# Python Matplotlib

# First Thing First

- Install the Matplotlib package if you have not had it already
  - Typically Matplotlib is installed together with numpy and scipy
  - Example: Use Anaconda Python (https://store.continuum.io/cshop/anaconda/)

# A Typical Matplotlib Program

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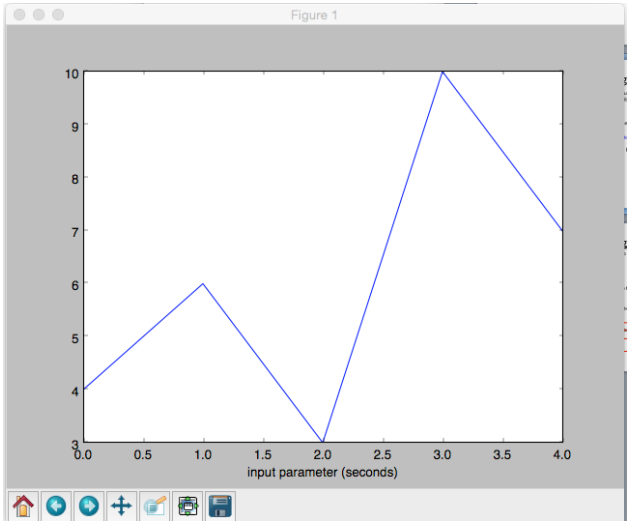

# Display Multiple Plots

- Use ‘subplot()’ command to display multiple plots together

```
plt.subplot(211) // create a 2x1 grid for subplots, and you will draw on the first subplot
plt.plot(np.array([4,6,3,10,7]) // use line graph here
plt.subplot(212)
plt.plot(np.random.uniform(10,15,20)
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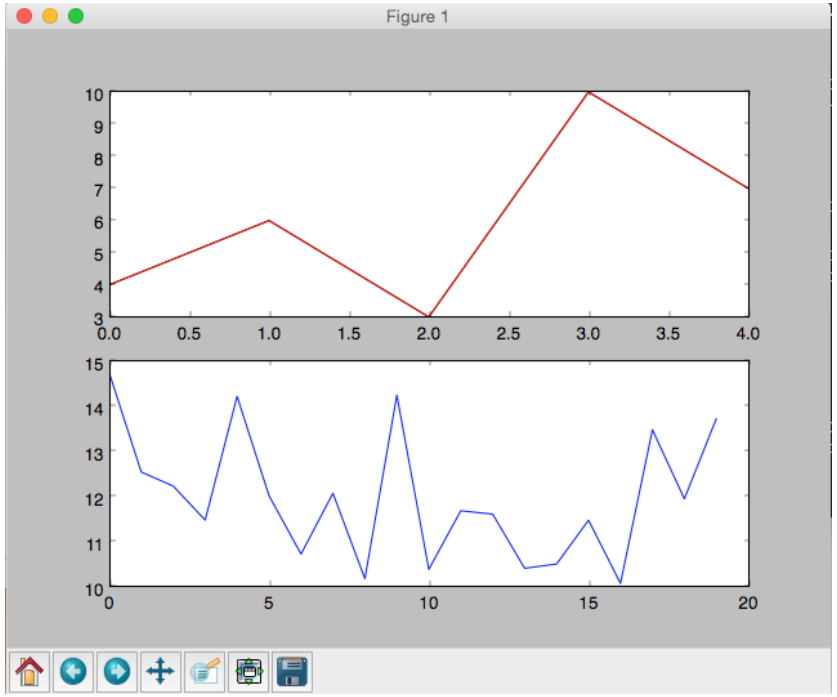

# Tick Marks, Labels, and Grid

- You can customize tick marks, labels, and grid

```
plt.plot(np.random.uniform(10,15,20))
plt.xticks(np.arange(1,20))
plt.ylabel('random')
plt.grid()
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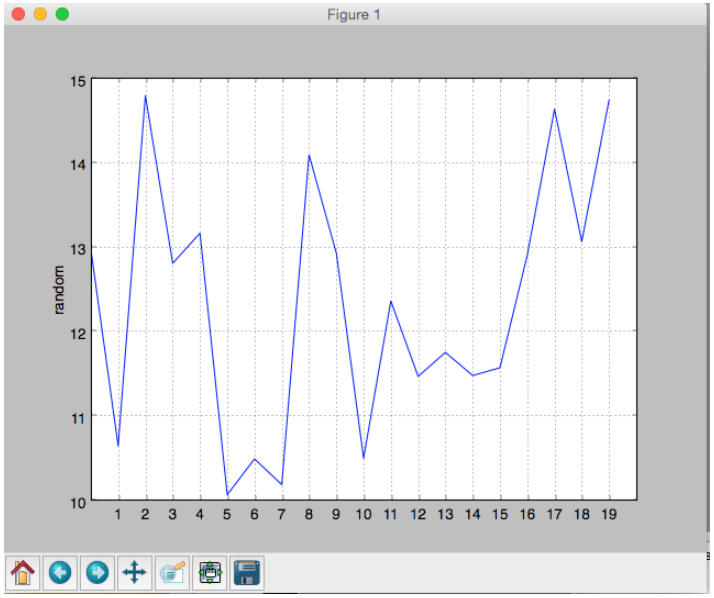

# Multiple Graphs and Legend

- You can put multiple graphs in a single plot and add legend

```
x = np.arang(--2*np.pi, 2*np.pi, 0.1)
plt.plot(x, np.sin(x), label='graph1')
plt.plot(x, np.cos(x), label = 'graph2')
plt.legend()
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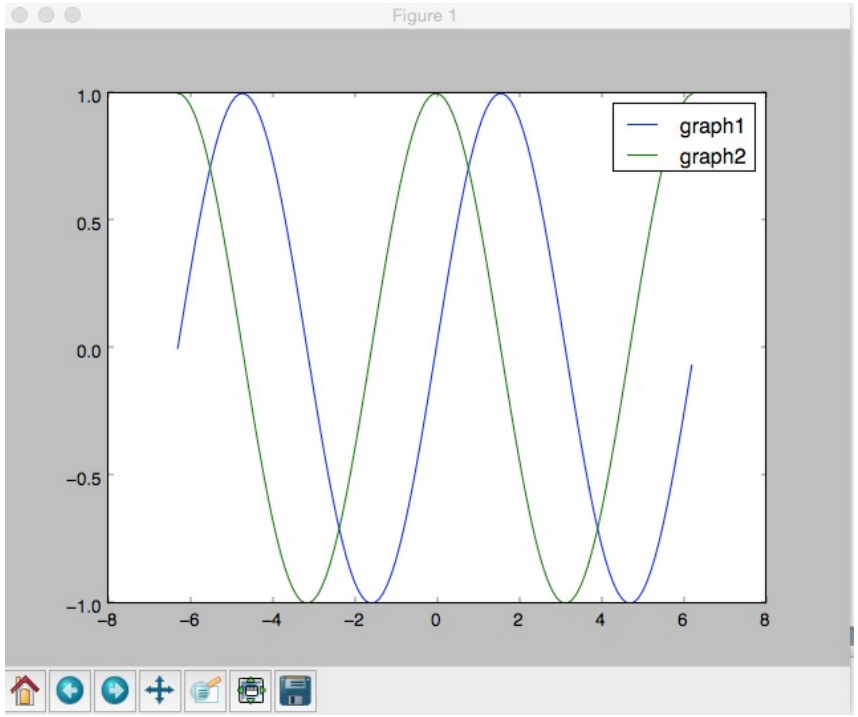
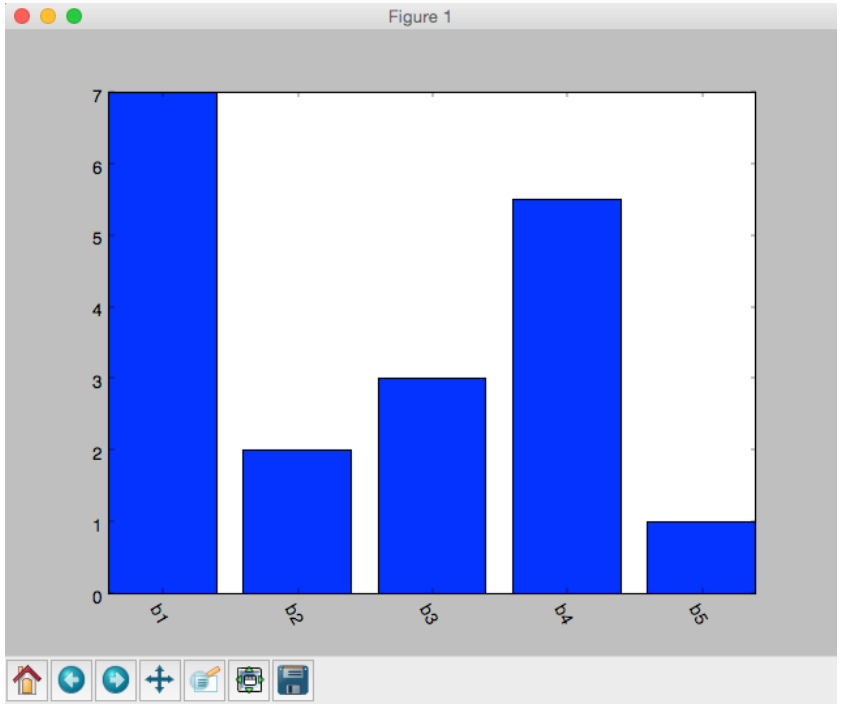


# Bar Charts

- Use the function bar(xlist, ylist) to draw a bar chart

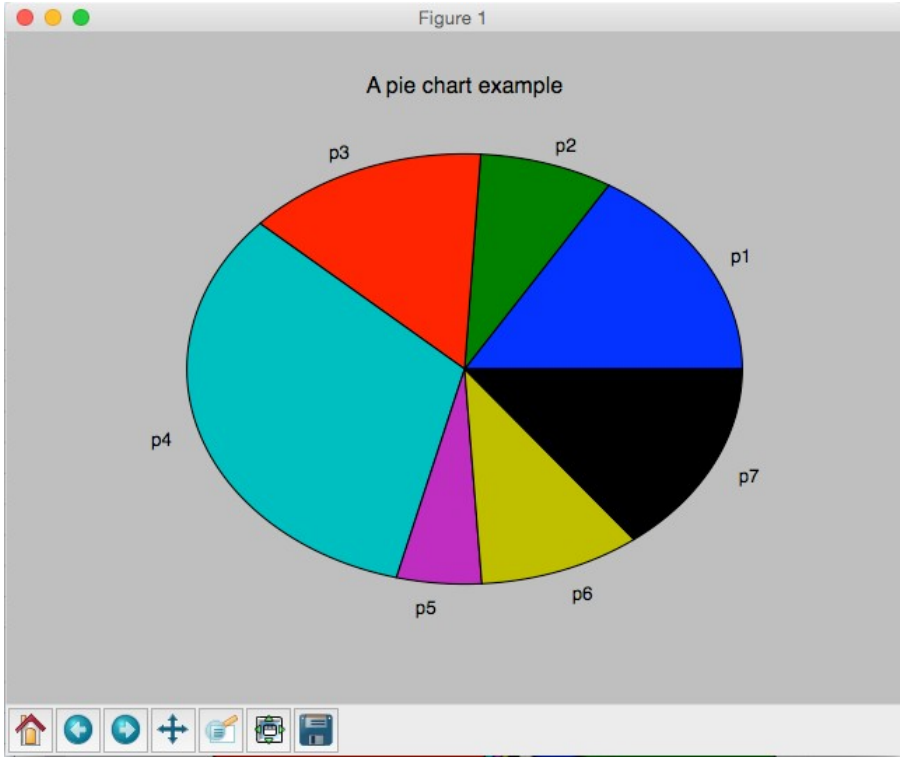
```
x= [1,2,3,4,5]
y = [7,2,3,5.5, 1]
plt.xticks(x,['b1','b2','b3','b4','b5'],rotation=--60)
plt.bar(x,y, align='center')
plt.grid()
plt.show()
```



# Pie Chart

- Use the function pie(list, labels) to plot a pie chart

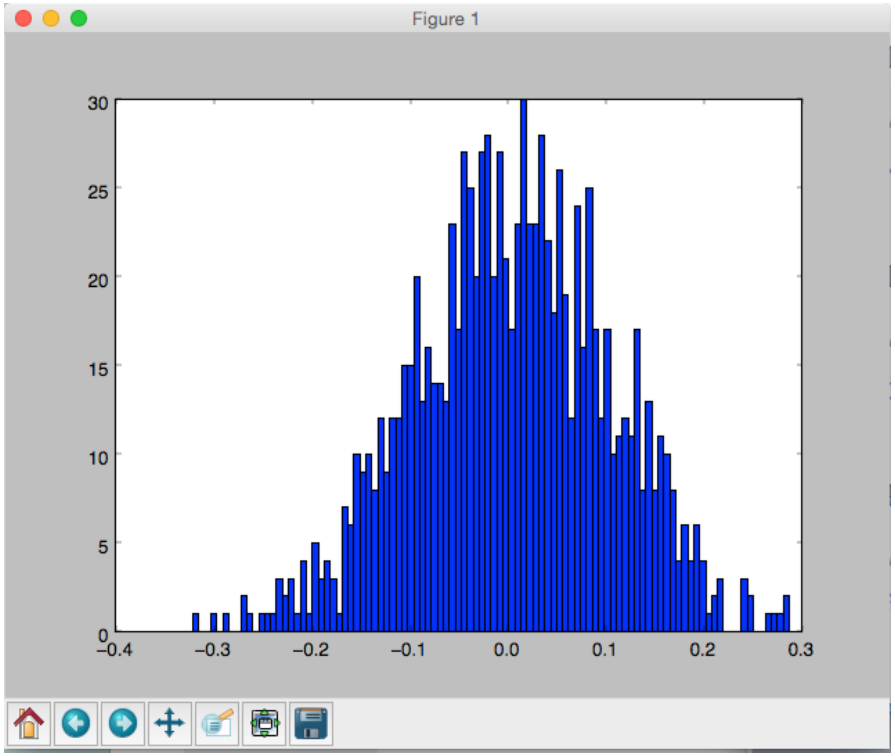
```
a = np.random.uniform(1,10,7)
L = ['b1', 'b2', 'b3', 'b4', 'b5', 'b6', 'b7']
plt.pie(a, labels = L)
plt.title('A pie chart example')
plt.show()
```



# Histogram

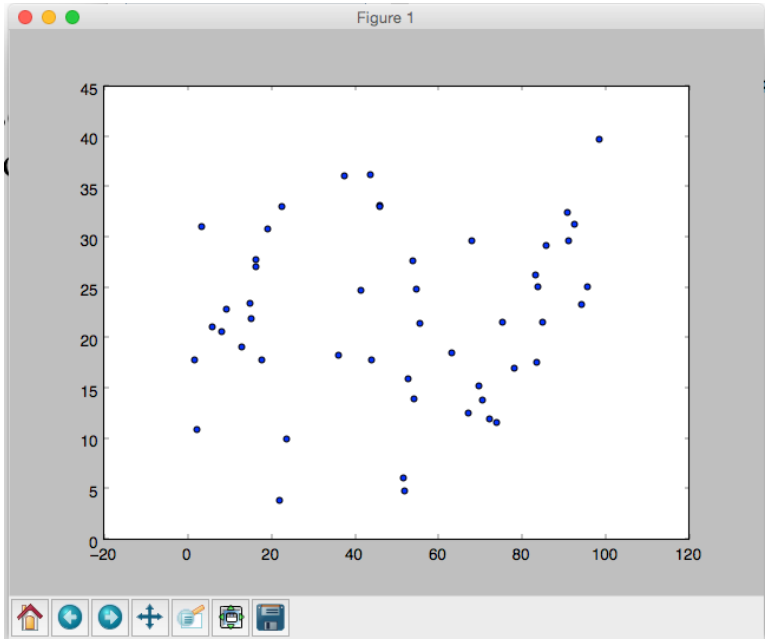
- Use the function hist(values, bins) to display a histogram for a distribution

```
x = np.random.uniform(0,0.1,1000) // create a normal distribution
plt.hist(x,100) // 100 bins
plt.show()
```

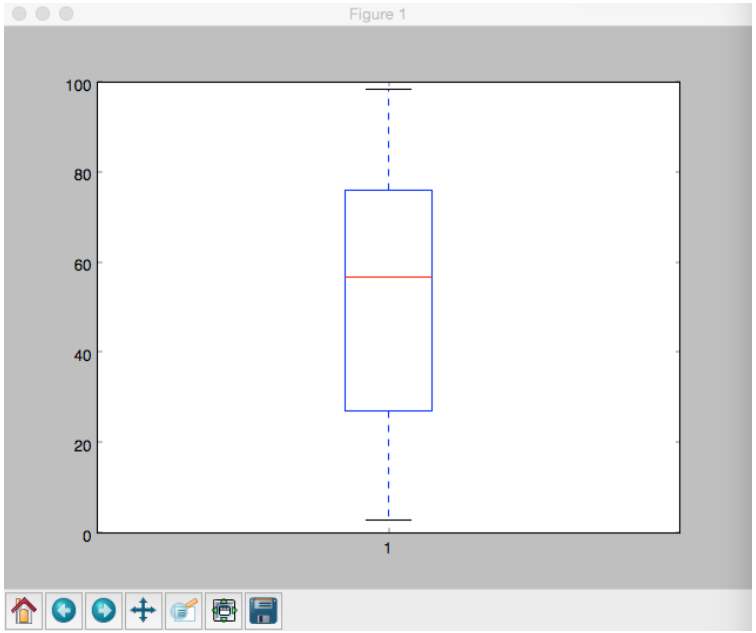


# Scatter and Box Plots

```
x = np.random.uniform(1,100,50)
y = np.random.normal(20, 10, 50)
plt.scatter(x,y)
plt.show()
```




```
x = np.random.uniform(1,100,50)
plt.boxplot(x)
plt.show()
```



# Display Images

```
# load image data
data = np.fromfile('HeadMRVolume.raw', dtype='uint8')
data = data.reshape(42, 62, 48)

# plot slices
plt.imshow(data[20,:,:])
plt.gca().invert_yaxis()
plt.show()

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