Data Fitting

In [1]:

```
'''name: apeksha chavan
BE COMPS
UID: 2017130013
FCI Exp - 4'''
```

Out[1]:

```
'name: apeksha chavan\nBE COMPS\nUID: 2017130013\nFCI Exp - 4'
```

In [ ]:

```
from pylab import *
from scipy.optimize import curve_fit
```

In [2]:

```
xdata,ydata=loadtxt('FakeData.txt',unpack=True)
```

In [3]:

```
print(xdata)
```

```
[8.213 7.402 6.876 5.491 5.196]
```

In [4]:

```
print(ydata)
```

```
[3.107 2.551 2.2   1.306 1.11 ]
```

In [5]:

```
def linearFunc(x,intercept,slope):
 y = intercept + slope * x
 return y
```

In [6]:

```
linearFunc(1,2,3)
```

Out[6]:

```
5
```

In [7]:

```
a_fit,cov=curve_fit(linearFunc,xdata,ydata)
```

In [8]:

```
inter = a_fit[0]
slope = a_fit[1]
print(cov)
```

```
[[ 1.06510152e-03 -1.55899107e-04]
 [-1.55899107e-04  2.34943498e-05]]
```

In [9]:

```
d_inter = sqrt(cov[0][0])
d_slope = sqrt(cov[1][1])
```

In [10]:

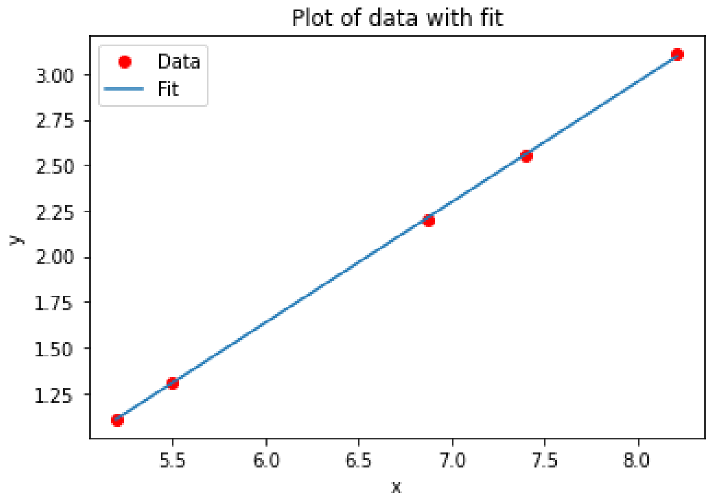
```
# Create a graph showing the data.
plot(xdata,ydata,'ro',label='Data')
# Compute a best fit y values from the fit intercept and slope.
yfit = inter + slope*xdata

# Create a graph of the fit to the data.
plot(xdata,yfit,label='Fit')

# Display a legend, label the x and y axes and title the graph.
legend()
xlabel('x')
ylabel('y')
title('Plot of data with fit')
```

Out[10]:

```
Text(0.5, 1.0, 'Plot of data with fit')
```



In [11]:

```
# Display the best fit values for the slope and intercept. These print
# statments illustrate how to print a mix of strings and variables.
print(f'The slope = {slope}, with uncertainty {d_slope}')
print(f'The intercept = {inter}, with uncertainty {d_inter}')
```

```
The slope = 0.6587176810599606, with uncertainty 0.004847097046293064
The intercept = -2.3161870444414747, with uncertainty 0.03263589309955411
```

With Error

In [12]:

```
def linearFunc(x,intercept,slope):
 y = intercept + slope * x
 return y
```

In [13]:

```
xdata,ydata,d_y = loadtxt('FakeData_with_error.txt',unpack=True)
```

In [14]:

```
print(xdata)
```

```
[8.213 7.402 6.876 5.491 5.196]
```

In [15]:

```
print(ydata)
```

```
[3.261 2.52  2.239 1.299 1.175]
```

In [16]:

```
print(d_y)
```

```
[0.0971 0.0559 0.0708 0.0683 0.0893]
```

In [17]:

```
a_fit,cov=curve_fit(linearFunc,xdata,ydata,sigma=d_y)
```

In [18]:

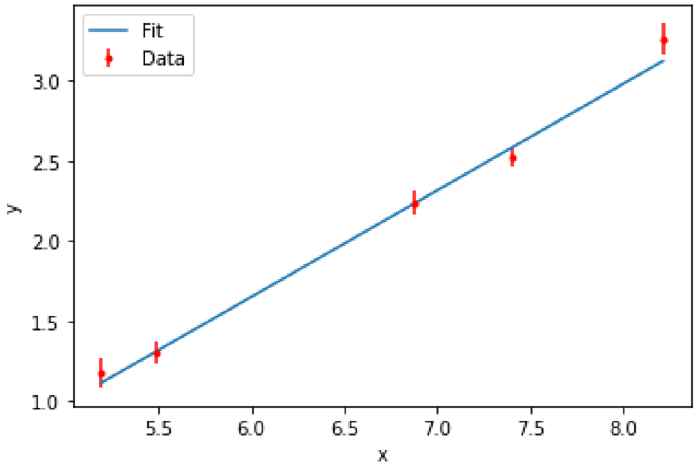
```
inter = a_fit[0]
slope = a_fit[1]
d_inter = sqrt(cov[0][0])
d_slope = sqrt(cov[1][1])
```

In [19]:

```
# Create a graph showing the data.
errorbar(xdata,ydata,yerr=d_y,fmt='r.',label='Data')
# Compute a best fit line from the fit intercept and slope.
yfit = inter + slope*xdata
# Create a graph of the fit to the data. We just use the ordinary plot
# command for this.
plot(xdata,yfit,label='Fit')
# Display a legend, label the x and y axes and title the graph.
legend()
xlabel('x')
ylabel('y')
```

Out[19]:

```
Text(0, 0.5, 'y')
```



In [20]:

```
print(f'The slope = {slope}, with uncertainty {d_slope}')
print(f'The intercept = {inter}, with uncertainty {d_inter}')
```

```
The slope = 0.6656028702881751, with uncertainty 0.03549213604200107
The intercept = -2.3430681719234285, with uncertainty 0.239532487804196
```

In [21]:

```
chisqr = sum((ydata-linearFunc(xdata,inter,slope))**2/d_y**2)
dof = len(ydata) - 2
chisqr_red = chisqr/dof
print(f'Reduced chi^2 = {chisqr_red}')
```

```
Reduced chi^2 = 1.2633310164063059
```

Conclusion

I performed data fitting for the given data in a linear function of form y=mx+c

In the second part we performed the data fitting for a data with given error and performed the chi square test to check the fitting , reduced chi^2 value was near 1 so it indicates that the data has been fitted accurately.