Simple Linear Regression and Correlation

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11.1 A study was conducted at Virginia Tech to determine if certain static arm-strength measures have an influence on the "dynamic lift" characteristics of an individual. Twenty-five individuals were subjected to strength tests and then were asked to perform a weightlifting test in which weight was dynamically lifted overhead. The data are given here.

Individual	Arm Strength, x	Dynamic Lift, y
1	17.3	71.7
2	19.3	48.3
3	19.5	88.3
4	19.7	75.0
5	22.9	91.7
6	23.1	100.0
7	26.4	73.3
8	26.8	65.0
9	27.6	75.0
10	28.1	88.3
11	28.2	68.3
12	28.7	96.7
13	29.0	76.7
14	29.6	78.3
15	29.9	60.0
16	29.9	71.7
17	30.3	85.0
18	31.3	85.0
19	36.0	88.3
20	39.5	100.0
21	40.4	100.0
22	44.3	100.0
23	44.6	91.7
24	50.4	100.0
25	55.9	71.7

According to the results obtained from our program in Python, this are showed on figure [1]:

```
cidetec@ubuntu:~/Documents$ python regresion.py
El valor de B1 es 0.56089779252841609
El valor de B0 es 64.529155558324888
El valor de uY para 30 es 81.356089334177369
```
Figure 1 Results from python program.

(a) Estimate β_0 and β_1 for the linear regression curve

$$\mu Y|x = \beta_0 + \beta_1 x.$$
$$\beta_0 = 64.52915$$
$$\beta_1 = 0.560897$$

(b) Find a point estimate of $\mu Y|30$.

$$\mu Y|x = \beta_0 + \beta_1 x$$
$$\mu Y|x = 64.52915 + 0.560897x$$
$$\mu Y|30 = 64.52915 + 0.560897*30$$
$$\mu Y|30 = 81.356089$$

(c) Plot the residuals versus the x's (arm strength).

We can see that the points closest to zero are those closest to the line drawn by linear regression, figure [2].
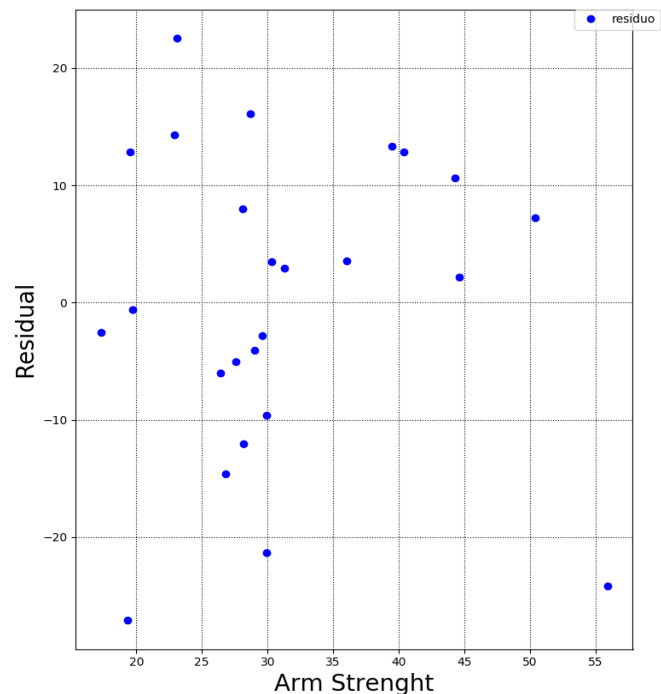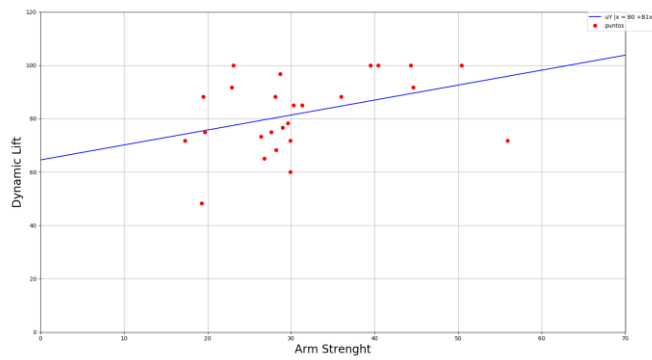

Figure 2 Residual vs Arm Strenght

We can see the line drawn by linear regression, figure [3].

I. CONCLUSIONS

It should be noted that the least squares criterion is designed to provide a fitted line that results in a "closeness" between the line and the plotted points.

REFERENCES

[1] Ronald E. Walpole, Sharon L. Myers, (2012), Probability and Statistics for Engineers and Scientists, 9th Edition. ©Pearson