

→ Prediction / Recognition

- Face Recognition
- Speech Recognition
- Weather forecasting
- Stock market price prediction

→ Problems which deals with imprecise or incomplete information

→ The problems which are computationally hard

Does late night studies during the exam improve your result?

$X = \text{late night study} = \{\text{Yes, No}\}$

$Y = \text{Good Result} = \{\text{Yes, No}\}$

(is $X \rightarrow Y$ correct?)

Dataset

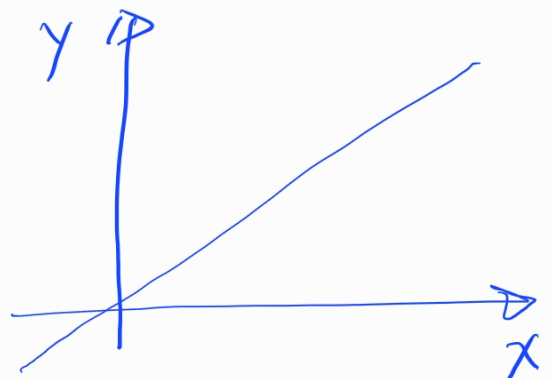
$$Y = f^A(X) \quad \underline{\underline{\text{Learn}}}$$

X	0	$\bar{1}$	0	$\bar{1}$	0	0	$\bar{1}$	0	0	$\bar{1}$
Y	1	$\bar{1}$	1	$\bar{1}$	1	1	$\bar{1}$	0	0	0

①

$$Y = mX + c$$

learn values of
 m & c



② $P(\underline{Y}/X)$ - Probabilistic Modeling
 \underline{X} & Y are R.V.

$$P(Y=1/X=1) = P(Y/X) = \boxed{3/4}$$

$$\frac{P(Y/X)}{\uparrow}$$

$$P(Y=1/X=0) = P(Y/\sim X) = 2/3$$

$$P(Y=0/X=1) = P(\sim Y/X) = 1/4$$

$$P(Y=0/X=0) = P(\sim Y/\sim X) = 1/3$$

Outcome depends on many factors

$$\underline{P(Y)}$$

Baye's Theorem :

$$P(Y/X) = \frac{P(X/Y) \cdot P(Y)}{P(X)}$$

$$P(X \cap Y) = \frac{P(X/Y) \cdot P(Y)}{P(X)} = P(Y/X) \cdot P(X)$$

Posterior probability \rightarrow

Likelihood \rightarrow

class prior \rightarrow

$$P(Y/X) = \frac{P(X/Y) \cdot P(Y)}{P(X)}$$

Predictor prior \rightarrow

Naïve Bayes Classifier

- X	0	$\bar{1}$	0	$\bar{1}$	0	0	$\bar{1}$	0	0	$\bar{1}$
Y	1	$\bar{1}$	1	$\bar{1}$	1	1	$\bar{1}$	0	0	0

$$\begin{aligned}P(Y=1/X=1) &= \frac{P(X=1/Y=1) \times P(Y=1)}{P(X=1)} \\&= \frac{\left(\frac{3}{4}\right) \times \left(\frac{4}{10}\right)}{\left(\frac{4}{10}\right)} \\&= \underline{\underline{\frac{3}{4}}}\end{aligned}$$

X_1 = Late Night Study {

X_2 = Regular Studies {

X_3 = Extra Curricular {

$$P(Y/X_1, X_2, X_3) = \frac{P(X_1, X_2, X_3/Y) \cdot P(Y)}{P(X_1, X_2, X_3)}$$