make_output_image_reconstruct-with_interpolation-advanced

February 9, 2016

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In [1]: import numpy as np
        import matplotlib.pyplot as plt
        %matplotlib inline
        import Image
        import scipy
        import time

        # Make sure that caffe is on the python path:
        caffe_root = ’/home/axj232/caffe/’
        import sys
        sys.path.insert(0, caffe_root + ’python’)

        import caffe

        # configure plotting
        plt.rcParams[’figure.figsize’] = (10, 10)
        plt.rcParams[’image.interpolation’] = ’nearest’
        plt.rcParams[’image.cmap’] = ’gray’
```

```
In [2]: #load our fully convolutional network
        net_full_conv = caffe.Net(’deploy_full.prototxt’,
                                  ’full_convolutional_net.caffemodel’, caffe.TEST)
```

```
In [3]: #load our mean file and get it into the right shape
        transformer = caffe.io.Transformer({’data’: net_full_conv.blobs[’data’].data.shape})

        a = caffe.io.caffe_pb2.BlobProto()
        file = open(’DB_train_w32_1.binaryproto’,’rb’)
        data = file.read()
        a.ParseFromString(data)
        means = a.data
        means = np.asarray(means)
        means = means.reshape(3, 32, 32)


        transformer.set_mean(’data’,means.mean(1).mean(1))
        transformer.set_transpose(’data’, (2,0,1))
        transformer.set_channel_swap(’data’, (2,1,0))
        transformer.set_raw_scale(’data’, 255.0)
```

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In [4]: #set the mode to use the GPU
        caffe.set_device(0)
        caffe.set_mode_gpu()
```

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In [5]: im_orig = caffe.io.load_image('8914_500_f00021_original.tif')

        nrow_in=im_orig.shape[0] #we'll be doing padding later,
        ncol_in=im_orig.shape[1] #so lets make sure we know the original size

        #IMPORTANT: note here that the shape is 2000 x 2000, which is the same size
        #as we specified in our deploy_full text!

In [6]: patch_size = 32 #the patch size that trained the network
        hpatch_size = patch_size / 2 #this is the size of the edges around the image

        # 2032 x 2032 input file , 501 x 501 output = 3.99 <-- this round error
        # is why we need to use interpoliation
        displace_factor = 4

        im_orig = np.lib.pad(im_orig, ((hpatch_size, hpatch_size+displace_factor), \
                                       (hpatch_size, hpatch_size+displace_factor), \
                                       (0, 0)),  'symmetric')

        print im_orig.shape
        #IMPORTANT: note here that the shape is 2032 x 2032, which is the same size
        #as we specified in our deploy_full text!

        start=time.time()

        xx_all=np.empty([0,0])
        yy_all=np.empty([0,0])
        zinter_all=np.empty([0,0])
```

```
(2036, 2036, 3)
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```
In [7]: for r_displace in xrange(0,displace_factor): # loop over the receptor field
            for c_displace in xrange(0,displace_factor):
                print "Row + Col displace:\t (%d/ %d) (%d/ %d) " %( r_displace, displace_factor, \
                                                                   c_displace, displace_factor)


                im= im_orig[0+r_displace:-displace_factor+r_displace,0+c_displace \
                            :-displace_factor+c_displace,:] #displace the image
                out = net_full_conv.forward_all(data=np.asarray([transformer.preprocess('data', im)])) #
                #i'm only interested in the "positive class channel"
                # the negative is simply 1- this channel
                output_sub_image=out['prob'][0][1,:,:]

                nrow_out=output_sub_image.shape[0]
                ncol_out=output_sub_image.shape[1]

                start_spot_row=r_displace
                start_spot_col=c_displace

                end_spot_row=nrow_in+r_displace
                end_spot_col=ncol_in+c_displace

                rinter=np.linspace(start_spot_row,end_spot_row,num=nrow_out)
                cinter=np.linspace(start_spot_col,end_spot_col,num=ncol_out)
```

```
        xx,yy=np.meshgrid(cinter,rinter)

        xx_all=np.append(xx_all,xx.flatten())
        yy_all=np.append(yy_all,yy.flatten())
        zinter_all=np.append(zinter_all,output_sub_image.flatten())

        print "Time since beginning:\t %f"% (time.time()-start)
print "Total time:\t %f"%(time.time()-start)
```

```
Row + Col displace:         (0/ 4) (0/ 4)
Time since beginning:         1.541099
Row + Col displace:         (0/ 4) (1/ 4)
Time since beginning:         3.049229
Row + Col displace:         (0/ 4) (2/ 4)
Time since beginning:         4.559972
Row + Col displace:         (0/ 4) (3/ 4)
Time since beginning:         6.069370
Row + Col displace:         (1/ 4) (0/ 4)
Time since beginning:         7.583510
Row + Col displace:         (1/ 4) (1/ 4)
Time since beginning:         9.094986
Row + Col displace:         (1/ 4) (2/ 4)
Time since beginning:         10.616256
Row + Col displace:         (1/ 4) (3/ 4)
Time since beginning:         12.213828
Row + Col displace:         (2/ 4) (0/ 4)
Time since beginning:         13.728349
Row + Col displace:         (2/ 4) (1/ 4)
Time since beginning:         15.309684
Row + Col displace:         (2/ 4) (2/ 4)
Time since beginning:         16.965825
Row + Col displace:         (2/ 4) (3/ 4)
Time since beginning:         18.541659
Row + Col displace:         (3/ 4) (0/ 4)
Time since beginning:         20.104928
Row + Col displace:         (3/ 4) (1/ 4)
Time since beginning:         21.662009
Row + Col displace:         (3/ 4) (2/ 4)
Time since beginning:         23.236639
Row + Col displace:         (3/ 4) (3/ 4)
Time since beginning:         24.799390
Total time:         24.800260
```

```
In [8]: start_spot_row=0
        start_spot_col=0

        end_spot_row=nrow_in
        end_spot_col=ncol_in

        xnew = np.arange(start_spot_col, end_spot_col, 1)
        ynew = np.arange(start_spot_row, end_spot_row, 1) #maybe -1?


        xx,yy=np.meshgrid(xnew,ynew)
```

```
In [9]: # 35.871207 seconds
        interp = scipy.interpolate.NearestNDInterpolator( (xx_all,yy_all), zinter_all)

        # 182.112707 seconds... more sophistocated linear interpolation
        #interp = scipy.interpolate.LinearNDInterpolator( (xx_all,yy_all), zinter_all)
```

```
In [10]: result0= interp(np.ravel(xx), np.ravel(yy))
          print "Total time:\t %f"%(time.time()-start)
```

```
Total time:          36.557154
```

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In [11]: result0=result0.reshape(nrow_in,ncol_in)
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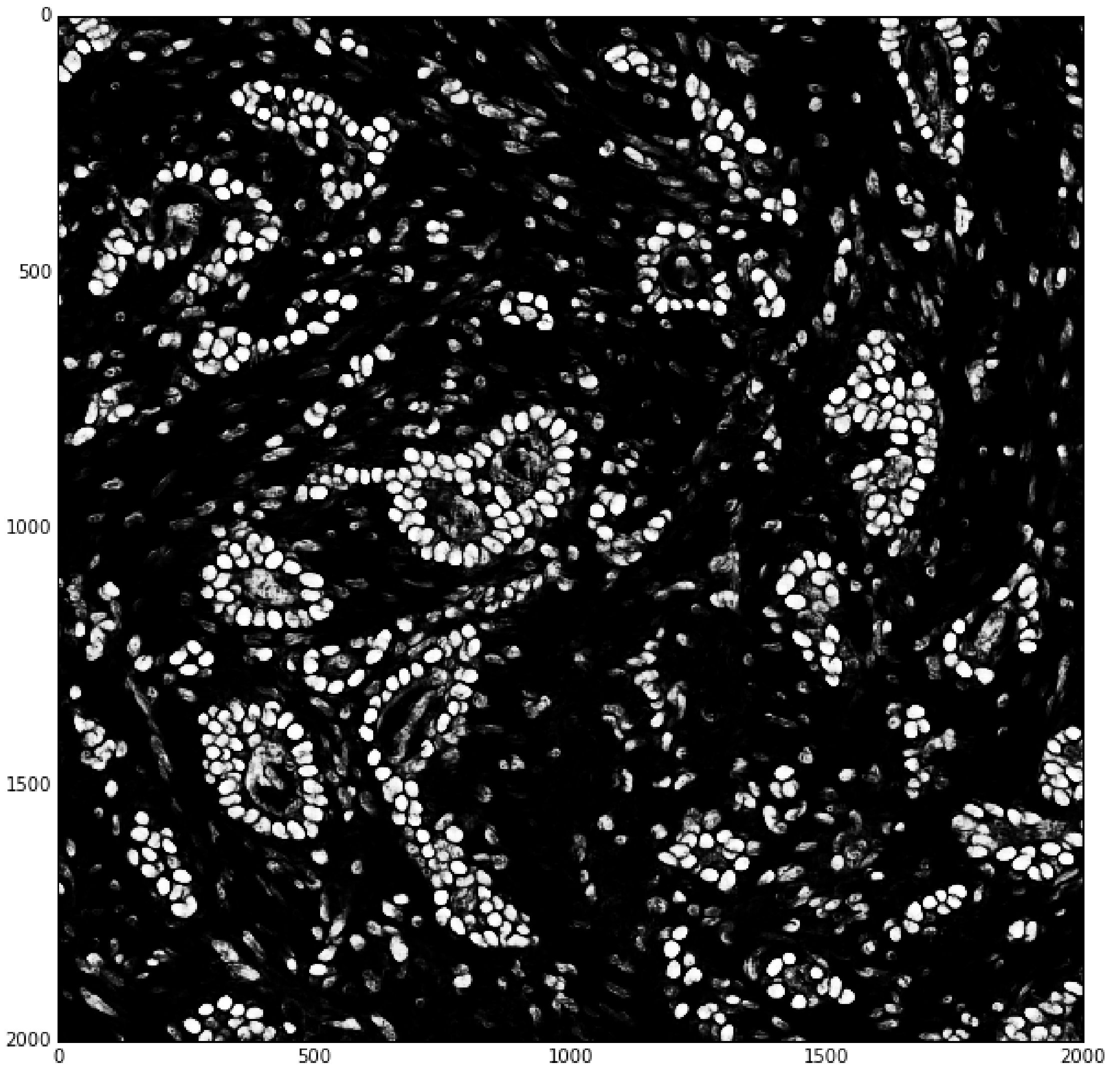
```
In [12]: plt.imshow(result0)
```

```
Out[12]: <matplotlib.image.AxesImage at 0x7fcb80eed610>
```



```
In [13]: scipy.misc.toimage(result0, cmin=0.0, cmax=1.0).save('recon_nn.tif')
```