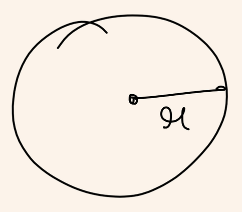
03 Regression

Thursday, 4 March 2021   12:15 PM

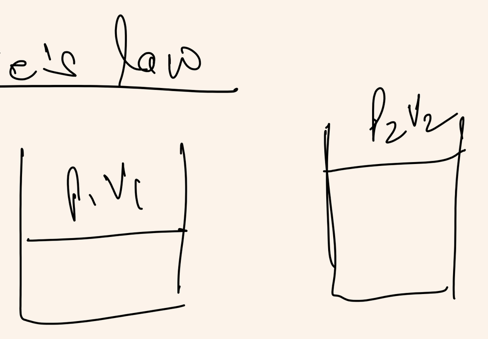
(1) Relation Based Prediction

Eg:-  $\boxed{C = 2\pi r}$

$C \propto r$

or

Boyle's law



$= P_1V_1 = P_2V_2$

} Rigid Physics } Provide example of linear & Non-linear models.

Flexible

(1) Height of offspring vs the height of parents.

Can draw a relationship b/w the height of father and son.

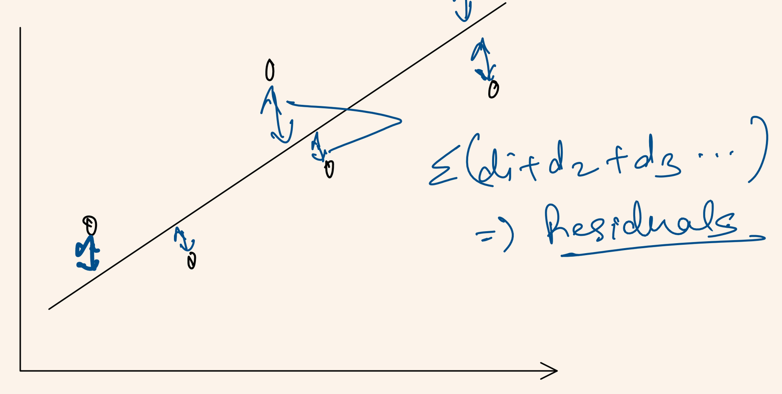
while many would follow a general trend, there would certainly be cases where it won't. } source of error

Regression :-

Regression means that in general we can express the height of son and fathers using an equation involving the height of father and son.

$R(h_f, h_s) :\Rightarrow \; h_s = a h_f + b$
or $h_s = b + a h_f$ } linear Regression

Linear Regression :- The idea is to fit a line that's nearest to all values at once. The values of this line is nearest to the actual value and we take this as the forecast or estimate.



} Linear Regression aims to find the smallest sum of residuals that's possible for the dataset

R^2 :⇒ goodness of fit $\{0, 100\%\}$

→ It indicates the variance in the dependent variable that the independent variable explains.

[0-1]

$R^2 = \frac{\text{Variance explained by the model}}{\text{Total variance}}$

Caution :- (1) Cannot be used to evaluate the coefficient estimates or bias in prediction.
Hence look at the plot

(2) A good model can have low R^2 value and a bias model can have a high R^2.

Ordinary Least Square / Multivariable regression

Simp. Linear. Reg. :⇒ $\boxed{y = ax + b}$ where $\{a, b\}$ → coefficient

{1 → input, 1 → Output}

y → dependent

x → Independent

Ordinary Least Sq: more than 1 input, 1 output.

$$\boxed{y = a_1x_1 + a_2x_2 + a_3x_3 + b}$$

→ seeks to minimize the sum of the square residuals.

i.e (1) we fit a line

(2) we take the distance of each point from the line

(3) we square it and sum it all. } Minimize it

$OLS = \Sigma(d(\text{point \& line}))^2$

The approach treats the data as matrix and uses linear algebra to find optimal values for the coefficients

→ Disadvantage :→ {Memory hogger}

→ Advantage :⇒ Very very fast.