linear algebra project—

Suitable Height to LIVE

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Background and problem statement

In our stereotype ,women prefer the higher one,
and we want to find out the suitable height to attract women.
Meanwhile, we also do the research on the other gender.

Is the higher one more popular?

Methods with details

We use a google form to collect the data,
and use the least square approximation to find out
the relevance between the probability of having a girlfriend(Y)
and the height of the subject(X).
At first, we assume X-Y are fitting in the parabola,and then we
find the parabolas's maximum, which is the most suitable
height to have a boy/girlfriend.
If the inaccuracy are higher than we expected,
we will further discuss the reason behind it.

using python to draw the parabola

$$y = A + Bx + Cx^2$$

$$
\begin{bmatrix}
1 & 161.5 & 161.5^2 \\
1 & 164.5 & 164.5^2 \\
1 & 167.5 & 167.5^2 \\
1 & 170.5 & 170.5^2 \\
1 & 173.5 & 173.5^2 \\
1 & 176.5 & 176.5^2 \\
1 & 179.5 & 179.5^2 \\
1 & 182.5 & 182.5^2 \\
1 & 185.5 & 185.5^2 \\
1 & 188.5 & 188.5^2 \\
1 & 191.5 & 191.5^2 \\
1 & 194.5 & 194.5^2
\end{bmatrix}
\begin{bmatrix} A \\ B \\ C \end{bmatrix}
=
\begin{bmatrix}
5.3 \\
10.7 \\
9.3 \\
8 \\
13.3 \\
29 \\
9.3 \\
12 \\
4 \\
0 \\
1.3 \\
2.7
\end{bmatrix}
$$

$$A \qquad \vec{x} = \vec{b}$$

solve $\quad A^T A \ \vec{x} = A^T \vec{b}$

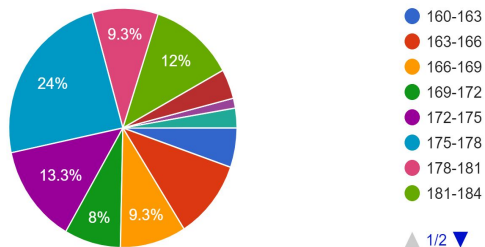$$\vec{x} = (A^T A)^{-1} A^T \vec{b}$$

$$y = A + Bx + Cx^2$$

$$
\begin{bmatrix}
1 & 146.5 & 146.5^2 \\
1 & 149.5 & 149.5^2 \\
1 & 152.5 & 152.5^2 \\
1 & 155.5 & 155.5^2 \\
1 & 158.5 & 158.5^2 \\
1 & 161.5 & 161.5^2 \\
1 & 164.5 & 164.5^2 \\
1 & 167.5 & 167.5^2 \\
1 & 170.5 & 170.5^2 \\
1 & 173.5 & 173.5^2 \\
1 & 176.5 & 176.5^2 \\
1 & 179.5 & 179.5^2 \\
1 & 182.5 & 182.5^2
\end{bmatrix}
\begin{bmatrix} A \\ B \\ C \end{bmatrix}
=
\begin{bmatrix}
1.2 \\
1.2 \\
2.9 \\
5.9 \\
16.5 \\
18.2 \\
12.1 \\
9.4 \\
9.4 \\
7.6 \\
4.7 \\
3.5 \\
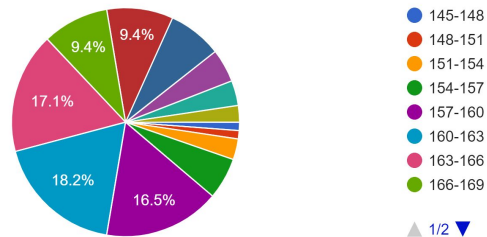2.9
\end{bmatrix}
$$

Code & Dataset

理想伴侶或自身身高(有伴侶的填自身身高)(沒有的填理想伴侶身高)
74 則回應

Legend:
- 160-163
- 163-166
- 166-169
- 169-172
- 172-175
- 175-178
- 178-181
- 181-184

△ 1/2 ▽

理想伴侶或自身身高(有伴侶的填自身身高)(沒有的填理想伴侶身高)
132 則回應

Legend:
- 145-148
- 148-151
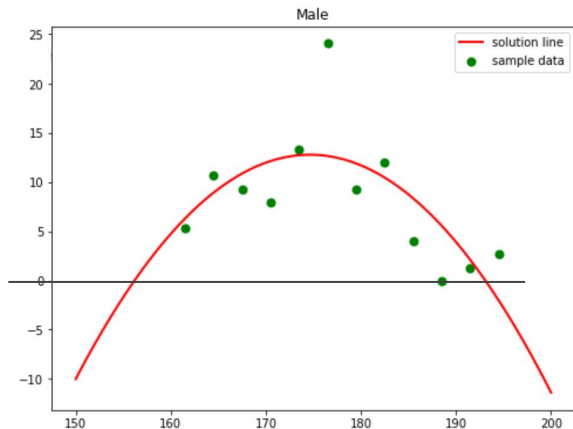- 151-154
- 154-157
- 157-160
- 160-163
- 163-166
- 166-169

△ 1/2 ▽

a= -0.03757076259279479 b= 13.122394272450947 c= -1133.0396749155077
求解的曲線圖:
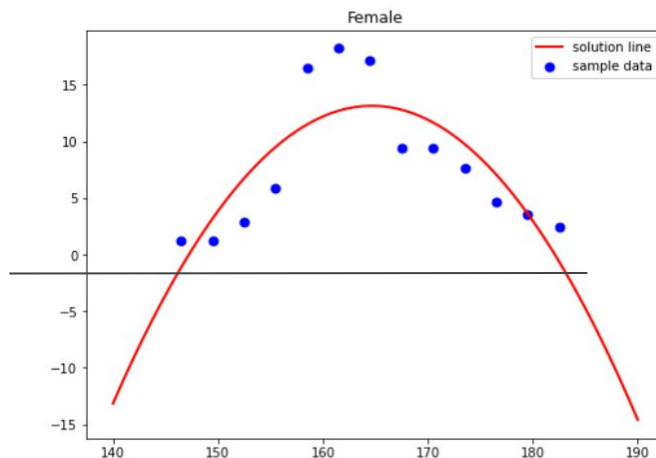y=-0.04x*x+13.12x+-1133.0396749155077

a= -0.04321234323427525 b= 14.231512931531235 c= -1158.6100038883258
求解的曲線圖:
y=-0.04x*x+14.23x+-1158.6100038883258

```python
import numpy as np
import matplotlib.pyplot as plt
from scipy.optimize import leastsq #導入函式
X = np.array([161.5,164.5,167.5,170.5,173.5,176.5,179.5,182.5,185.5,188.5,191.5,194.5])
Y = np.array([5.3,10.7,9.3,8,13.3,24,9.3,12,4,0,1.3,2.7])
#寫進數據(男性)

def func(params, x):
    a, b, c = params
    return a*x*x+b*x+c
def error(params, x, y):
    return func(params, x) - y
def slovePara():
    p0=[10,10,10]
    Para = leastsq(error, p0, args=(X, Y))#用leastsq計算
    return Para
def solution():
    Para = slovePara()
    a, b, c = Para[0]
    print("a=",a,"b=",b,"c=",c)
    print("求解的曲線圖:")
    print("y="+str(round(a, 2))+"x*x+"+str(round(b, 2))+"x+"+str(c))
    #用matplotlib.pyplot繪出圖形
    plt.figure(figsize=(8, 6))
    plt.scatter(X, Y, color="green",label="sample data", linewidth=2)
    x=np.linspace(150,200,100)
    y=a*x*x+b*x+c
    plt.plot(x,y,color="red",label="solution line",linewidth=2)
    plt.title("Male")
    plt.legend()
    plt.show()

solution()
```

Results

We found that the ideal girlfriends in the men's eyes are highly related to their height .($R^2=0.67$)
On the other hand,the height of boyfriends does not affect that much for women ,but still has something to do with their height.($R^2=0.5$)

Extreme value：
Male：174.202(cm)
Female：164.35(cm)

Conclusion

Although we are not able to grow to the most suitable height, we can change our clothing to make us look more attractive.

Discussion

1.The number of subjects is only 206, maybe the dataset is not big enough.
2.The range of height may be too large.(3 cm)
3.According to some reviews on Dcard, they hope the ideal height of a girlfriend/boyfriend is a multiple choice question with more than one selection.

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To sum up, our stereotype may be wrong!