Last Class – Jul 25

1) Intro & Polls
2) Summary of what we have learnt before (all libraries)
3) 10,000 ft overview of ML
   - ML ? ML v/s SDE
   - ML Tasks
   - Types of Learning
4) Applications
5) Cars 24 Dataset (Time Permits)
6) Doubt - Solving Session (11:15 pm)

Today's class

1) Quick recap
2) Target variable encoding
3) Scaling the data
4) Data Notation
5) ML Generalization
6) Lin Reg Intuition
7) Evaluation Metric
8) Model Interpretability

Label encoding

1) Maruti → 0
2) Hyundai → 1
3) Ford → 2
4) Hyundai
5) Ford

One hot encoding

is Maruti	is Hyundai	is Ford
1	0	0
0	1	0
0	0	1
0	1	0
0	0	1

Std Scaler → 0 mean, 1 std

min-max → 0 to 1

→ −1 to 1

$\bar{x}$, σ

$$\frac{x_i - \bar{x}}{\sigma} = x_i'$$

$m_1 = \min(x_i)$

$m_2 = \max(x_i)$

$$x_i' = \frac{x_i - m_1}{m_2 - m_1}$$ 0 to 1

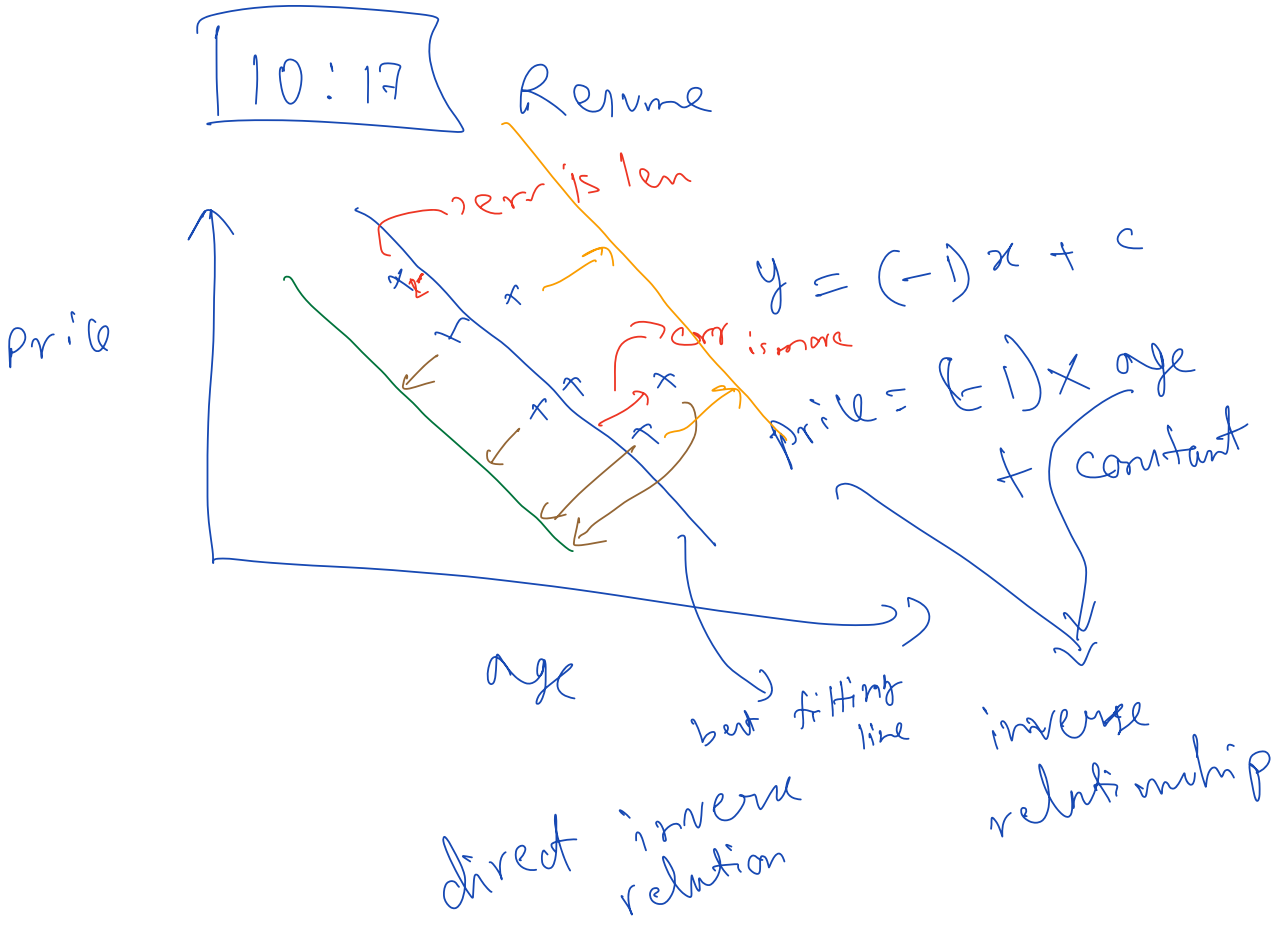
→ −1 to +1

$$\hat{y}^{(i)} = w_0 + w_1 \cdot x_1^{(i)} + w_2 \cdot x_2^{(i)} + w_3 \cdot x_3^{(i)} + \dots + w_d \cdot x_d^{(i)}$$

$[w_0, w_1, w_2, \dots, w_d]$

↳ params

10:17 Resume



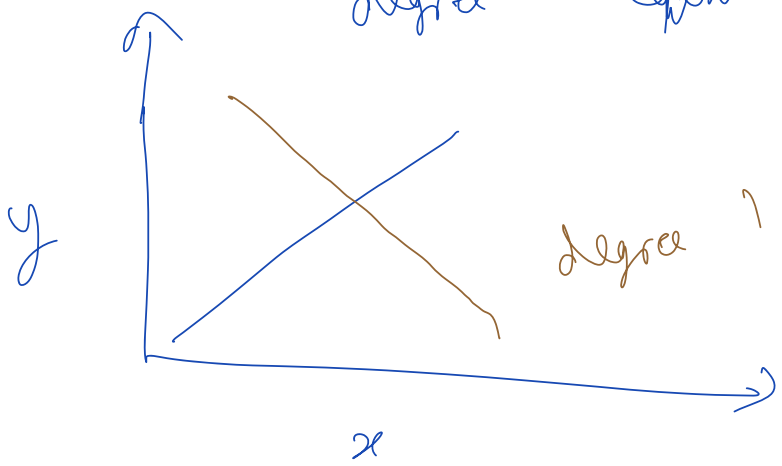
$y = a_0 + a_1 x + a_2 x^2 + a_3 x^{\boxed{3}}$ → degree 3

↳ max degree

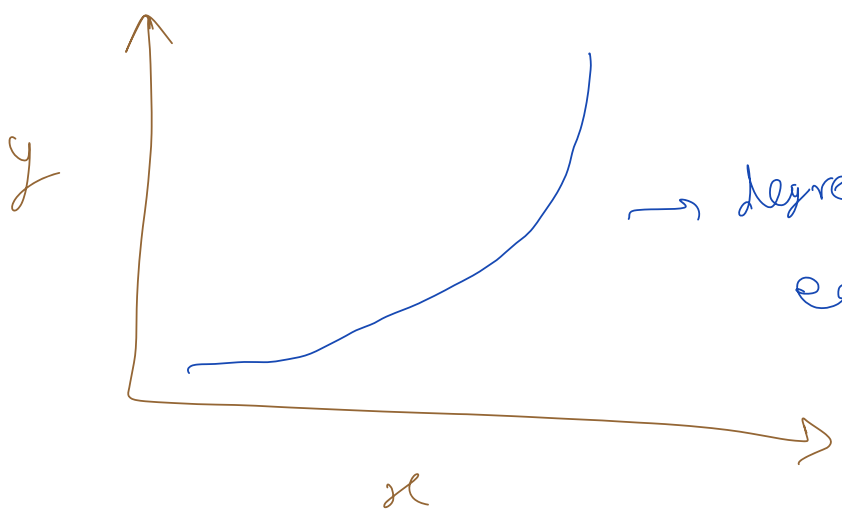
$y = a_0 + a_1 x^{\boxed{1}}$ → max deg = 1

degree 1 equation

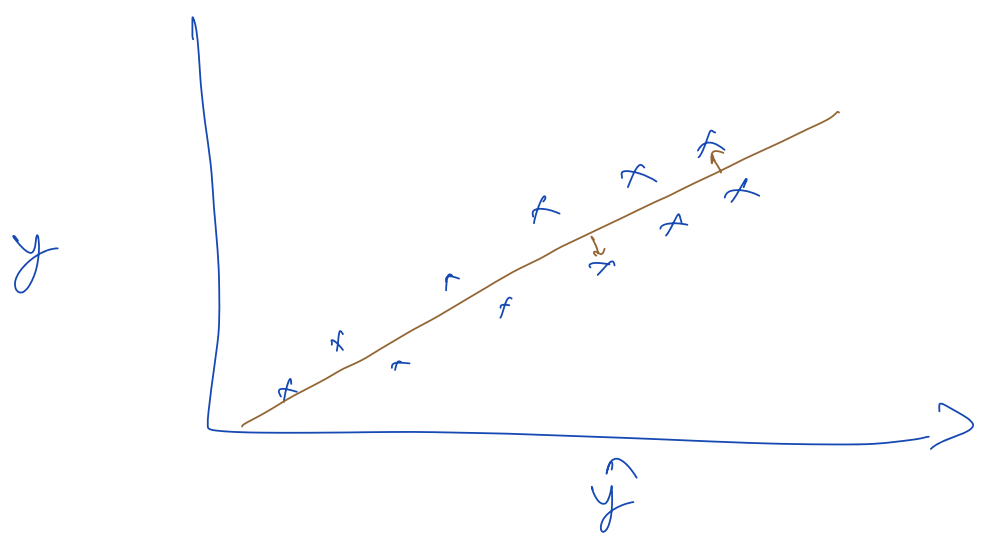
$y = a_0 + a_1 x$

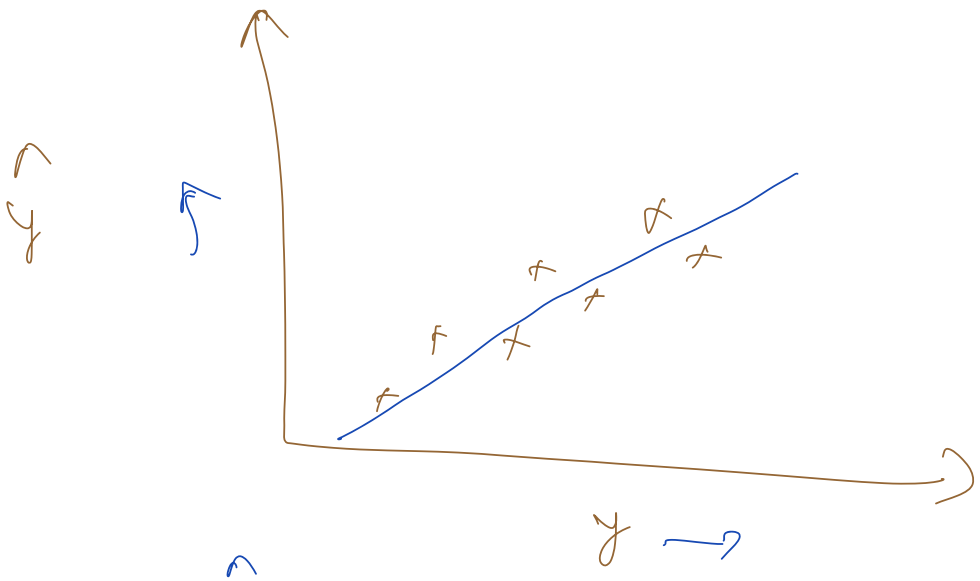


$y = a_0 + a_1 x + a_2 x^2 + a_3 x^3$



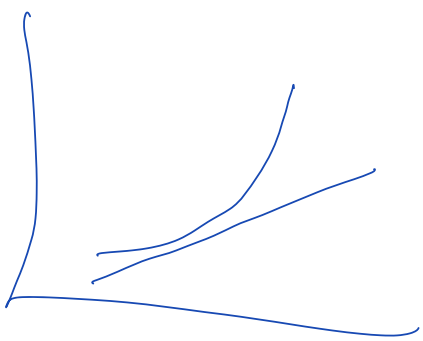
→ degree 3 equation





y	$\hat{y}$
1.0	1.1
1.5	1.6
2.0	2.3
5.0	2.3
6.0	2.4

bad model



$$err := \| y^{(i)} - \hat{y}^{(i)} \|^2$$

$y^{(i)}$	$\hat{y}^{(i)}$	
1.0	0.9	+0.1
2.0	2.1	−0.1

0.0

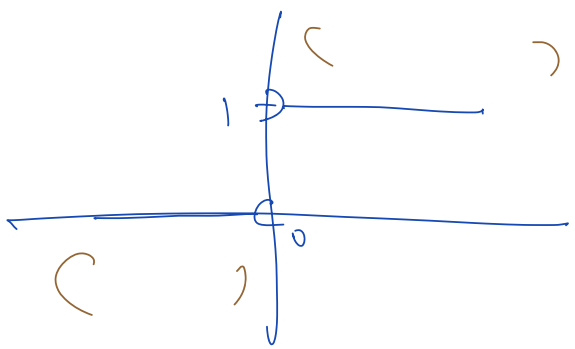
MSE

$$\sum_{i=1}^{m} \left(y^{(i)} - \hat{y}^{(i)} \right)^2$$

$$\sum_{i=1}^{m} \left| y^{(i)} - \hat{y}^{(i)} \right| \quad \text{MAE}$$

$$\frac{\partial (MAE)}{\partial w_1} = 0$$

when $w_1 = 0$



$$Var(y^{(i)}) = \frac{1}{m} \sum_{i=1}^{m} \left(y^{(i)} - \bar{y} \right)$$

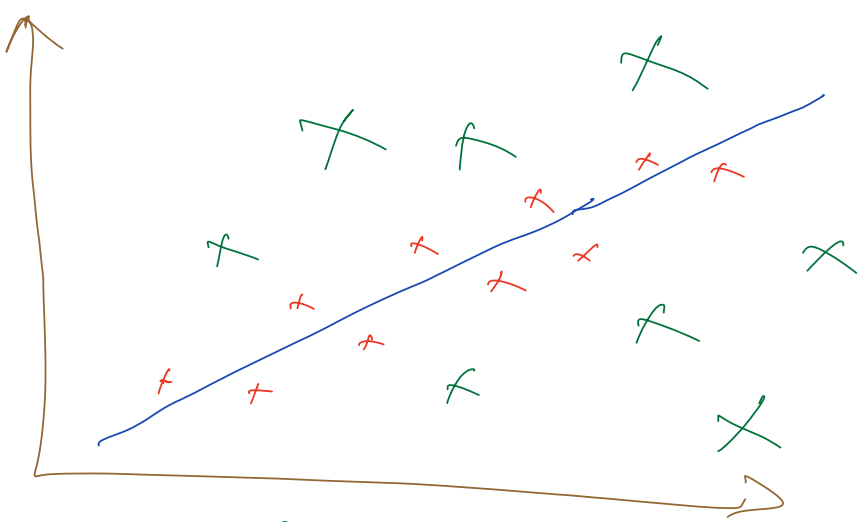
$$\sum_{i=1}^{m} \left(y^{(i)} - \bar{y} \right) = m \times Var(y^{(i)})$$

$$MSE = \frac{1}{m} \sum_{i=1}^{m} \left(y^{(i)} - \hat{y}^{(i)} \right)^2$$

$$m \times MSE \Rightarrow \sum_{i=1}^{m} \left(y^{(i)} - \hat{y}^{(i)} \right)^2$$

$$R^2 \text{ score} = 1 - \frac{m \times MSE}{m \times var\left(y^{(i)} \right)}$$

$$= 1 - \frac{MSE}{var\left(y^{(i)} \right)}$$



$$\sum_{i=1}^{m} \left(y^{(i)} - \hat{y}^{(i)} \right)^2 > \sum_{i=1}^{m} \left(y^{(i)} - \bar{y} \right)^2$$