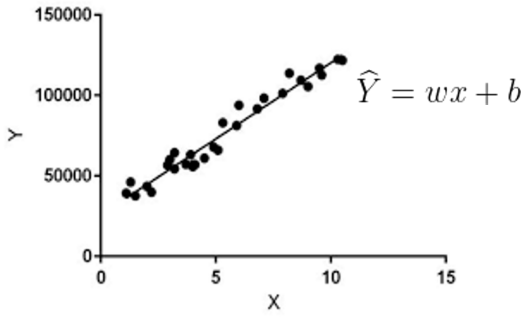
# Polynomial Regression ML GURU

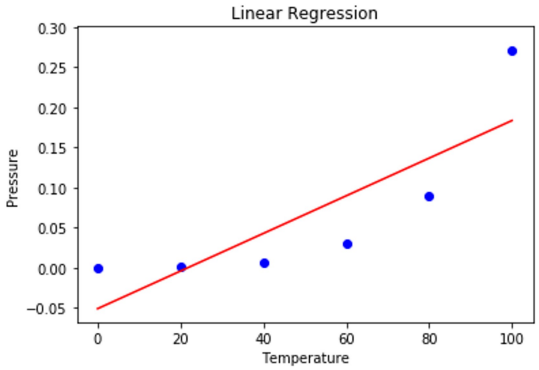
## Linear Regression Model:

$$\widehat{Y} = w1x1 + w2x2 + ....wnxn + b$$

**Eg:**




**But what if the data is non linear?**




- **The Linear model wont fit the data well.**
- **This is known as under fitting.**

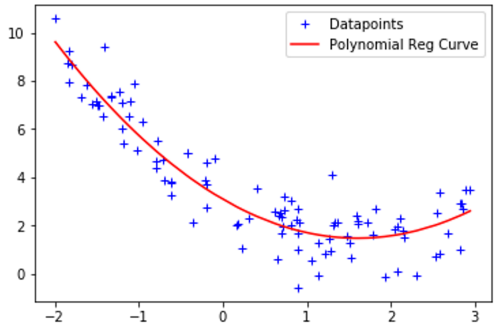
## Polynomial Regression

$$\widehat{Y} = w_1x^n + w_2x^{n-1} + w_3x^{n-2} + \ldots + w_nx^1 + b$$

*Where $n$ = degree of the polynomial equation*

***Eg 2nd degree polynomial equation:***

$$\widehat{Y} = w_1x^2 + w_2x + b$$




**If multiple variables: eg x1, x2**

**Degree = 2**

$$\widehat{Y} = w_1x_1^2 + w_2x_2^2 + w_3x_1x_2 + w_4x_1 + w_5x_2 + b$$

**How to covert dataset for Polynomial regression?**

Original X

| $X$ |
|---|
| 1 |
| 2 |
| 3 |
| 4 |
| 5 |

Transformed X

| $X$ | $X^2$ |
|---|---|
| 1 | 1 |
| 2 | 4 |
| 3 | 9 |
| 4 | 16 |
| 5 | 25 |

**Now Apply Multivariate Linear Regression**
**(Treat each column as a feature)**

**You can also apply other functions**
**Eg:**

$$\widehat{Y} = w_1x^2 + w_2\sqrt{x} + w_3 \sin x + b$$