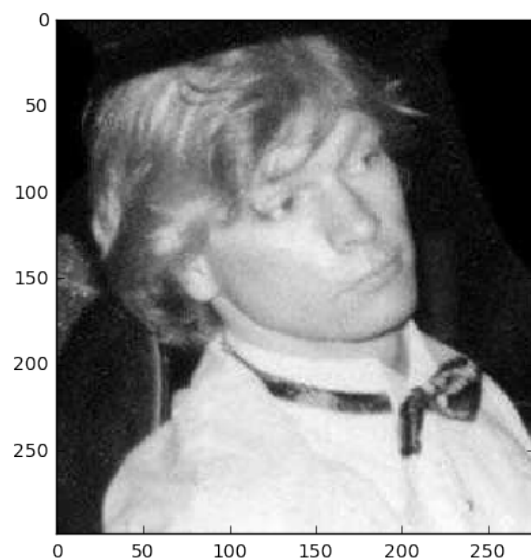
```

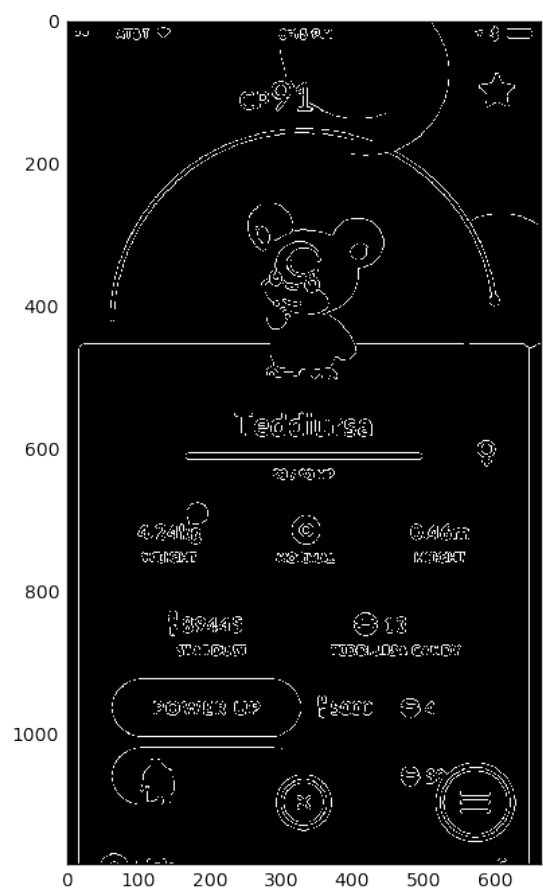
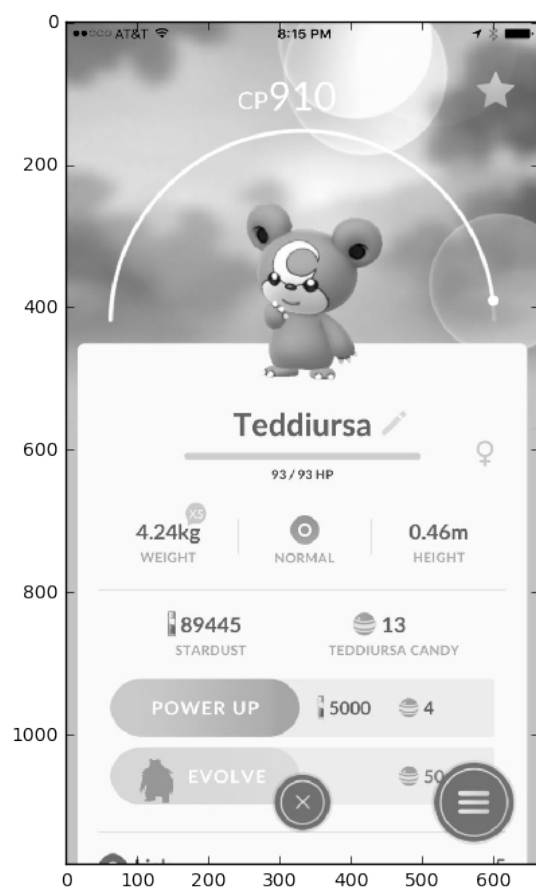
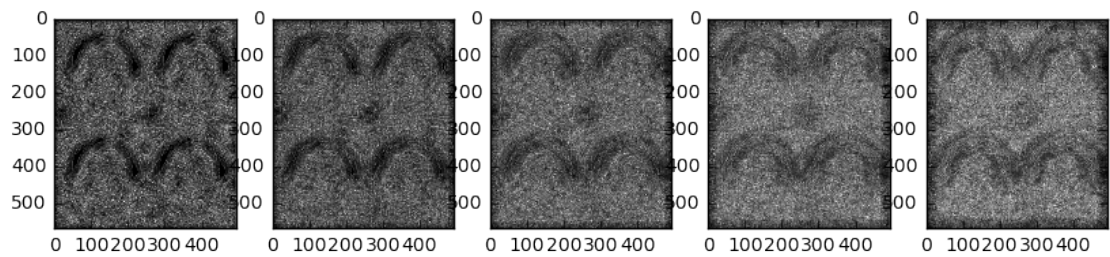


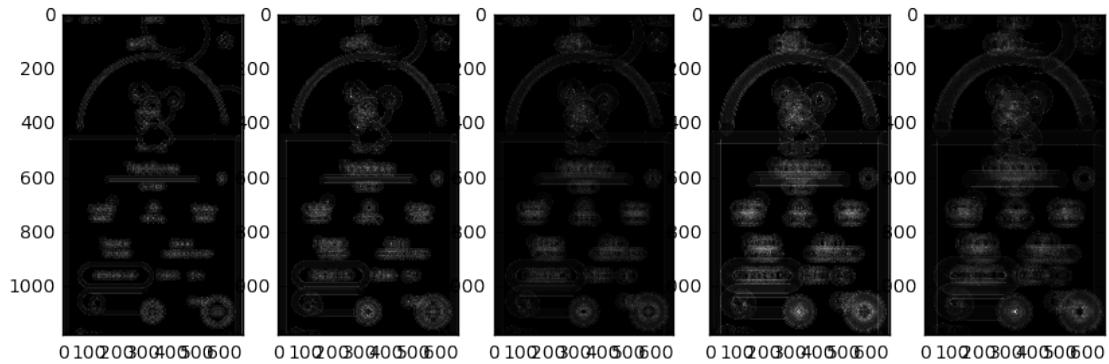












2 Python Tutorials

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>)

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

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.