ECE5307_hw1_2

January 19, 2023

[1]:
```
import numpy as np
import pandas as pd
import matplotlib
import matplotlib.pyplot as plt

x = np.array([0, 1, 2, 3, 4])
y = np.array([0, 0.5, 1, 0.5, 3])
```

0.0.1 (a) the sample mean xm is 2.0, ym is 1.0

[2]:
```
xm = np.mean(x)
xm
```

[2]: 2.0

[3]:
```
ym = np.mean(y)
ym
```

[3]: 1.0

0.0.2 (b) sample variance sxx is 2.0 , syy is 1.1, co-variance sxy is 1.2

[4]:
```
sxx = np.mean((x-xm)**2)
syy = np.mean((y-ym)**2)
sxy = np.mean((x-xm)*(y-ym))
print("sxx:",sxx)
print("syy:",syy)
print("sxy:",sxy)
```

```
sxx: 2.0
syy: 1.1
sxy: 1.2
```

0.0.3 (c) least-squares parameters beta0 is -0.20 , beta1 is 0.6

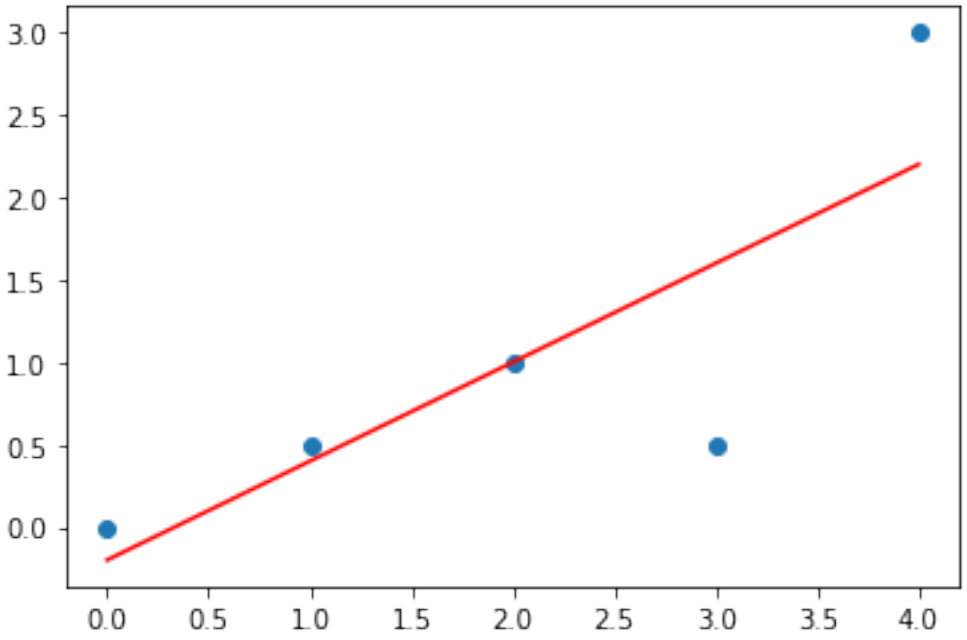
[5]:
```
beta1 = sxy/sxx
beta0 = ym - beta1*xm
print("beta1:", beta1)
print("beta0:", beta0)
```

```
beta1: 0.6
beta0: -0.19999999999999996
```

0.0.4 (d) plot the scatterplot and the regression line:

[6]:
```
plt.plot(x,y,'o')
plt.plot(x, beta1*x+beta0, color='red')
```

[6]:
```
[<matplotlib.lines.Line2D at 0x2b992a06dd68>]
```



0.0.5 (e) R2 for the LS linear model is 0.6545

[7]:
```
R2 = sxy**2/sxx/syy
print("R2:",R2)
```

```
R2: 0.6545454545454544
```

0.0.6 (f) The linear regression is not that effective in this dataset. As R2=1 implies the predictor is perfect, R2=0 implies the predictor is no better than the trival one. R2 in this model is about 0.65 not that effective but showed some linear relation.