

# Python for Image Processing

FSMK Sunday School

# Packages

Sudo apt-get install numpy

- \* matplotlib

- \* scipy

# 1. Writing an array to file

- `from scipy import misc`
- `Image= misc.lena()`
- `misc.imsave('lena.png', Image)`
  
- `import matplotlib.pyplot as plt`
- `plt.imshow(Image) #plt.gray()`
- `plt.show()`

# Cont.....

- `import numpy as np`
- `im=np.random.rand(50,50) # creating 2-D array`
- `misc.imsave('trial.png', im)`
- `plt.imshow(im)`
- `plt.gray()`
- `plt.pcolor(im)`
- `plt.hot()`
- `plt.colorbar()`

# Reading from image file

- `from scipy import misc`
- `lena = misc.imread('lena.png')`
- `type(lena)`
- `lena.shape, lena.dtype`

# Displaying Images

- `lena= misc.lena()`
- `import matplotlib.pyplot as plt`
- `plt.imshow(lena, cmap=plt.cm.gray) #help() > matplotlib.pyplot.cm`
- `plt.show()`

## Varying contrast

- `plt.imshow(lena, cmap=plt.cm.gray, vmin=30, vmax=200)`
- `plt.show()`

# Cont....

- `plt.contour(lena, [100, 200])`
- `plt.show()`

# Basic image manipulations

- `lena= misc.lena()`

- `Lena[0,40]`

## Slicing

- `Lena[13:45, 13:45]=255`

## masking

- `lx, ly = lena.shape`
- `X, Y = np.ogrid[0:lx, 0:ly]`
- `mask = (X - lx / 2) ** 2 + (Y - ly / 2) ** 2 > lx * ly / 4`
- `lena[mask] = 0`



## Statistical information

- `lena= misc.lena()`
- `lena.mean()`
- `lena.max(), lena.min()`
  
- `lena = misc.lena()`
- `lx, ly = lena.shape`
- `# Cropping`
- `crop_lena = lena[lx / 4: - lx / 4, ly / 4: - ly / 4]`
- `# up <-> down flip`
- `flip_ud_lena = np.flipud(lena)`
- `# rotation`
- `from scipy import ndimage`
- `rotate_lena = ndimage.rotate(lena, 45)`

# Basic filtering

- `from scipy import misc`
- `lena = misc.lena()`

## Smoothing

- `blurred_lena = ndimage.gaussian_filter(lena, sigma=3)`
- `very_blurred = ndimage.gaussian_filter(lena, sigma=10)`

## Sharpening

- `from scipy import misc`
- `lena = misc.lena()`
- `blurred_l = ndimage.gaussian_filter(lena, 3)`
- `filter_blurred_l = ndimage.gaussian_filter(blurred_l, 1)`
- `alpha = 30`
- `sharpened = blurred_l + alpha * (blurred_l - filter_blurred_l)`

# Denoising

- `from scipy import misc`
- `I = misc.lena()`
- `I = I[230:310, 210:350]`
- `noisy = I + 0.4 * I.std() * np.random.random(I.shape)`
- `gauss_denoised = ndimage.gaussian_filter(noisy, 2)`
- `med_denoised = ndimage.median_filter(noisy, 3)`

Happy Image Processing with  
Python!!!