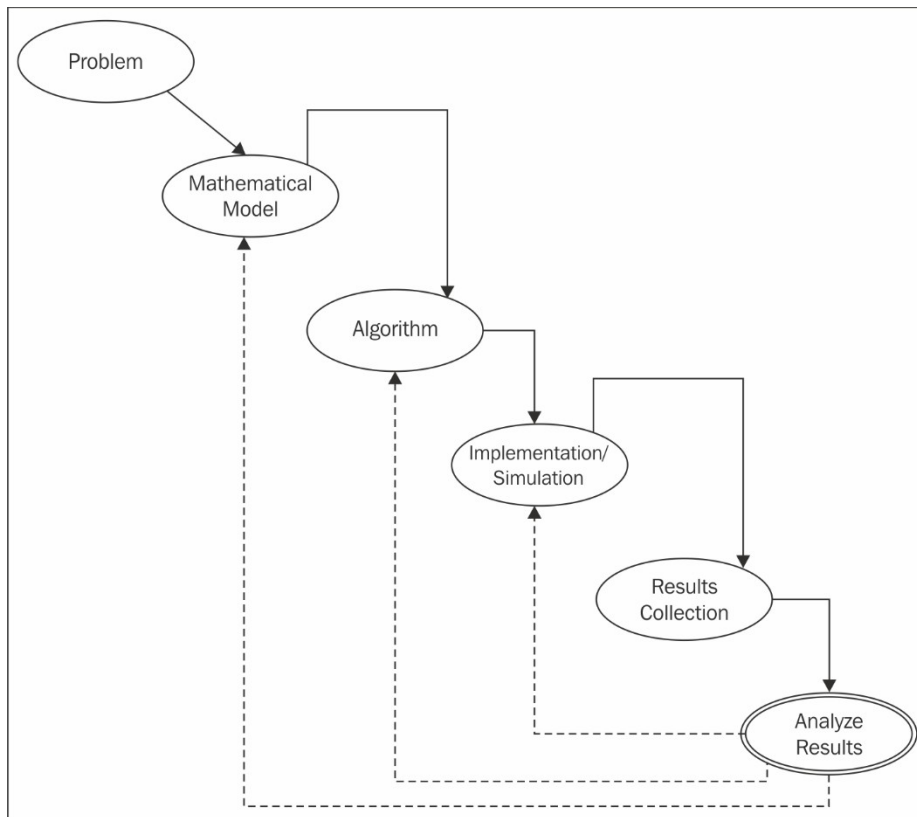
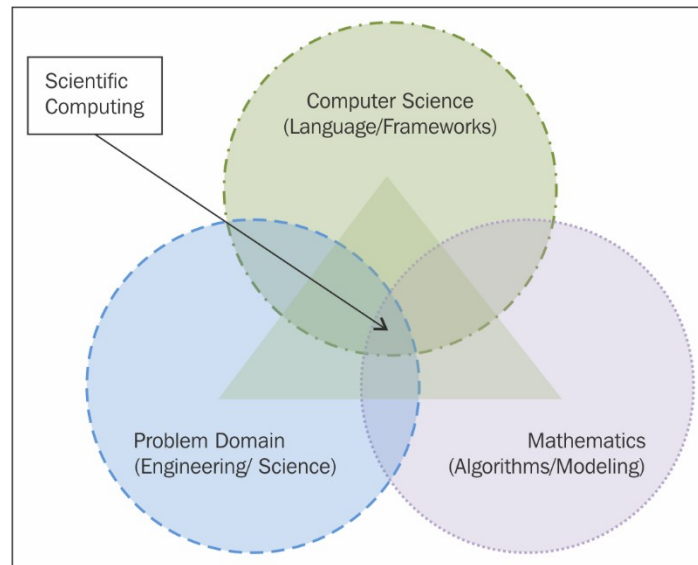
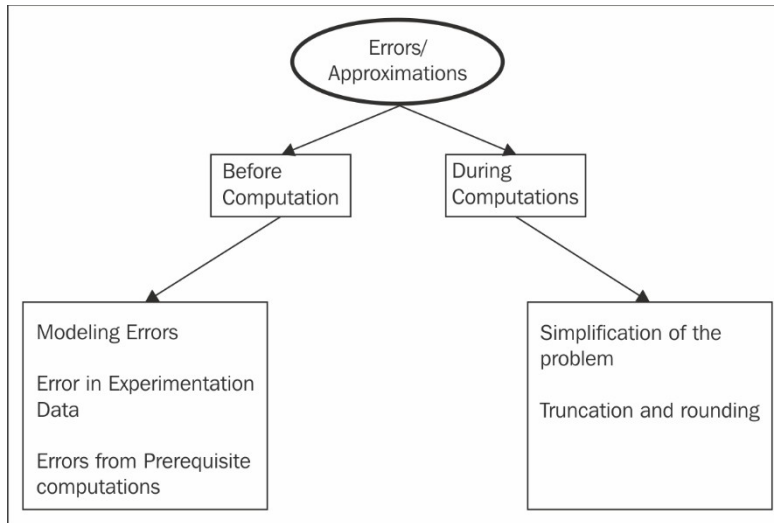
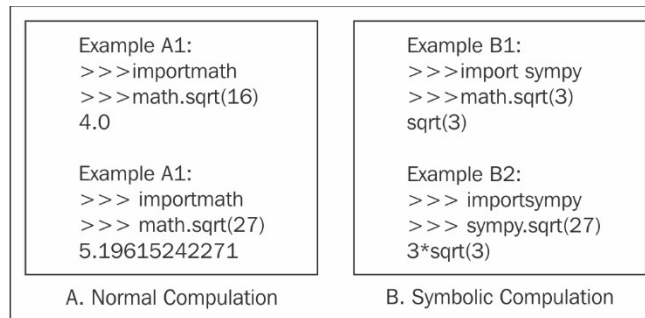


# Chapter 1





## Chapter 2



IPy IPython Dashboard x IPy spectrogram x

127.0.0.1:8888/a5222740-848b-4ac1-b212-d732c9f8f78b

IP[y]: Notebook spectrogram Last saved: Mar 07 11:14 PM

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Markdown

## Simple spectral analysis

An illustration of the [Discrete Fourier Transform](#)

$$X_k = \sum_{n=0}^{N-1} x_n e^{-\frac{2\pi i}{N} kn} \quad k = 0, \dots, N-1$$

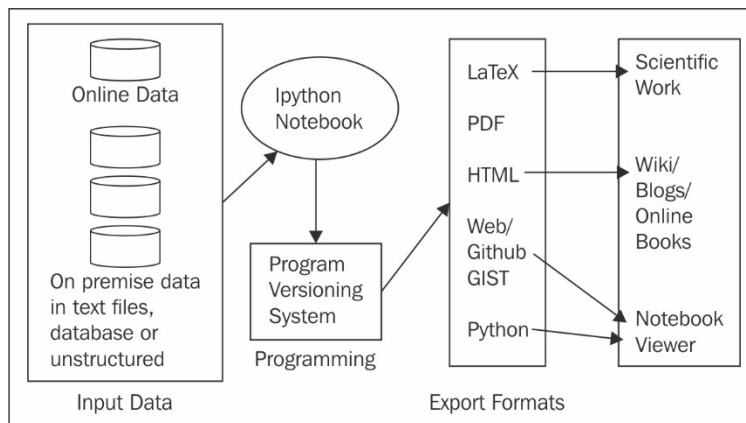
using windowing, to reveal the frequency content of a sound signal.

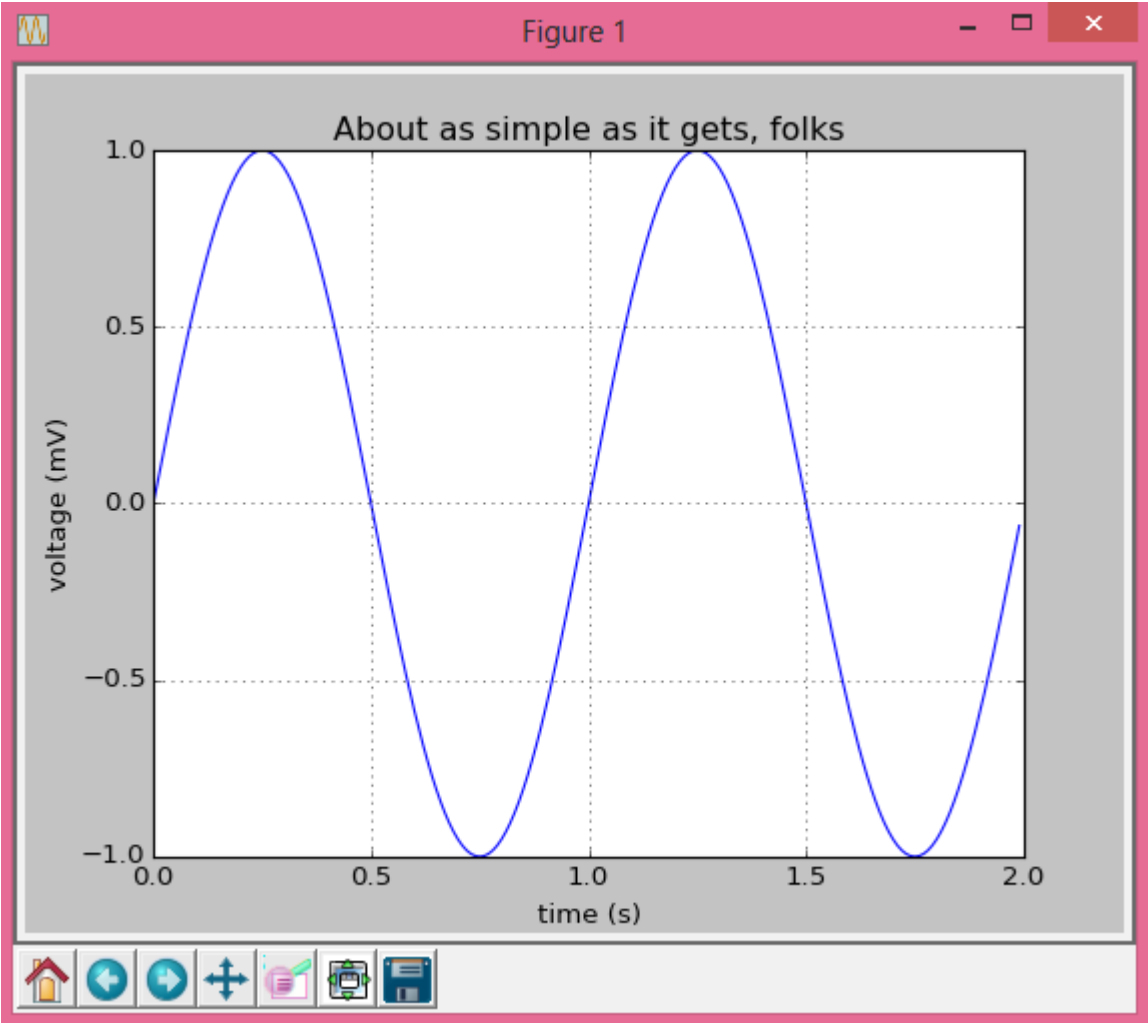
We begin by loading a datafile using SciPy's audio file support:

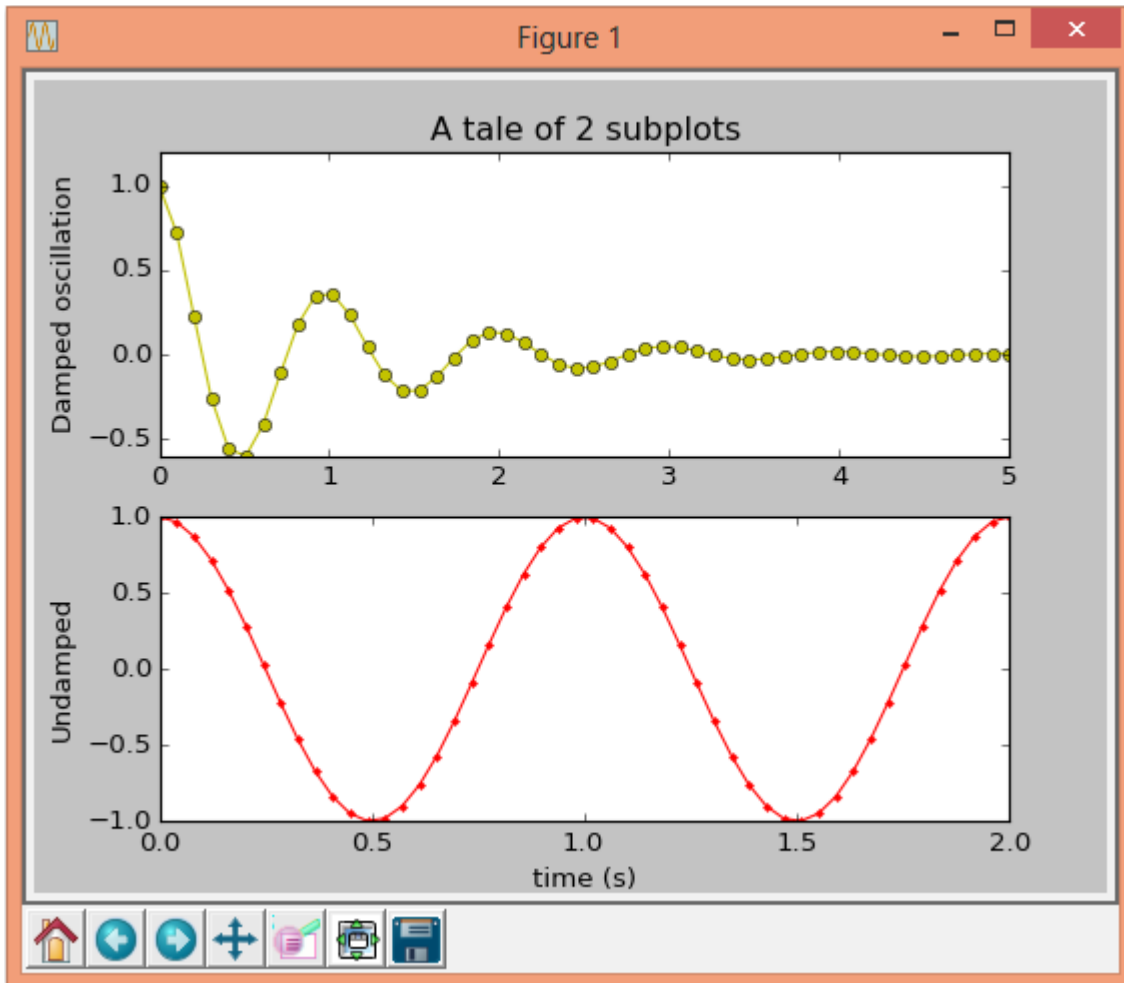
```
In [1]: from scipy.io import wavfile
rate, x = wavfile.read('test_mono.wav')
```

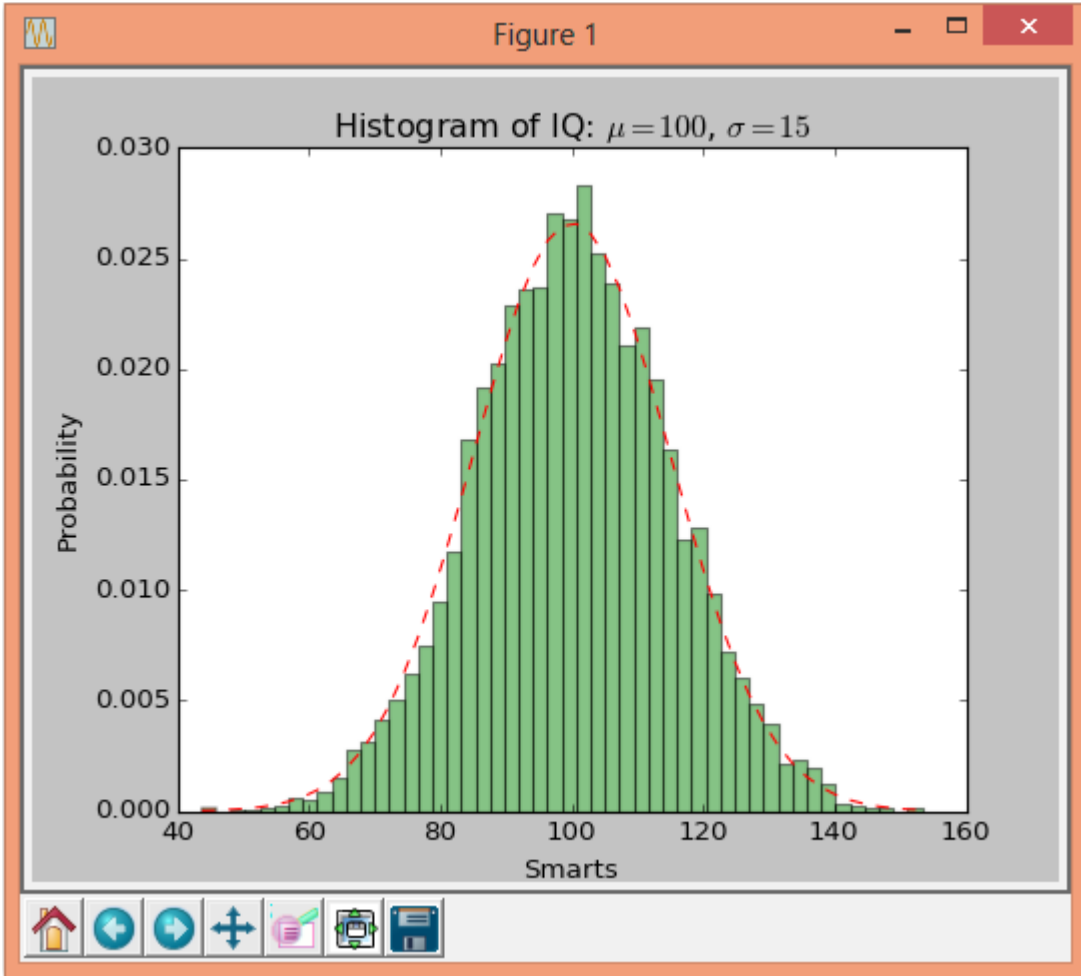
And we can easily view its spectral structure using matplotlib's builtin specgram routine:

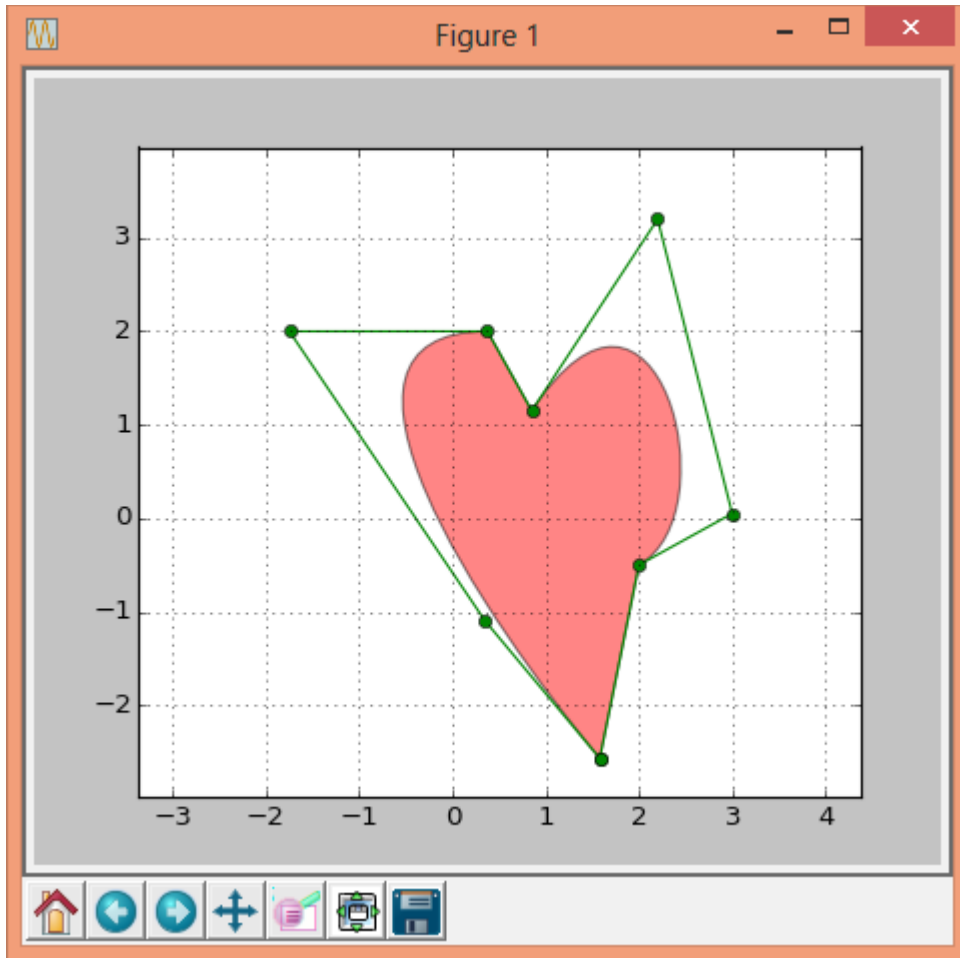
```
In [2]: fig, (ax1, ax2) = plt.subplots(1, 2, figsize=(12, 4))
ax1.plot(x); ax1.set_title('Raw audio signal')
ax2.specgram(x); ax2.set_title('Spectrogram');
```

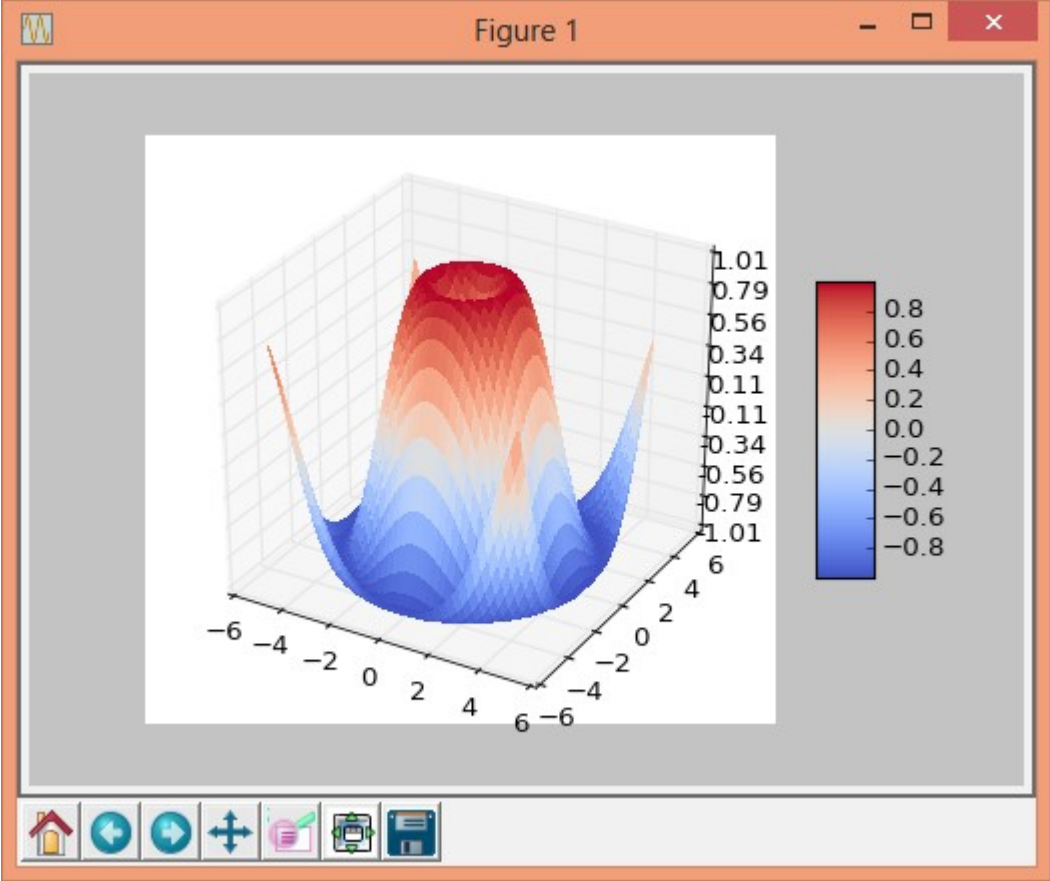




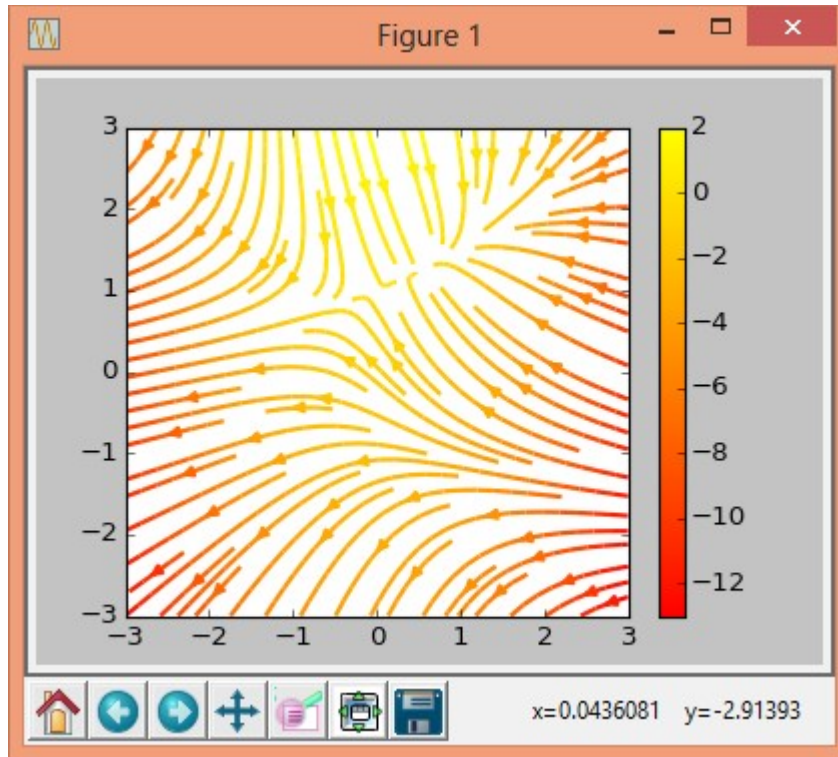


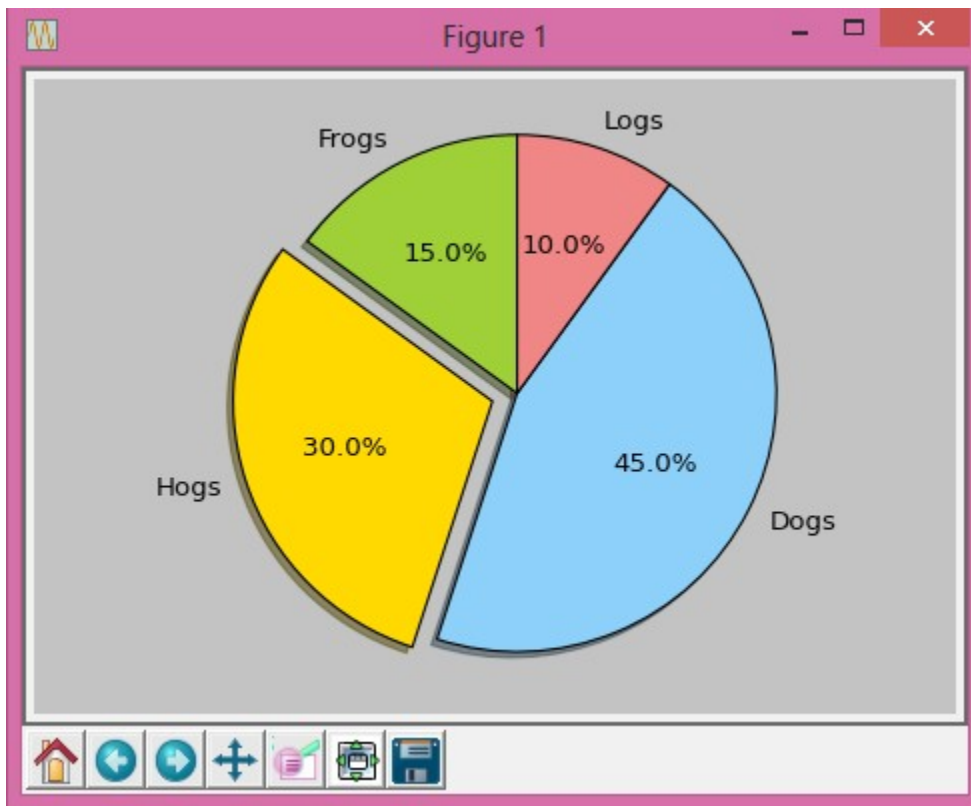


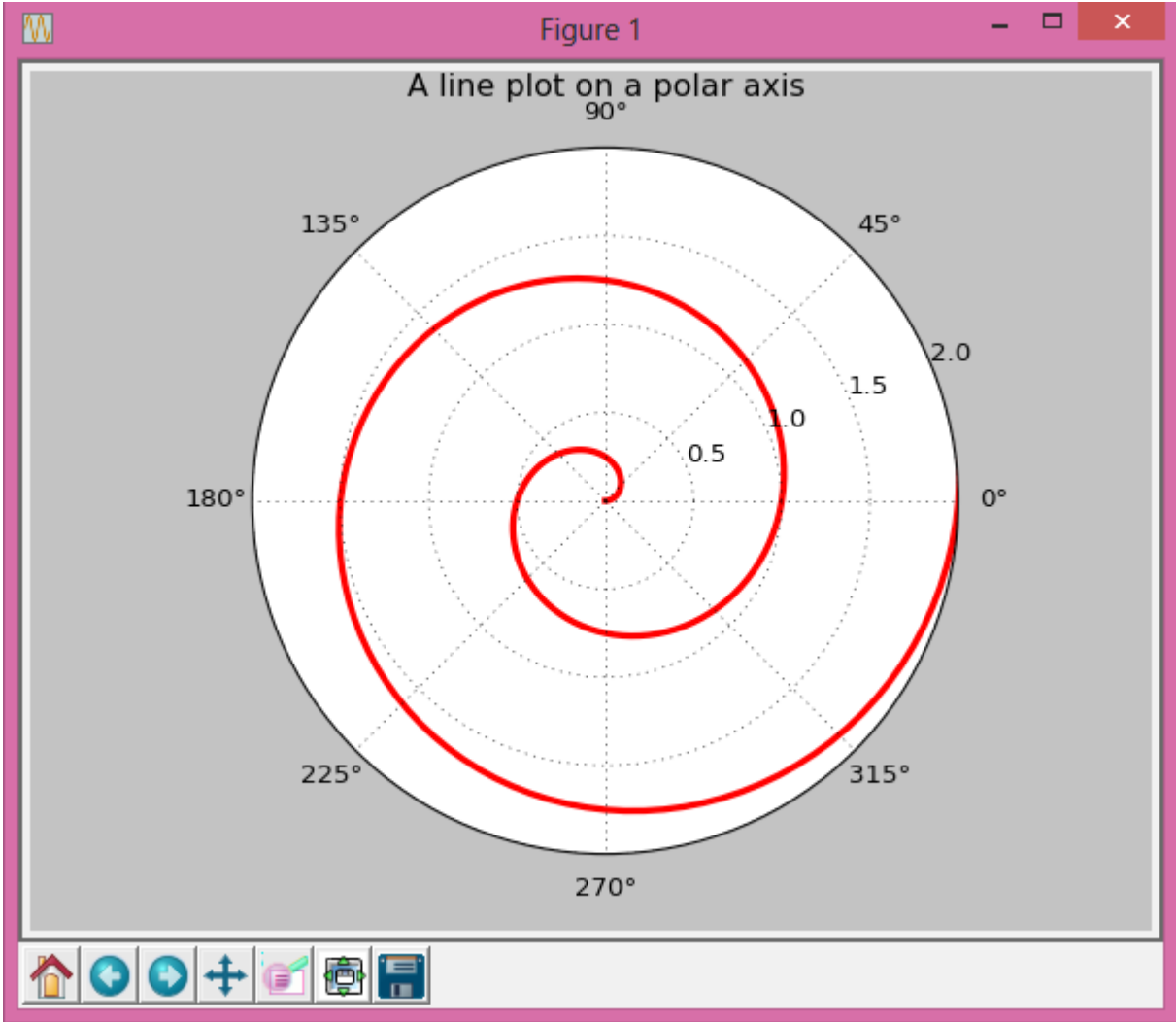


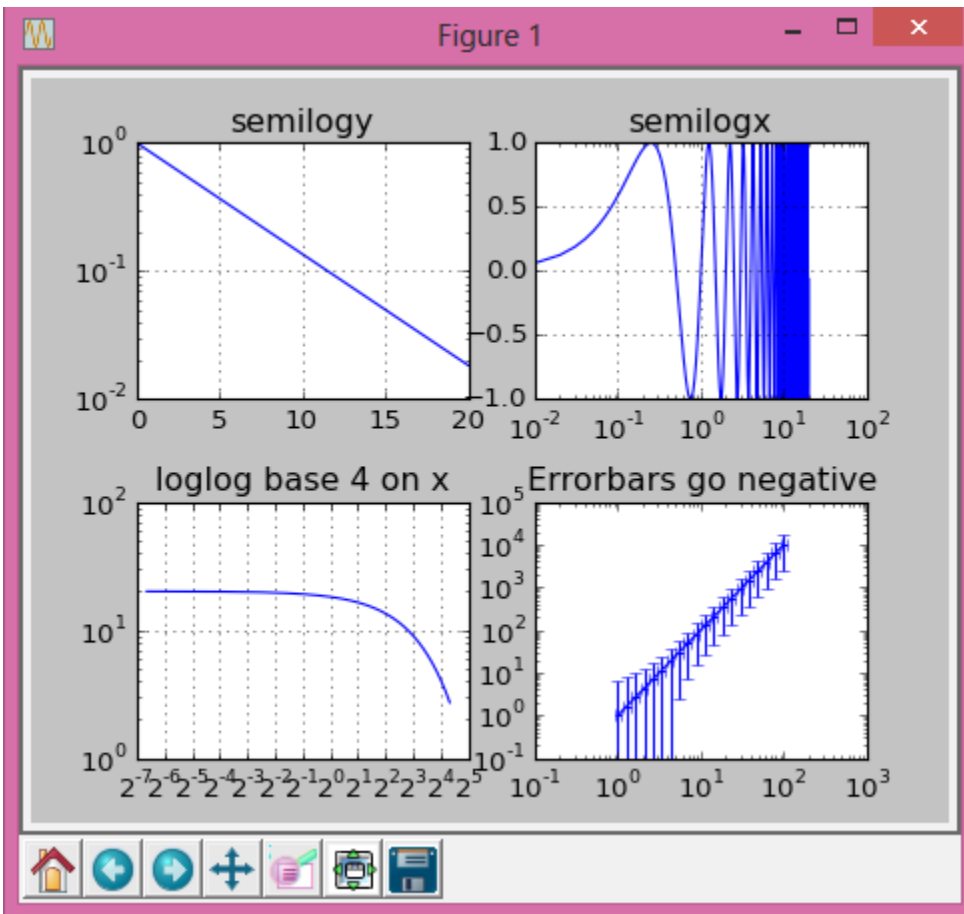




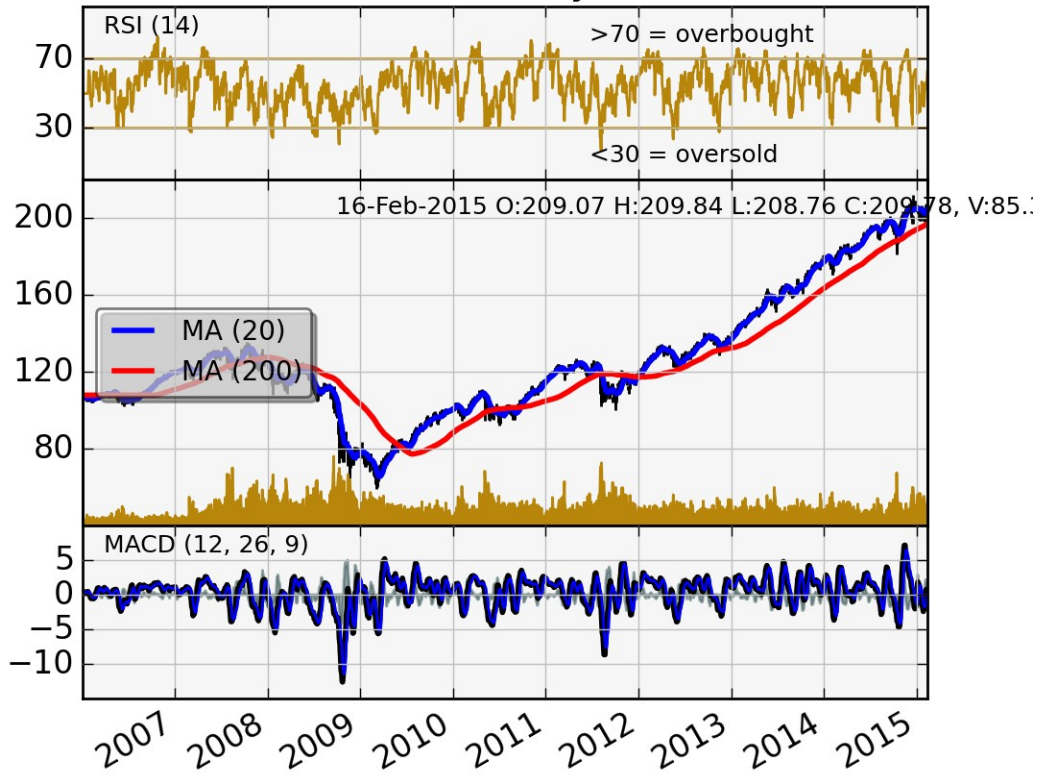




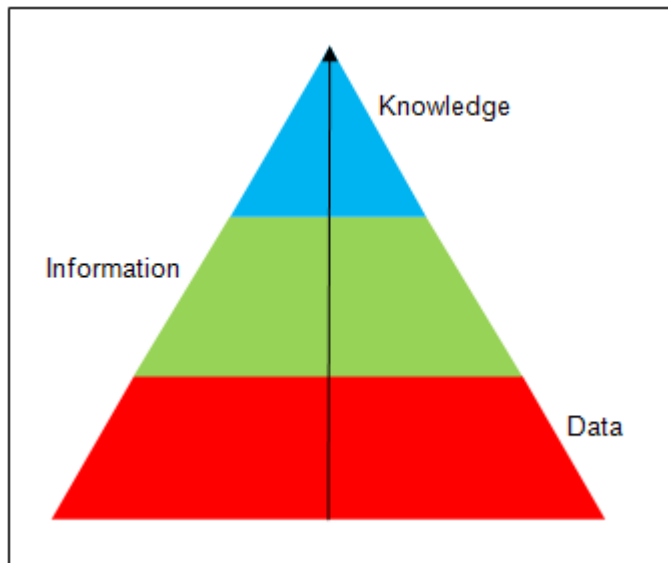


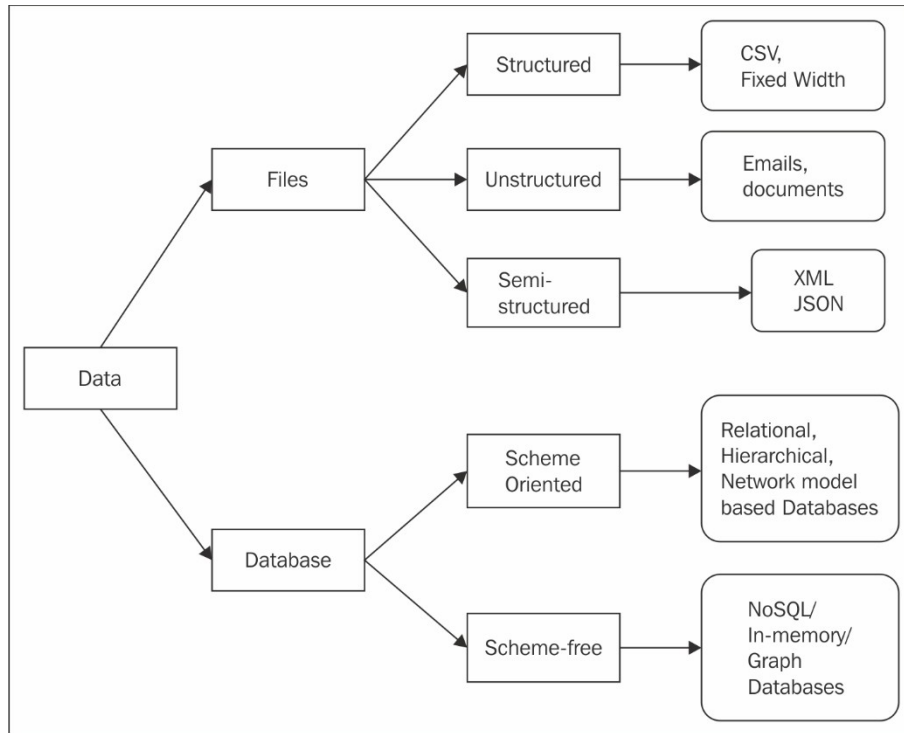


### SPY daily



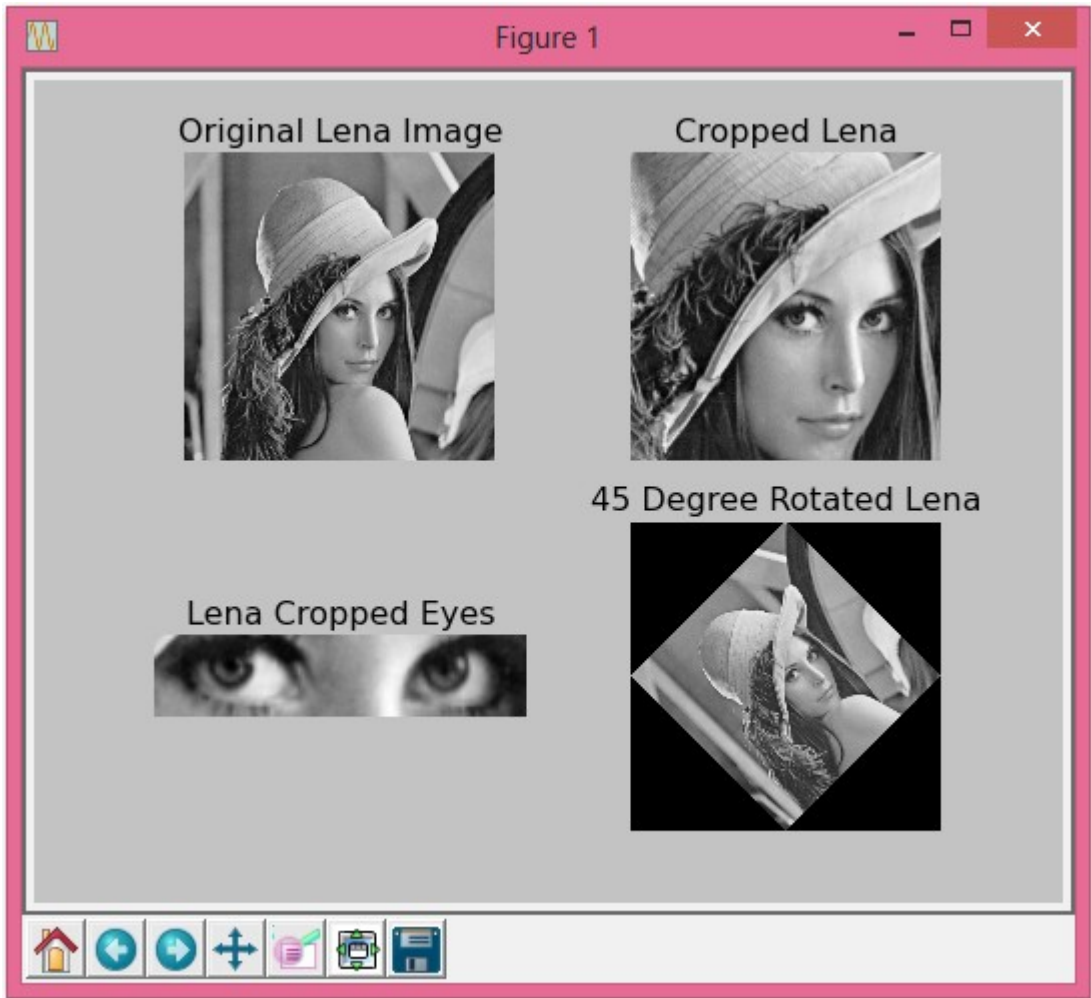
### Chapter 3

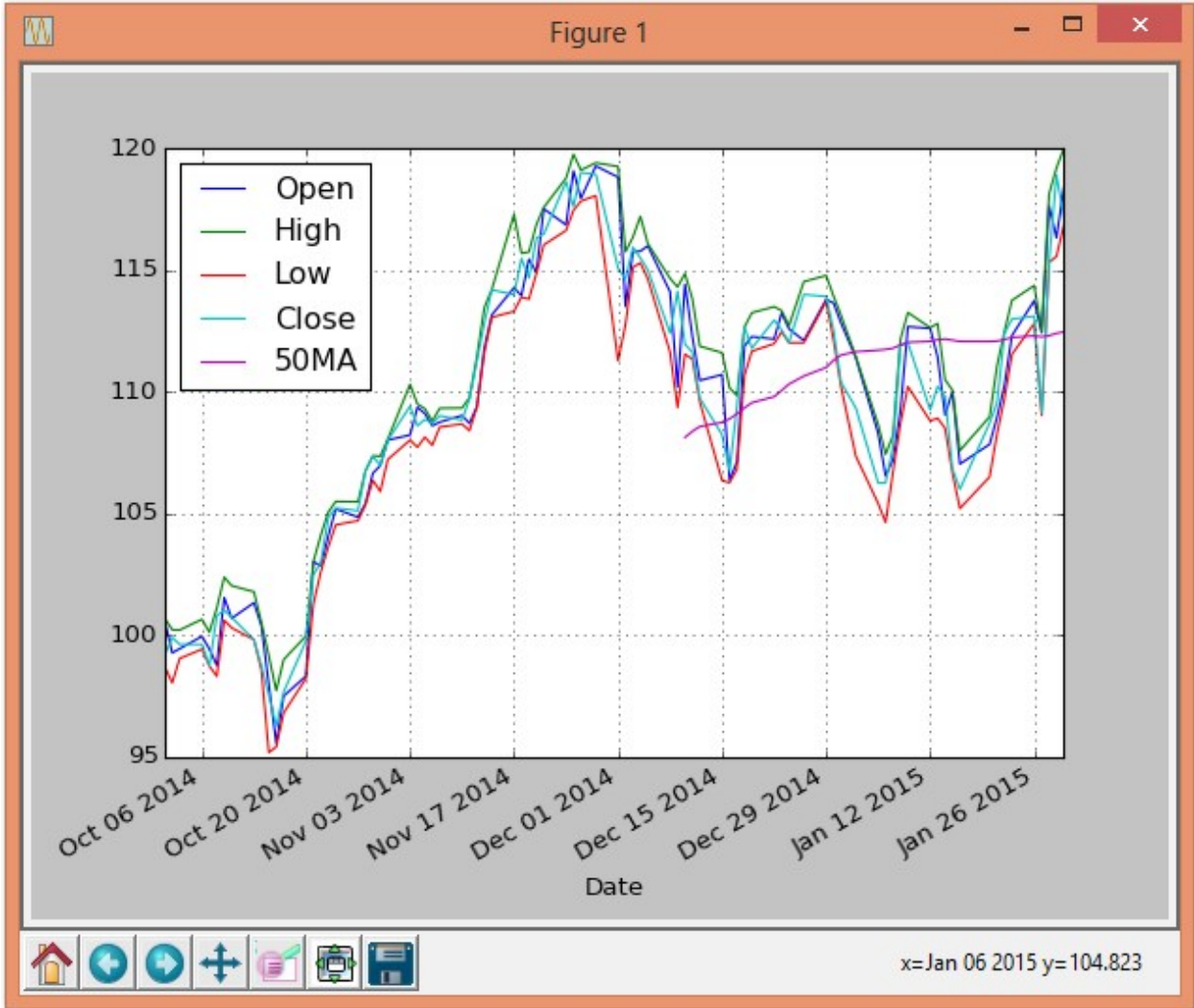




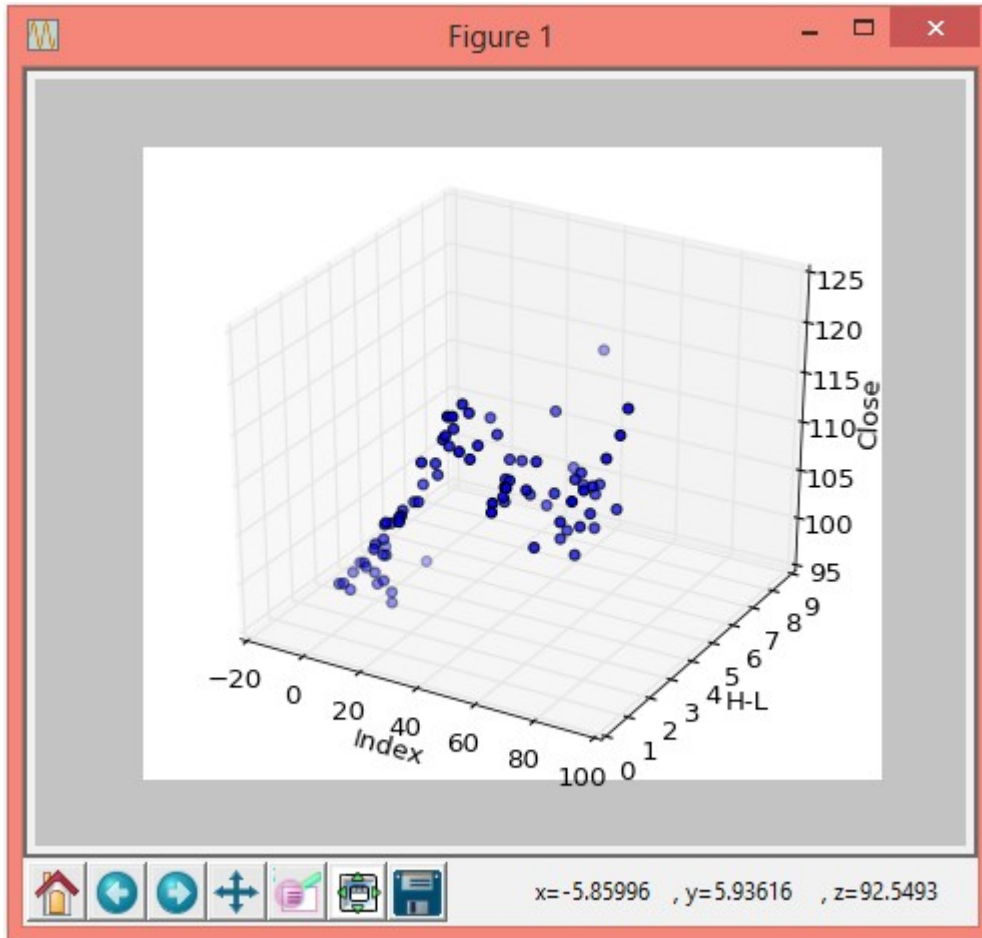
## Chapter 4





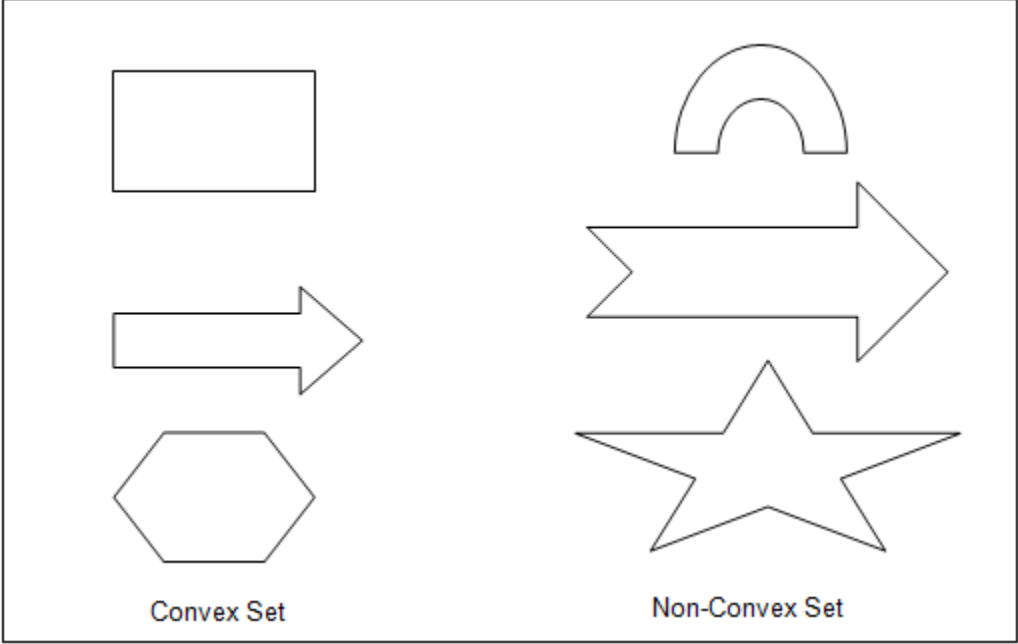
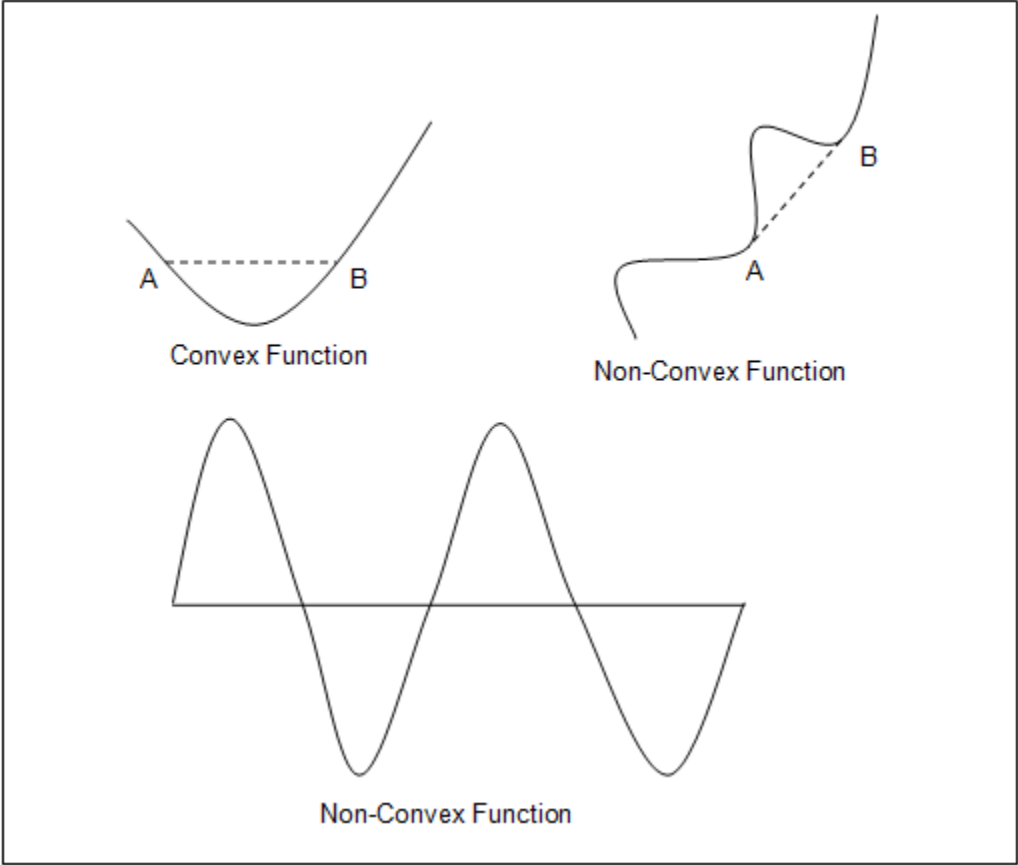


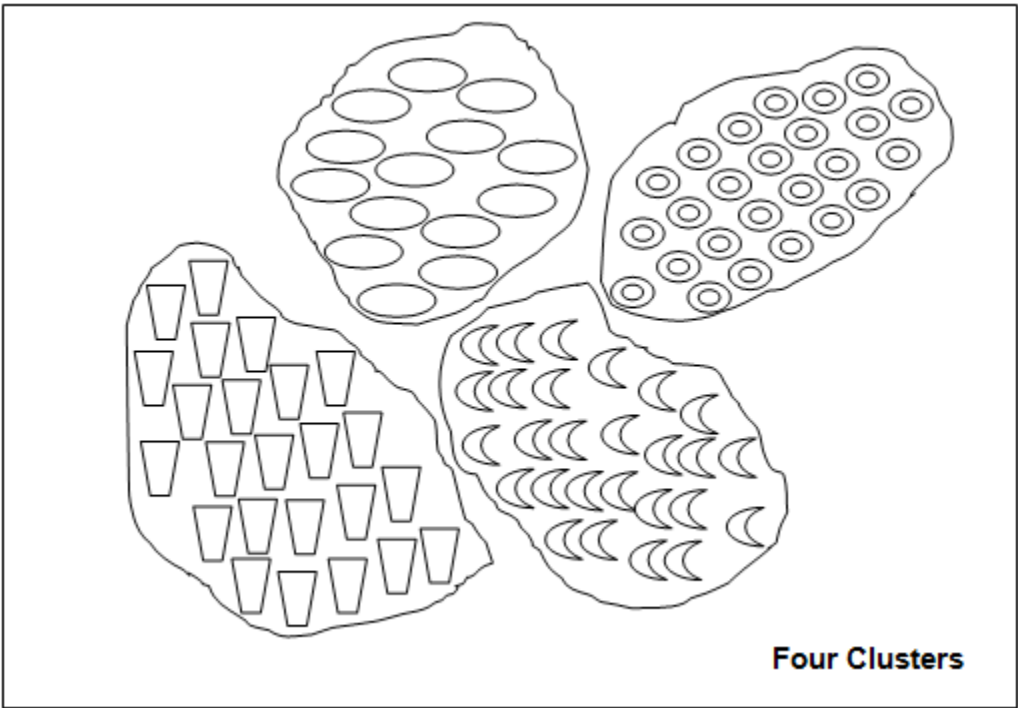
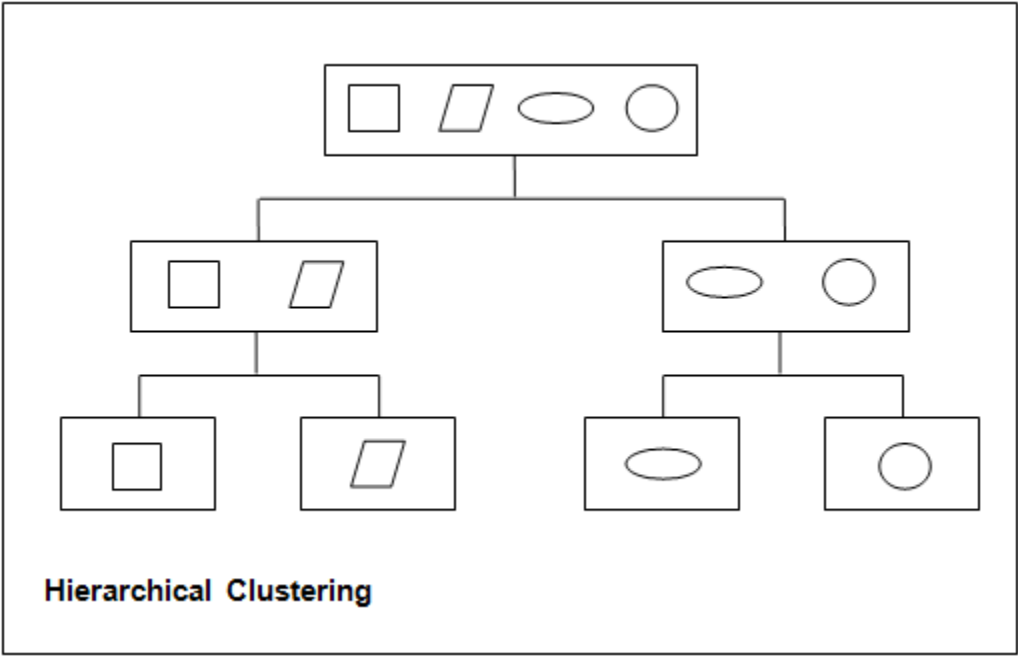


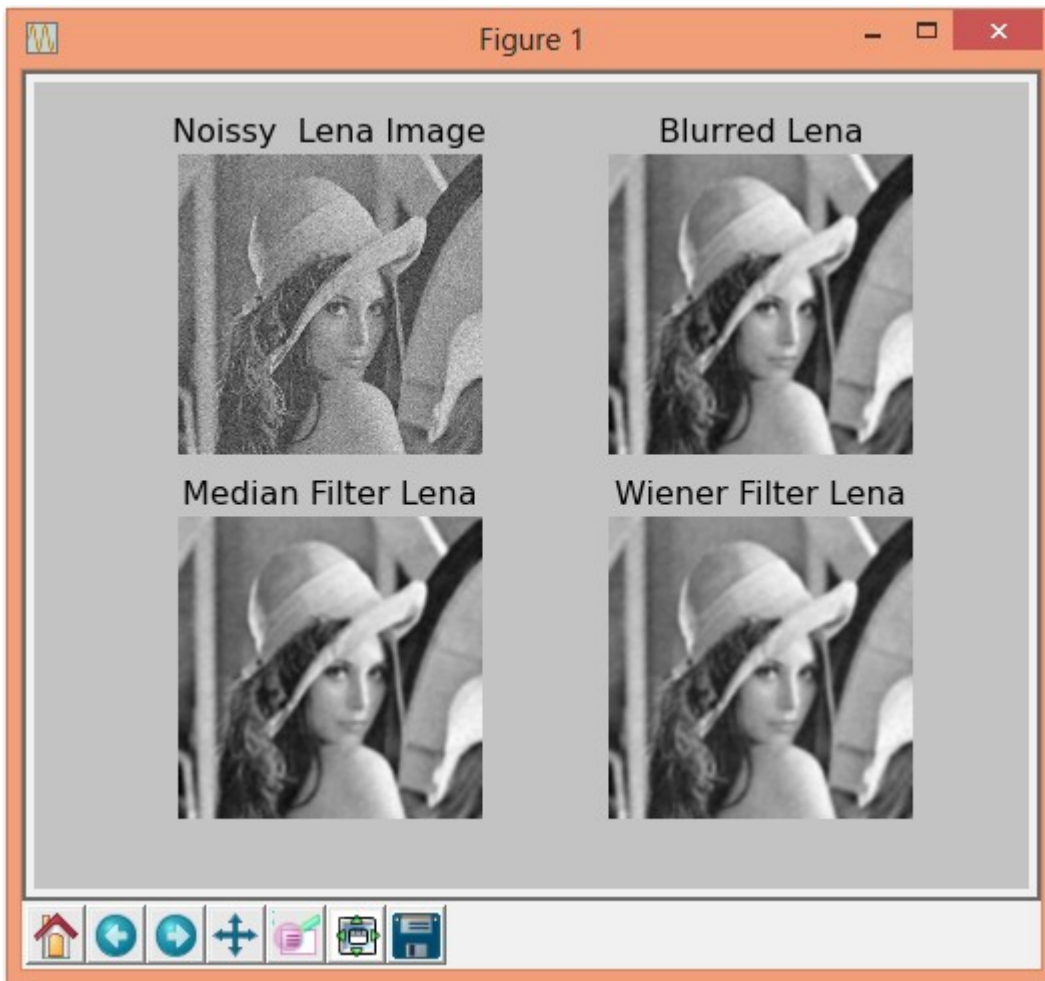


$$f(x) = \sum_{i=1}^{N-1} 100(x_i - x_{i-1}^2)^2 + (1 - x_{i-1})^2$$

# Chapter 5









# Chapter 7

IPy Python Dashboard x IPy spectrogram x +

127.0.0.1:8888/a5222740-848b-4ac1-b212-d732c9f8f78b

## IP[y]: Notebook spectrogram Last saved: Mar 07 11:14 PM

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### Simple spectral analysis

An illustration of the [Discrete Fourier Transform](#)

$$X_k = \sum_{n=0}^{N-1} x_n e^{-\frac{2\pi i}{N}kn} \quad k = 0, \dots, N-1$$

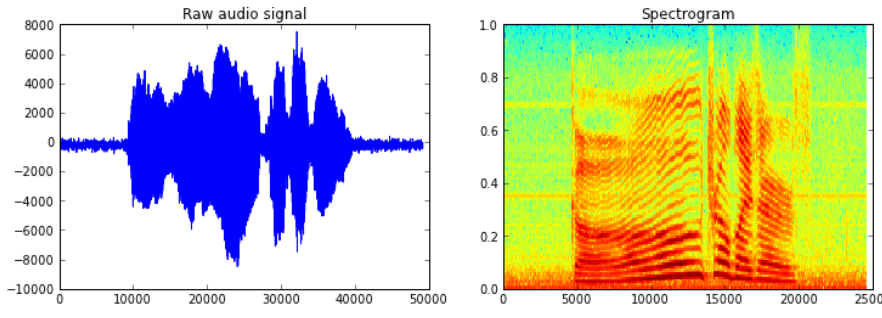
using windowing, to reveal the frequency content of a sound signal.

We begin by loading a datafile using SciPy's audio file support:

```
In [1]: from scipy.io import wavfile
rate, x = wavfile.read('test_mono.wav')
```

And we can easily view its spectral structure using matplotlib's builtin specgram routine:

```
In [2]: fig, (ax1, ax2) = plt.subplots(1, 2, figsize=(12, 4))
ax1.plot(x); ax1.set_title('Raw audio signal')
ax2.specgram(x); ax2.set_title('Spectrogram');
```



The figure displays two plots side-by-side. The left plot, titled "Raw audio signal", shows a blue waveform of an audio signal. The x-axis represents time in samples, ranging from 0 to 50,000 with major ticks every 10,000. The y-axis represents amplitude, ranging from -10,000 to 8,000 with major ticks every 2,000. The signal shows a complex, multi-peaked structure. The right plot, titled "Spectrogram", shows the frequency content of the signal. The x-axis is time in samples (0 to 25,000) and the y-axis is frequency in normalized units (0.0 to 1.0). The plot uses a color scale from blue (low intensity) to red (high intensity) to show the spectral structure, with distinct horizontal bands of energy.

```

C:\Users\Luv>ipython -pylab
WARNING: '-pylab' flag has been deprecated.
Use '-matplotlib <backend>' and import pylab manually.
WARNING: Readline services not available or not loaded.
WARNING: Proper color support under MS Windows requires the pyreadline library.
You can find it at:
http://ipython.org/pyreadline.html

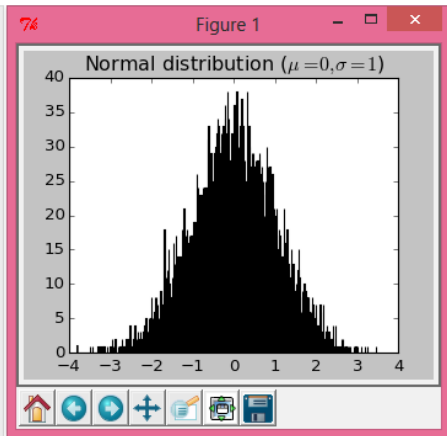
Defaulting color scheme to 'NoColor'
Python 2.7.9 (default, Dec 10 2014, 12:28:03) [MSC v.1500 64 bit (AMD64)]
Type "copyright", "credits" or "license" for more information.

IPython 3.0.0 -- An enhanced Interactive Python.
? -> Introduction and overview of IPython's features.
%quickref -> Quick reference.
help -> Python's own help system.
object? -> Details about 'object', use 'object??' for extra details.
Using matplotlib backend: TkAgg

In [1]: %run -d stepbystep.py
Breakpoint 1 at c:\users\luv\stepbystep.py:1
NOTE: Enter 'c' at the ipdb> prompt to continue execution.
> c:\users\luv\stepbystep.py(1)<module><>
1--> 1 import matplotlib.pyplot as plt
      2 from numpy import *
      3 var = random.randn(5300)

ipdb> c
In [2]:

```



```

IPython 3.0.0 -- An enhanced Interactive Python.
? -> Introduction and overview of IPython's features.
%quickref -> Quick reference.
help -> Python's own help system.
object? -> Details about 'object', use 'object??' for extra details.

In [1]:
In [1]: %run testdebug.py
File "C:\Users\Luv\testdebug.py", line 13
    x2d[0:4,0:3]
    ^
SyntaxError: invalid syntax

In [2]: %debug
> c:\python27\lib\site-packages\ipython\utils\py3compat.py(207)execfile()
--> 206         compiler = compiler or compile
      207         exec(compiler(scripttext, filename, 'exec'), glob, loc)
      208

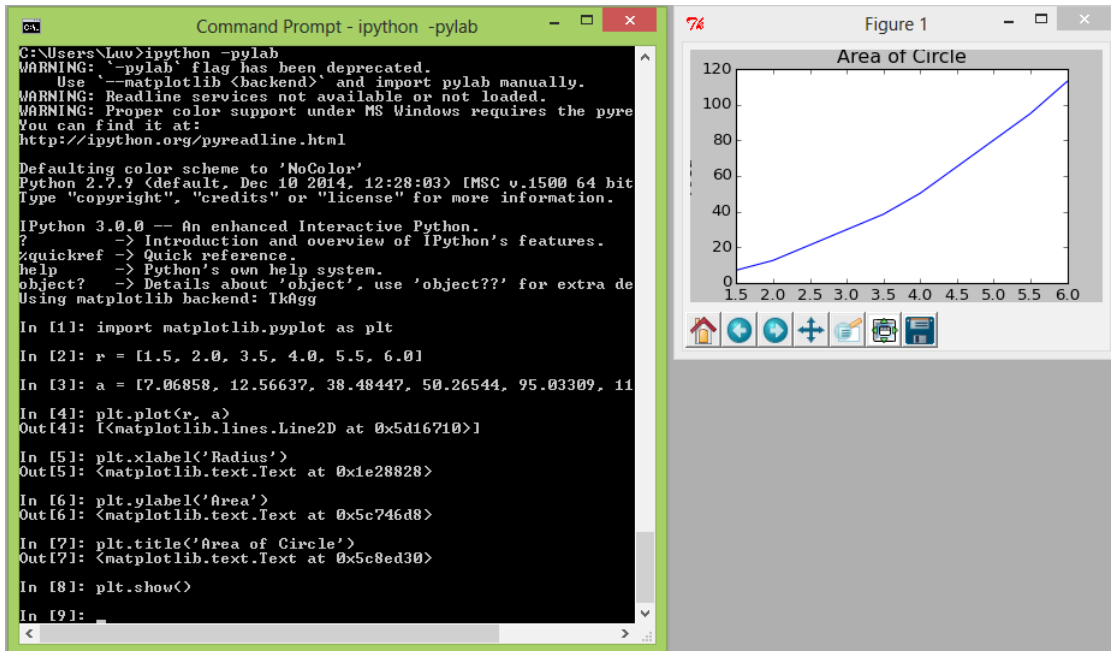
ipdb> ?
Documented commands (type help <topic>):
=====
EOF      bt          cont        enable      jump        pdef        psource    run         unt
a        c           continue    exit        l           pdoc        q          s          until
alias    cl          d           debug       h           list        pfile     quit       step
args     clear      debug       disable     help        n           pinfo     r          tbreak    w
b        commands  disable     ignore     next        pinfo2     restart   u          whatis
break    condition down        j           p           pp          return     unalias   where

Miscellaneous help topics:
=====
exec pdb

Undocumented commands:
=====
retval rv

ipdb>

```



```
C:\Users\Luv>cd videos
C:\Users\Luv\videos

In [17]: ls
Volume in drive C is OS
Volume Serial Number is C01B-A2A6

Directory of C:\Users\Luv\videos
10/09/2013  10:48 PM    <DIR>          .
10/09/2013  10:48 PM    <DIR>          ..
                0 File(s)      0 bytes
                2 Dir(s)   4,815,884,288 bytes free

In [18]: cd ..
C:\Users\Luv

In [19]: !dir *.txt
Volume in drive C is OS
Volume Serial Number is C01B-A2A6

Directory of C:\Users\Luv
07/03/2013  01:05 AM                229 Wah.txt
                1 File(s)      229 bytes
                0 Dir(s)   4,815,360,000 bytes free

In [20]:
```



```
Command Prompt - ipython

In [15]: import numpy as np
In [16]: randn = np.random.randn
In [17]: from pandas import *
In [18]: df = DataFrame({'one-1' : Series(randn(3), index=['a', 'b', 'c']),
.....:                  'two-2' : Series(randn(4), index=['a', 'b', 'c', 'd']),
.....:                  'three-3' : Series(randn(3), index=['b', 'c', 'd'])})
In [19]: df?
Type:      DataFrame
String form:
   one-1  three-3  two-2
a  0.296237      NaN  0.225582
b  0.310758 -0.894493  0.350207
c  0.381691 -0.501984 -0.333075
d      NaN  1.183187  0.680522
Length:    4
File:      c:\python27\lib\site-packages\pandas\core\frame.py
Docstring:
Two-dimensional size-mutable, potentially heterogeneous tabular data
structure with labeled axes (rows and columns). Arithmetic operations
align on both row and column labels. Can be thought of as a dict-like
container for Series objects. The primary pandas data structure

Parameters
-----
data : numpy ndarray (structured or homogeneous), dict, or DataFrame
      Dict can contain Series, arrays, constants, or list-like objects
index : Index or array-like
      Index to use for resulting frame. Will default to np.arange(n) if
      no indexing information part of input data and no index provided
columns : Index or array-like
      Column labels to use for resulting frame. Will default to
      np.arange(n) if no column labels are provided
dtype : dtype, default None
      Data type to force, otherwise infer
copy : boolean, default False
      Copy data from inputs. Only affects DataFrame / 2d ndarray input

---Return to continue, q to quit---
```

```
Command Prompt - ipython

C:\Users\Luv>ipython
WARNING: Readline services not available or not loaded.
WARNING: Proper color support under MS Windows requires the pyreadline library.
You can find it at:
http://ipython.org/pyreadline.html

Defaulting color scheme to 'NoColor'
Python 2.7.9 (default, Dec 10 2014, 12:28:03) [MSC v.1500 64 bit (AMD64)]
Type "copyright", "credits" or "license" for more information.

IPython 3.0.0 -- An enhanced Interactive Python.
?          -> Introduction and overview of IPython's features.
%quickref  -> Quick reference.
help       -> Python's own help system.
object?    -> Details about 'object', use 'object??' for extra details.

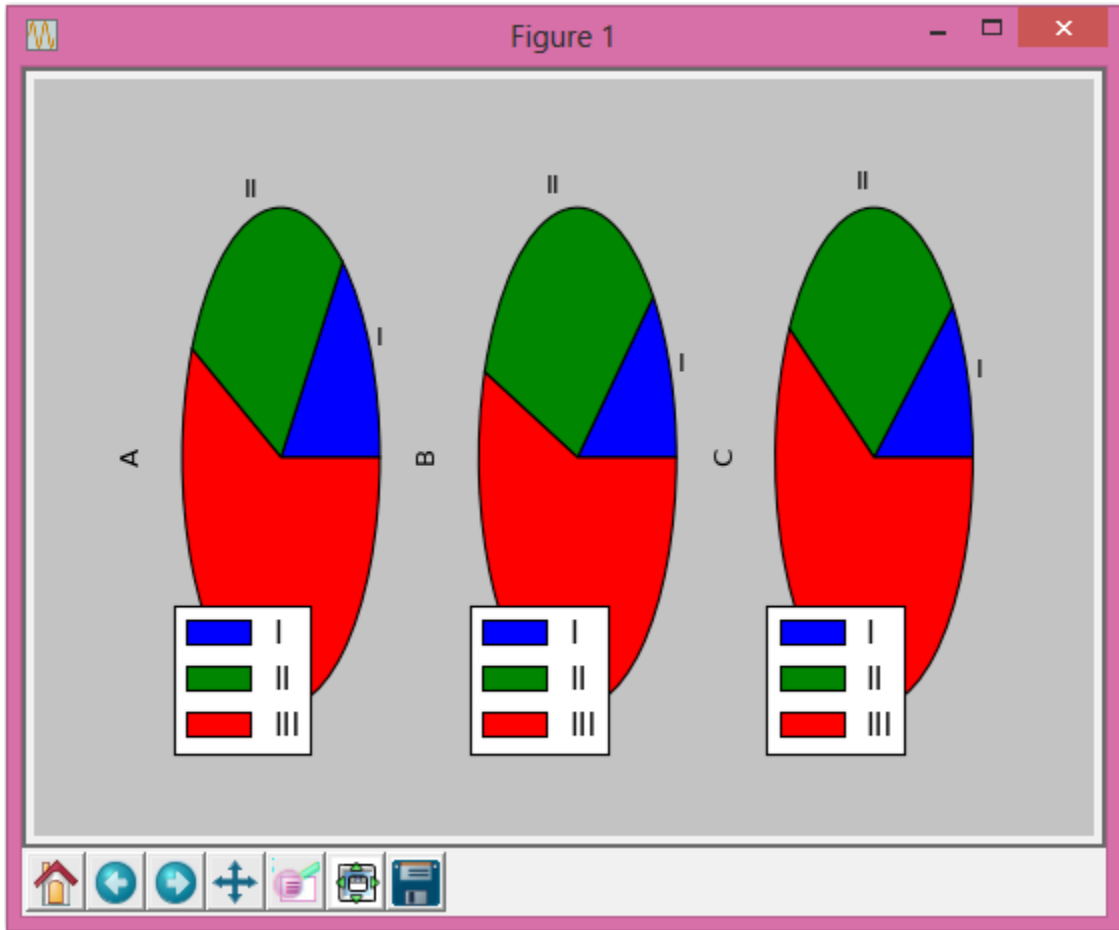
In [1]: 4*2
Out[1]: 8

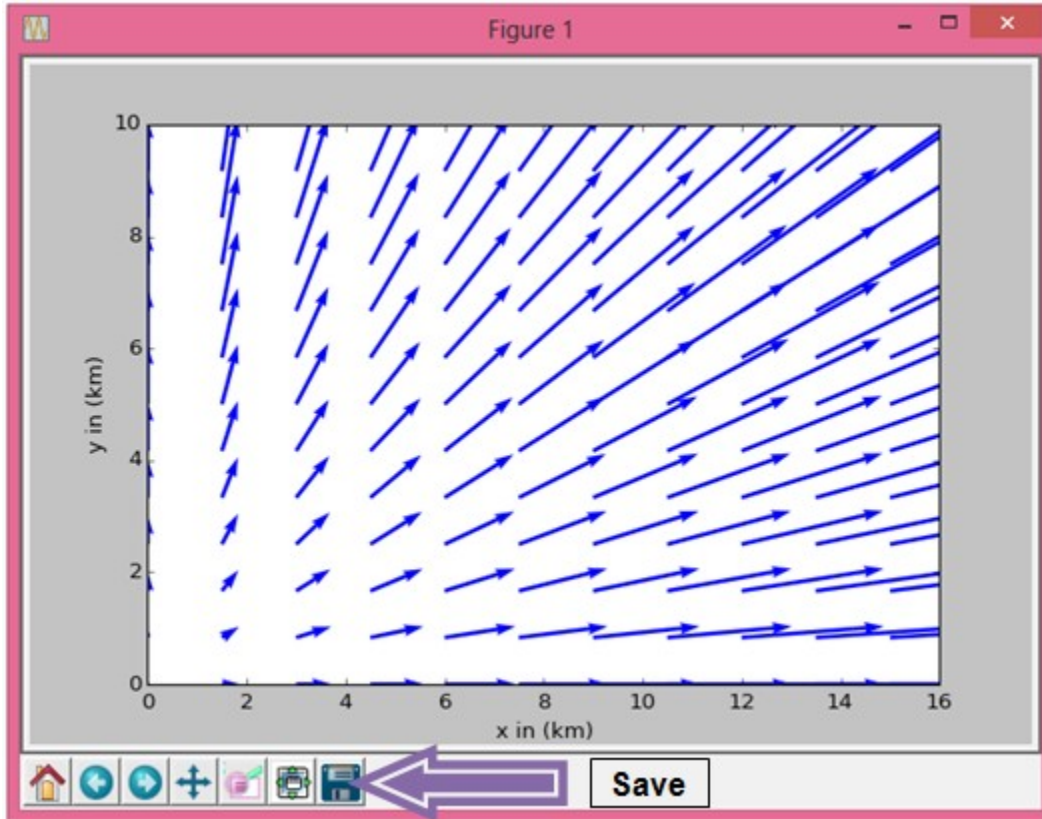
In [2]: _1*7
Out[2]: 56

In [3]: _1+_2
Out[3]: 64

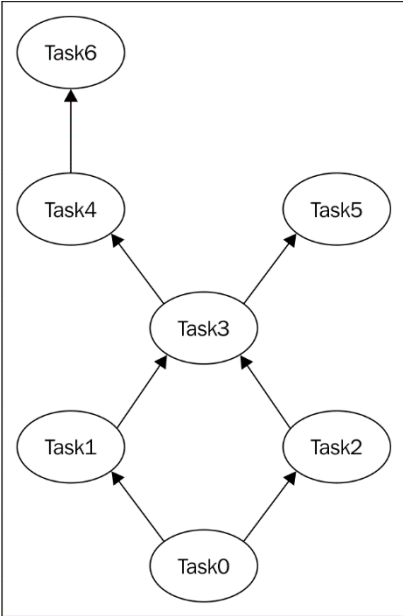
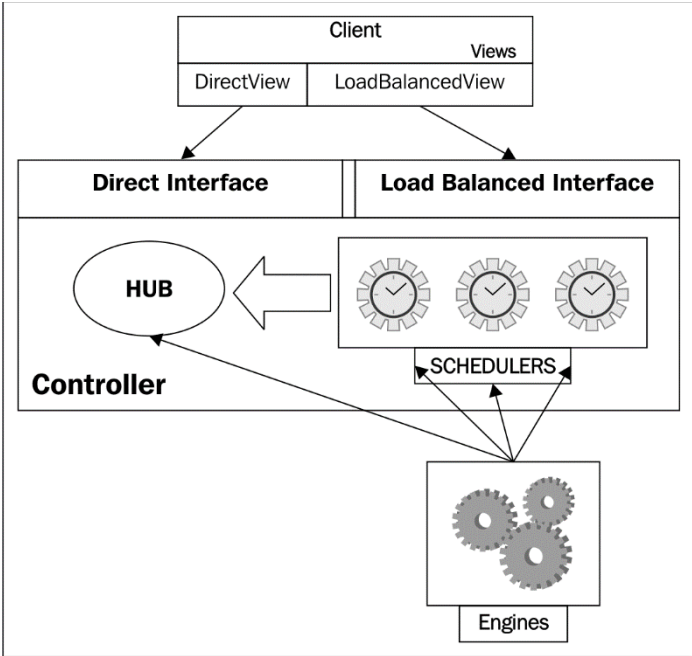
In [4]: _3/_1
Out[4]: 8

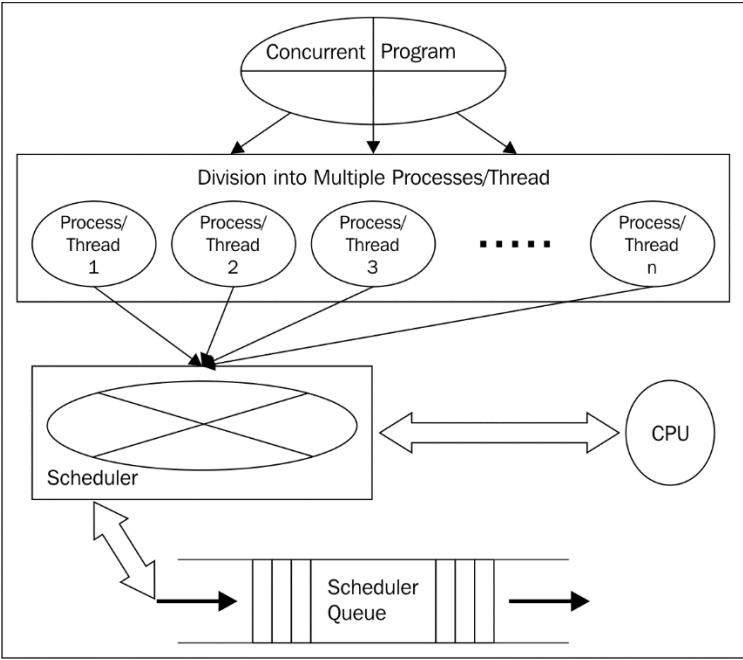
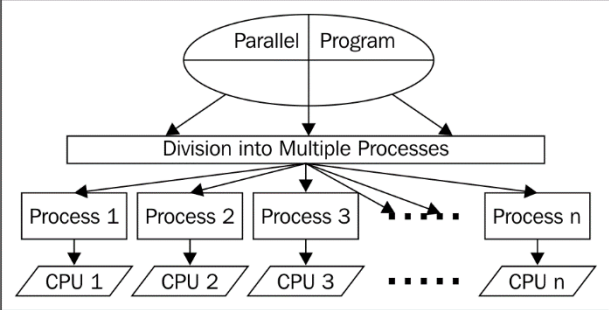
In [5]:
```

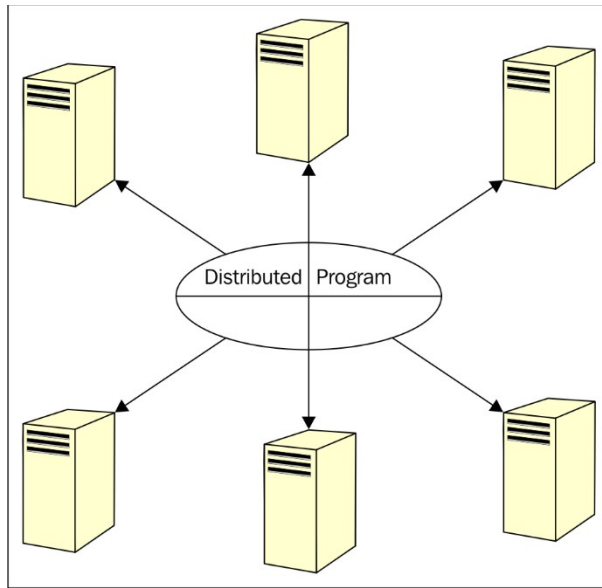




# Chapter 8



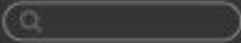




# Chapter 9









Getting started



Place the laptop with the XO icon face up and with the handle facing away.



Lift the ears to release the latches.

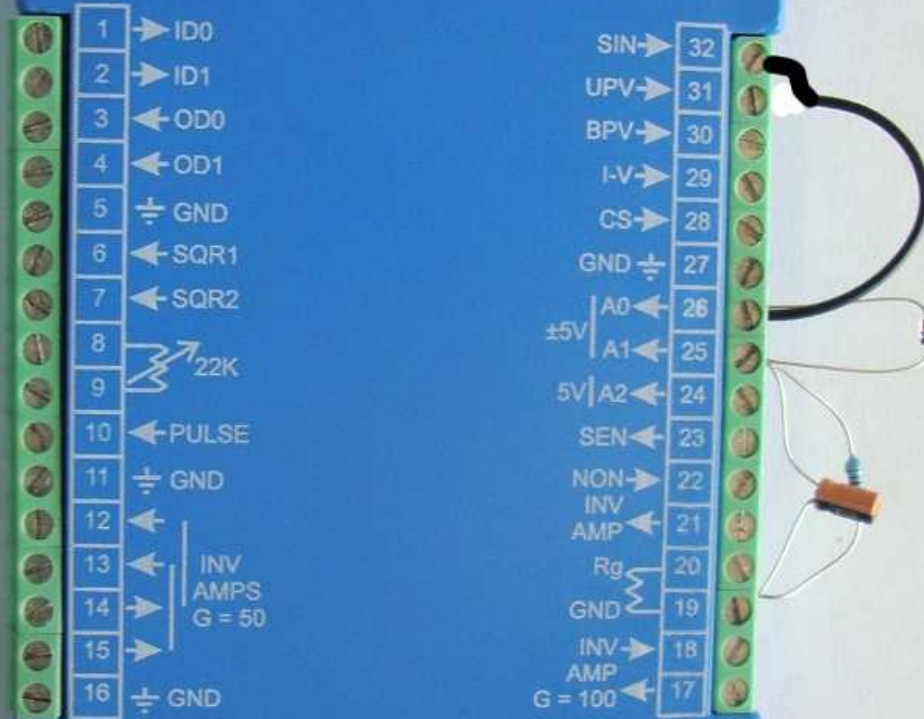


Lift the display up from the keyboard along the seam.

Experiments for Young  
Engineers & Scientists



EXP EYES



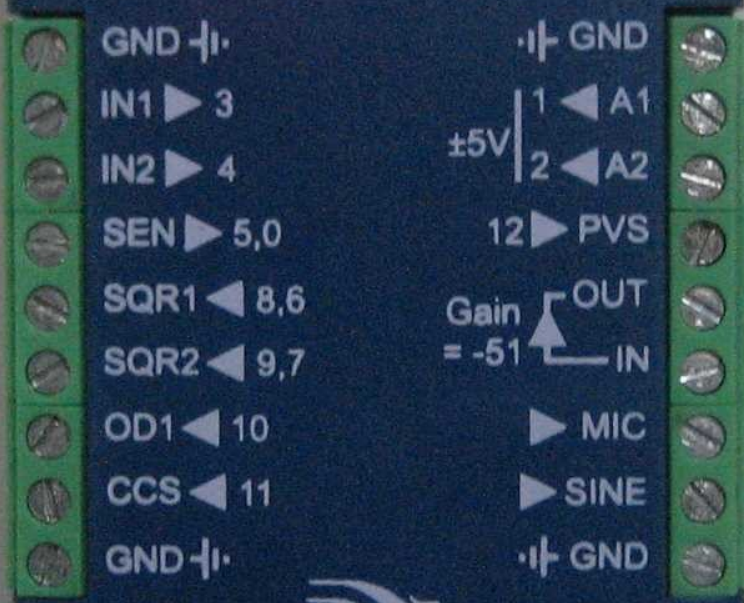
PHOENIX Project  
IUAC, New Delhi - 67  
[www.iuac.res.in](http://www.iuac.res.in)

Mkt by

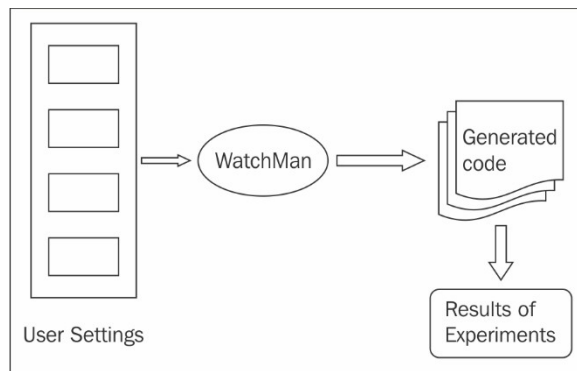
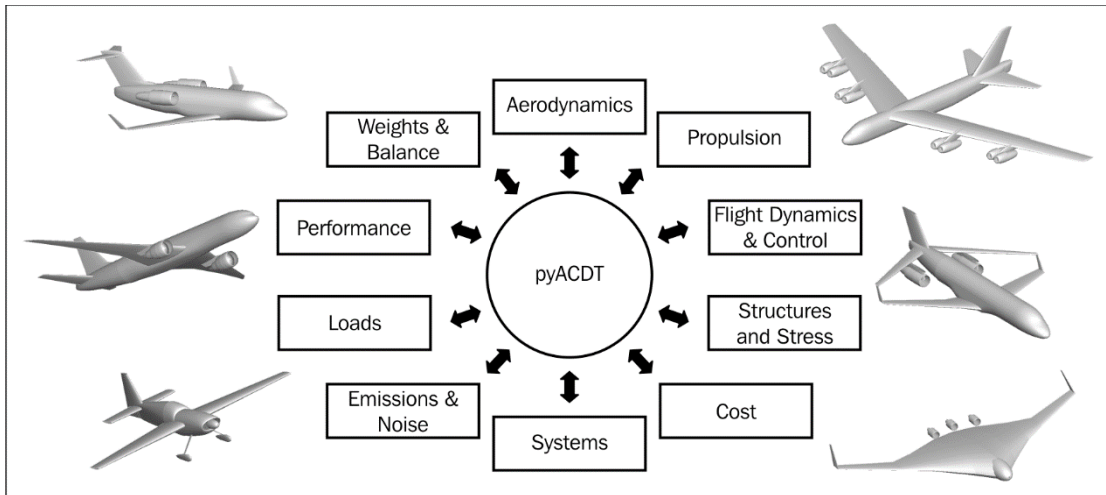
EXPEYES Junior

www.expeyes.in

Your Lab@Home



PHOENIX Project  
IUAC, New Delhi  
www.iuac.res.in



## Chapter 10

