Machine Learning

Assignment 3: Polynomial Regression

Data:

X	Y
3	2.5
4	3.2
5	3.8
6	6.5
7	11.5

Code:

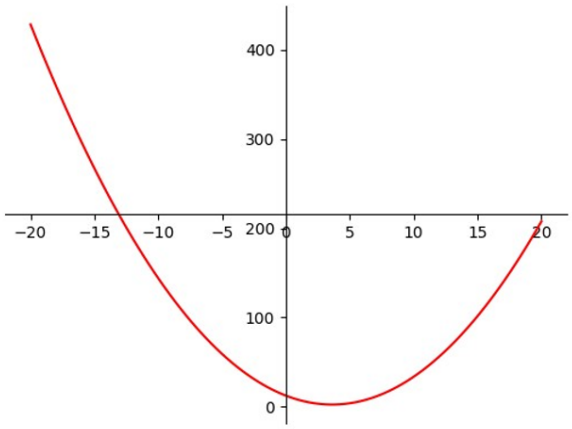
```
#21BCE8421
#Harshita Pasupuleti
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
x=[3,4,5,6,7]
xar=np.array(x)
print("x=",xar)
#find sum of all x
xsum=sum(xar)
print("xsum=",xsum)
y=[2.5,3.2,3.8,6.5,11.5]
yar=np.array(y)
print("y=",yar)
#find sum of all y
ysum=sum(yar)
print("ysum",ysum)

xy=[]

 for i in range(0,5):
    product=float(xar[i]*yar[i])
    xy.append(product)
xyarr=np.array(xy)
print("xy=",xyarr)
xysum=sum(xyarr)
print("xysum=",xysum)
```

```
xsq=[]
for i in range(0,5):
    square=float(xar[i]*xar[i])
    xsq.append(square)
xsqar=np.array(xsq)
print("x^2=",xsqar)
xsqsum=sum(xsqar)
print("x^2sum=",xsqsum)
xcube=[]
for i in range(0,5):
    cube=float(xar[i]*xar[i]*xar[i])
    xcube.append(cube)
xcubear=np.array(xcube)
print("x^3=",xcubear)
xcubesum=sum(xcubear)
print("x^3sum=",xcubesum)
xq=[]
for i in range(0,5):
    q=float(xar[i]*xar[i]*xar[i]*xar[i])
    xq.append(q)
xqar=np.array(xq)
print("x^4",xqar)
xqsum=sum(xqar)
print("x^4sum",xqsum)
xsqy=[]
for i in range(0,5):
    sqy=float(xar[i]*xar[i]*yar[i])
    xsqy.append(sqy)
xsqyar=np.array(xsqy)
print("x^2.y=",xsqyar)
xsqysum=sum(xsqyar)
print("x^2.ysum=",xsqysum)

print(ysum," = 5a0+",xsum,"a1+",xsqsum,"a2")
print(xysum," = ",xsum,"a0+",xsqsum,"a1+",xcubesum,"a2")
print(xsqysum," = ",xsqsum,"a0+",xcubesum,"a1+",xqsum,"a2")

c=[27.5,158.8,966.2]
b=[[5,25,135],[25,135,775],[135,775,4659]]
a=["a0","a1","a2"]
binv=np.linalg.inv(b)
ans=np.dot(binv,c)
print("After solving through matrices:")
print(a,"=",ans)
a0=round(float(ans[0]),3)
a1=round(float(ans[1]),3)
a2=round(float(ans[2]),3)
```

```
print("The required polynomial regression model is")
print("y = ",a0,"",a1,"x +",a2,"x^2")
x = np.linspace(-20,20,100)
y = a0+a1*x+a2*x*x
fig = plt.figure()
ax = fig.add_subplot(1, 1, 1)
ax.spines['left'].set_position('center')
ax.spines['bottom'].set_position('center')
ax.spines['right'].set_color('none')
ax.spines['top'].set_color('none')
ax.xaxis.set_ticks_position('bottom')
ax.yaxis.set_ticks_position('left')

 plt.plot(x,y, 'r')
plt.show()
```

Output:

```
x= [3 4 5 6 7]
xsum= 25
y= [ 2.5  3.2  3.8  6.5 11.5]
ysum 27.5
xy= [ 7.5 12.8 19.  39.  80.5]
xysum= 158.8
x^2= [ 9. 16. 25. 36. 49.]
x^2sum= 135.0
x^3= [ 27.  64. 125. 216. 343.]
x^3sum= 775.0
x^4 [  81.  256.  625. 1296. 2401.]
x^4sum 4659.0
x^2.y= [ 22.5  51.2  95.  234.  563.5]
x^2.ysum= 966.2

27.5  = 5a0+ 25 a1+ 135.0 a2
158.8  =  25 a0+ 135.0 a1+ 775.0 a2
966.2  =  135.0 a0+ 775.0 a1+ 4659.0 a2

After solving through matrices:
['a0', 'a1', 'a2'] = [12.42857143 -5.51285714  0.76428571]
The required polynomial regression model is
y =  12.429  -5.513 x + 0.764 x^2
```



1 : x axis as different values of and y = 12.429-5.513 * x+0.764*x

2 Figure

Submitted By:

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