

THIRD DETAILED EXAMPLE :
CONTROL INPUT

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Third Example:-

In the previous 2 examples , we tried to use a linear and a quadratic models to fit our data . But , what if our model has data from 2 different situations under same conditions ?

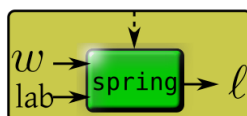
Example : Suppose we want to examine patients from different hospitals but we could not get enough patients from one hospital , so we administer our process on more than 1 hospitals where patients are treated under same conditions . But still there will be slight difference the reports on the patients based on the hospital he was in . So , there is factor which depends on which hospital the patient is sent i.e., the source . We call it **lab** .

Model:- Now , to our example with the spring .



In this picture , both the spring have same weights attached to it and are made of same materials but the elongation is measured at different places (which we termed as **labs**). And the most fascinating observation is that even under similar conditions , the spring in first lab is less elongated than that of the spring from second lab . So , the lab is a factor affecting the elongation . So in this case our model has another input variable in the black box other than the masses attached to the spring which we call as labs.

Then , the black box diagram of our model would be :



Let us try to understand this **lab** thing now .Suppose we take some data from the 2 labs . In our case, we have taken measurement of the elongation of same spring in 2 different places with some weights .

W	L
1.0	5.29
1.5	6.31
2.0	7.28
2.5	8.33
3.0	9.30
3.5	10.32

W	L
1.2	7.60
1.5	8.11
1.8	8.88
2.1	9.40
2.1	9.39

As , we can see from the first lab we have 6 data points while we have 5 data points from the second lab. So , the number of observations are different in both of them . And the weights taken in lab1 is 1.0,1.5,2.0,2.5,3.0,3.5 while that in lab2 is 1.2,1.5,1.8,2.1 . So, the input variables can be same or different in both the labs . It does not matter . We also observe 2.1 weight is used 2 times in lab2 but there is a slight error which made the elongation differ by 0.1 .
