Heatmaps

COMP 364 - Lecture 14
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A heatmap is one way to render a matrix.
Making a matrix

```python
import numpy as np
X = np.zeros((5,5))
```

A 5x5 matrix full of zeros.

```python
import numpy as np
X = np.random.random((10,10))
```

A 10x10 matrix full of random numbers.
Our first heatmap

`imshow(X)` - shows matrix $X$. Values in $X$ must be between 0 and 1

```python
import numpy as np
import pylab as pl

X = np.random.random((10,10)) pl.gray()
pl.imshow(X, interpolation='nearest')
```

$X = \text{np.random.random}((10,10)) \ \text{pl.gray()}$

$\text{pl.imshow}(X, \text{interpolation}=\text{’nearest’})$
Setting values in our matrix...

```python
print X[i,j]
X[i,j] = 0.3
print X[i,j]
```

Exercise: create and plot a matrix that has the value 0.0 all the way down the diagonal.
Reading data into our matrix

Exercise: read a microarray matrix and visualize it.
Color in the computer

RGB Hex Triplet Color Chart

Red-Green-Blue
A color heatmap

`imshow(X)` - if `X` is `MxMx3`, shows color `(X[i,j,0],X[i,j,1],X[i,j,2])` at position `X[i,j]`

Exercise: create a figure with a gradient from black to red.

Exercise: create a figure with a gradient from red to black to green.
Reading data into our matrix

Exercise: read a microarray matrix and visualize it such that the largest negative is very red, 0 is black, and the largest positive value is very green.

Exercise: read a microarray matrix and visualize it such that the largest negative is very red, 0 is black, and the largest positive value is very yellow.

Exercise: read a microarray matrix and visualize it such that each ROW is normalized as described above.
A faster way to read in CSV files

```python
import csv
r = csv.reader(fh, delimiter=',', quotechar='|')
```

A reader is an iterable object that produces lists containing the data in a given row.
Exceptions and Errors

```
fh = open('*$!JB;','r') → IOError

How can we catch the error and print something nicer?
```

```
try:
fh = open(fname,'r')
ext except IOError, e:
print 'Unable to open file %s: %s' % (fname,str(e))
```