

We will predict the values based on probability of an observation belonging to the certain class.  $(A|B)$

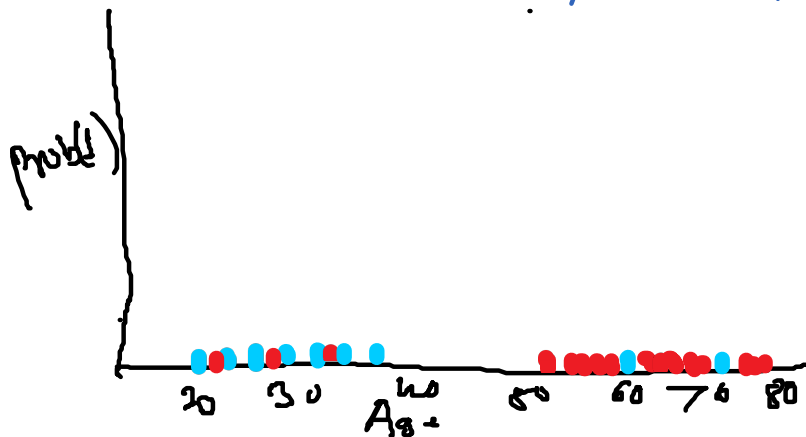
$\text{predict}() \rightarrow$  classes

$\text{predict\_proba}() \rightarrow$  probability of values

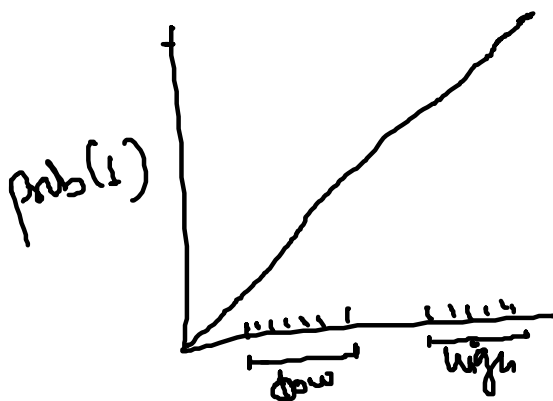
ex. default | non-default.

Age  
salary  
gender  
CIBIL score

Loan amount  
interest rate  
Past transactions  
any property



1 • non-default  
0 • default

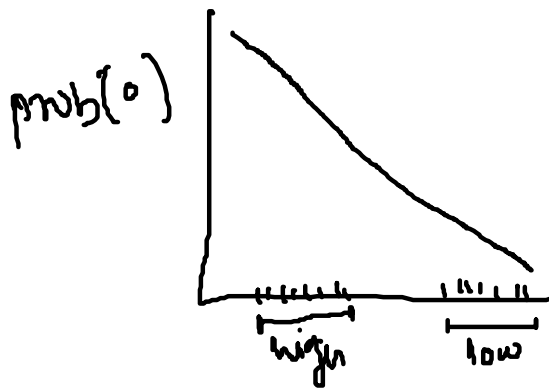


probability of somebody belonging to a class (1) increase linearly non-default

math(0) | \diagdown

$$x_{i0} = \begin{bmatrix} 0 \\ 0.7 \end{bmatrix} \parallel \begin{bmatrix} 1 \\ 0.3 \end{bmatrix}$$

0 to 1  
1

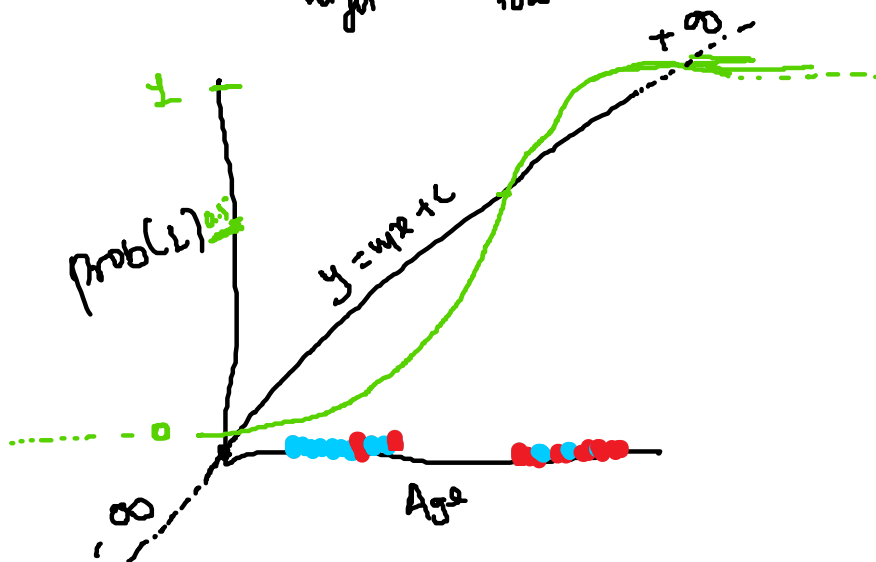


$$x_{y=0} = \begin{bmatrix} 0.7 \\ 0.3 \end{bmatrix}$$

$$x_{y=1} = \begin{bmatrix} 0.2 \\ 0.8 \end{bmatrix}$$

$$\frac{0}{1} \rightarrow 1$$

$$\underline{\underline{1}}$$

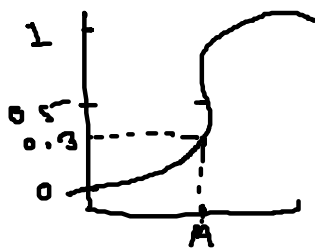


$y = \text{prob of belonging to class 1}$

$w = \text{slope}$   
 $x = \text{variable}$   
 $c = \text{intercept}$   
 zero, negative

This S-curve is called sigmoid / Logistic.

It is used to find out probabilities (0 to 1)



$$\underline{\underline{30\%}} \quad | \quad 70\%$$

$$\text{Sigmoid} = P(y) = \frac{1}{1 + e^{-y}} = \frac{1}{1 + e^{-(wx+c)}}$$

we have BFL  $y = (wx+c)$

this transformation will result in a sigmoid (S-curve) curve

$e = \text{Euler's Constant}$

derivation of sigmoid function.

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

$y = ?$

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

$$e^{-y} = \frac{1}{p} - 1 = \frac{1-p}{p}$$

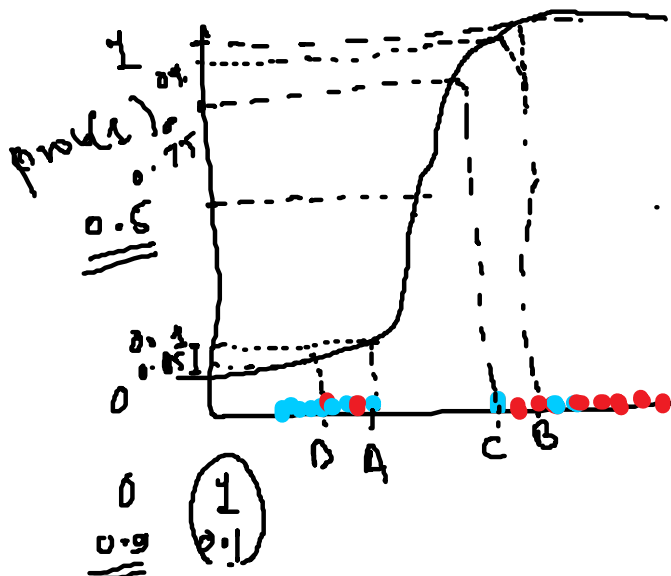
taking log on both sides

$$\log e^{-y} = \log \left( \frac{1-p}{p} \right)$$

$$-y \times \log e = \log \left( \frac{1-p}{p} \right)$$

$\log e = 1$

$$y = \log \left( \frac{p}{1-p} \right)$$



$A = \text{prob of A belong to class 1}$

0.1  
which means it  
belong to class 0.

$A = \text{Actual} = 0 \Rightarrow \text{default } y_a$   
 $\text{pred} = 0 \quad y_p$   
correctly classified

for point B.

prob of B belonging to class 1 = 0.9  $\gg$  high

$$\begin{aligned} \text{act} &= 1 = y_{\text{actual}} \\ \text{pred} &= 1 = y_{\text{pred}} \end{aligned} \quad \text{error} = \underline{\underline{\text{zero}}}$$

for point C

probab of C belonging to class 1 = 0.75  $\gg$  high

$$\begin{aligned} \text{act} &= 0 = y_{\text{actual}} \\ \text{pred} &= 1 = y_{\text{pred}} \end{aligned} \quad \text{mismatch} \quad \text{error} = \underline{\underline{\text{error}}}$$

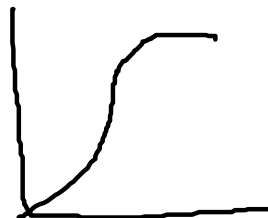
for point D

prob of D belong to class (1) = 0.05  $\gg$  low

$$\begin{aligned} \text{act} &= y_{\text{actual}} = 1 \\ \text{pred} &= y_{\text{pred}} = 0 \end{aligned} \quad \text{error} = \underline{\underline{\text{error}}}$$

Training error, error in training

Age	A	B	C	<u>I</u>
1	2	7	4	A
2	8	6	7	B
3	2	1	1	B - A



anbsjh