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"""
Chi squire with error
Created on Tue Dec 6 18:13:43 2022
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"""

import numpy as np
import pylab as pl
x,y,e=np.loadtxt("CS1.dat",unpack=True)
n=int(input("Order of Polynomial?? "))
C=np.zeros((n+1,1))
P=np.zeros((n+1,n+1))
#Forming the main MAtrix
for j in range(0,n+1):
    l=j
    for k in range(0,n+1):
        s=0
        for i in range(0,len(x)):
            s=s+((x[i]**l)/(e[i]**2))

        P[j,k]=s
        l=l+1

#Forming the Y Matrix
for j in range(0,n+1):
    s3=0
    for i in range(0,len(x)):
        s3=s3+(y[i]/(e[i]**2))*(x[i]**j)
    C[j,0]=s3

#Solving the matrix
A=np.linalg.solve(P, C)

#Calculating the value of Chi-squire
Chi=0
for i in range(0,len(x)):
    s2=0
    for k in range(0,n+1):
        s2=s2+A[k]*(x[i]**k)
    Chi=Chi+((y[i]-s2)/e[i])**2
print("The value of Chi-squire- ",Chi)

#Uncertainty in the coefficients
B=np.linalg.inv(P)
print("Uncertainty in the coefficients",np.sqrt(np.diag(B)))

#Plot and fit
Z=[]
u=np.linspace(0, 0.9, 100)
for i in range(0,100):
    s4=0
    for j in range(0,n+1):
        s4=s4+A[j]*(u[i]**j)
    Z.append(s4)
pl.scatter(x,y)
pl.xlabel("X axis")
pl.ylabel("Y axis")
pl.title("Chi squire fitting without error for polynomial 15")
pl.plot(u,Z)
pl.show()

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