Logistic reg

Approximations → Mean line } SSE ↑

→ Best fit line SSE ↓

(real numbers) Continuous (Assumption) (−∞, ∞)

Non-parametric (dogs vs cats)

KNN (discrete prediction (repeating class based discrete Values)

Can I do better?

↓

Logistic Regression (parametric method) (0,1)

Converting into probabilities

9:26:

discrete values?

$\boxed{0 \text{ or } 1}$ ⇒ 0 → 1, 0 loss

2000 ... 0

60,000

$\hat{x}$ →

odds of cricket

Team ⇒ 1002 matches
won = 559 matches
lost = 443 matches

(−∞ to +∞)

odds ⇒ $\frac{\text{No of wins}}{\text{No. of defeats}}$

ratios of some event happen & Not happen.

$\frac{559}{443} = 1.26$

→ 0 → ∞

$\frac{1}{100000}$ } → favourable

| 10000 Non-favorm.

Probability

$$\left.\frac{\text{favourable}}{\text{Total}}\right\} \Rightarrow 0 \to 1$$

Non f fav

odds $\Leftarrow \left(\frac{\text{Probability of a team winning}}{\text{Probability of a team lossing}}\right)$

log(odds)

$(-\infty, +\infty) \Leftarrow (0, \infty) \leftarrow (0, 1)$

log(odds) odds $\leftarrow$ probablity

Constructed $\leftarrow$

$(-\infty, +\infty) \to (0, \infty) \to (0, 1)$

inverse of log (e) (b0+b1x) $\to \dfrac{e^{y_{predict}}}{e^{y_{pred}} + 1}$

$-\infty$

(b0+b1x) $\xrightarrow{e}$ $(0, \infty) \to$ [0, 0.001, 0.002, 0.2, 0.5, 1]

mx+c

$(-\infty, +\infty)$

[-300, -200, -100, ... 100, 10000, 1000]

$$y = mx + c = 0$$

$$\frac{1}{1+e^{-y}} = 0.5$$

Predict of probabli $= \frac{e^{y}}{1+e^{y}}$

$$\frac{1}{\frac{1}{e^{y}} + \cancel{\frac{e^{y}}{e^{y}}}} \Rightarrow \frac{1}{1+e^{-y}}$$

$$\sigma(-4) = \frac{1}{1+e^{-(-4)}} = \frac{1}{1+e^{4}}$$

$$\rightarrow 0.0179$$

$$\lim_{y \to -\infty} \sigma(y) = \frac{1}{1+e^{-(-\infty)}} = \frac{1}{1+e^{\infty}}$$

$$= 0$$

$$\frac{1}{1+e^{-\infty}} \Rightarrow \frac{1}{1} = 1$$

$\boxed{\lim_{y \to +\infty}}$ $1+e$

$[0, 1]$

$0 \to 0.7$

$1 \to 0.3$

<ins>IN Summary</ins>

We have converted $(-\infty, +\infty)$ values from Linear Reg

$\downarrow$

$(0, 1)$ probability values (Sigmoid function)

$\downarrow$

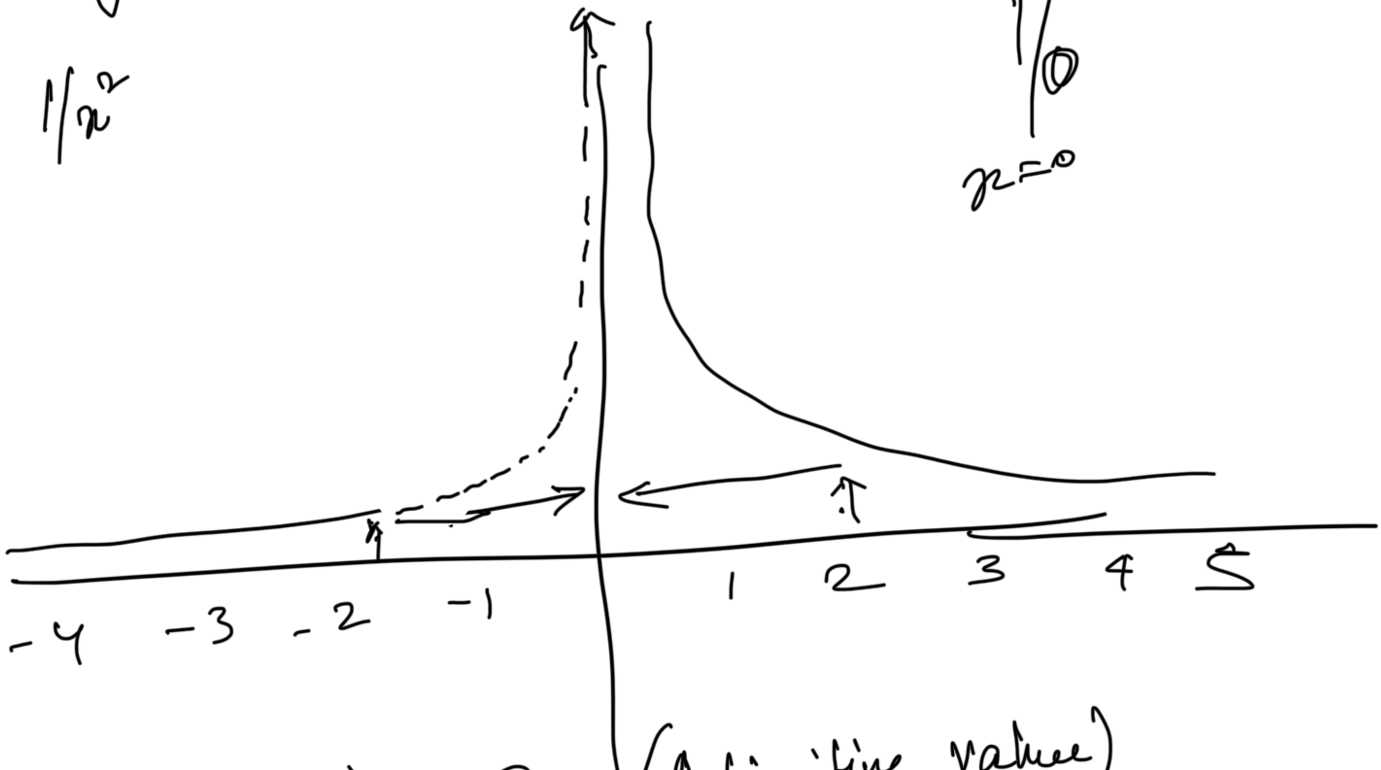
Classification

$y = 1/x^2$, $\frac{1}{x^2}$

$1/x^2$

$1/0$

$x=0$



$\lim (1/x^2) \to \infty$ (A limiting value) of the fn.

$x \to 0$

the val. of the ... to a particl. i/p as i/p appears

① loss function??

$$J(\theta) = \underbrace{\frac{1}{m}\sum_{i=1}^{m} \text{cost}(\hat{y}_i, y_i)}_{\text{common Error}}$$

Class wise Error term

0 − 1 ⇒ 0.89 ↓

6000 / 8000

requirements
① Classwise loss
② Blow up if its wrong
↳ reduce if predicts right

$y=0$

y	$\hat{y}$	loss
0	0	
0	1	

$\log(1-\hat{y})$

loss

$y=0 \quad \hat{y}=0 \quad 0$

$y=0 \quad \log(1) = 0$

Case 1

$y = 0$ | $y = 0$

$\hat{y} = 0 \Rightarrow \log(1 - 0) = 0$ | $-\log(1-\hat{y})$

$\hat{y} = 1 \Rightarrow \log(1 - 1) = -\infty$ | $-\log(1-\hat{y})$

Case 2

$y = 1 \Rightarrow \log(1) \Rightarrow -\log(\hat{y})$

$\downarrow 0$

$-[y \log(\hat{y}) + (1-y)\log(1-\hat{y})]$

$\uparrow 0$

Log Loss $-\frac{1}{n}\sum_{i=0}^{n}[y_i \log(\hat{y}_i) + (1-y_i)\log(1-\hat{y}_i)]$

Quantitative Metric Done !!!

Binary Cross entropy / Log Loss.

Qualitative Metrics. 500

250 | 0 → 200 ✓, 50 ✗

250 | 1 → 225 ✓, 25 ✗

Actual ↓

Predicted	0	
0	(1) 200	(2) 25
1	(3) 50	(4) 225

Confusion Matrix ⇒ diagonal are all correct preds

Actual

Predicted	POSITIVE +ve	-ve
+ve	TP	FP
Negative -ve	FN	TN

TP - True +ve

TN - True -ve

Accuracy of my model $= \dfrac{TP + TN}{FP + TP + FN + TN}$

Positive (P) Precision

$$\frac{TP}{TP + FP}$$

Negative TN-Prech

$$= \frac{TN}{TN + FN}$$

Sensitivity +ve ↳ Recall

$$\Rightarrow \frac{TP}{TP + FN}$$

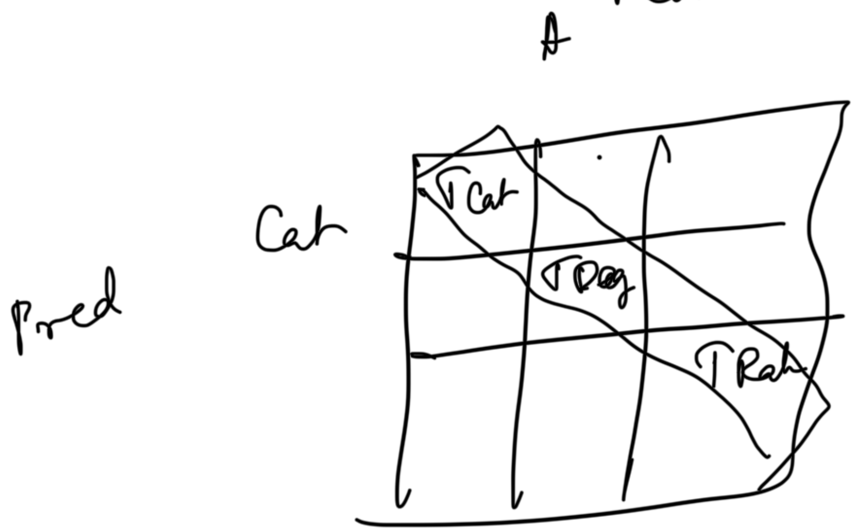
TP Rate

-ve Specificity

$$= \frac{TN}{TN + FP}$$

True Negative Rate

$$f_1\text{-Score} = \frac{2 \times Recall \times Precision}{Recall + Precision}$$


Cat
Pred
Cat
Dog
Rat