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SUB: ML

UNIT TEST I
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classmate
Date
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Q4.

SUPERVISED LEARNING	UNSUPERVISED LEARNING
→ supervised learning algorithm are trained using labled data	unsupervised learning algo. are trained using unlabled data.
→ It takes direct feedback to check if it is predicting correct output or not.	It does not take any feedback
→ In this input data is provided to model along with output	In this only input data is is provided to the model
→ It includes algo such as linear regression, logistic regression, etc.-	It includes algo such as clustering, KNN, and apriori algorithm

BAYESIAN BELIEF NETWORK

It is a graphical representation of different probabilistic relationships among random variable in a particular set.

It is a classifier with no dependency on attributes i.e. it is condition independents

Due to its feature of point probabity, the probability in bayesian belief network is derived based on condition - P(attribute/percent).

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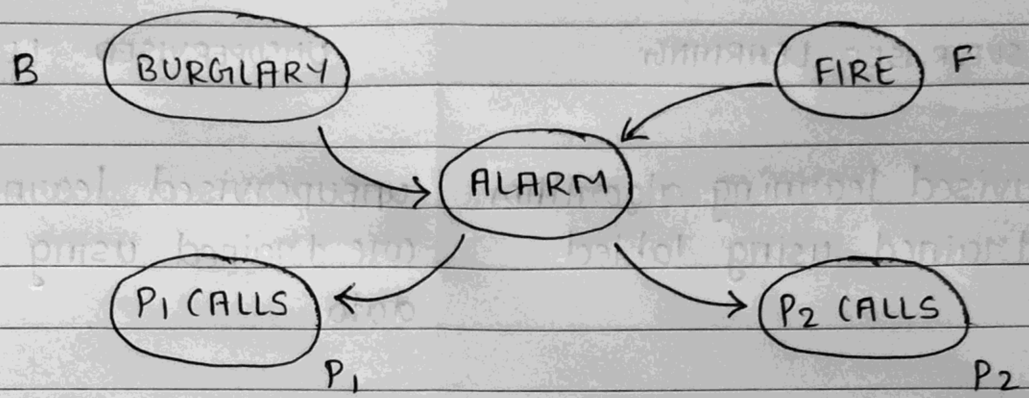

→ In figure, we have an alarm 'A' a node, say installed in house of person 'Rudra' which signs upon 2 probabilities i.e. burglary 'B' & fire 'F' which are parent nodes of the alarm node. The alarm is parent mode of 2 probability. P_1 calls 'P_1' & 'P_2' calls 'P_2' prson nodes.

→ Upon the instance of burglary & fire 'P_1' & 'P_2' call person 'Rudra'. But those are few drawbacks.

→ As sometimes 'P_1' may forget to call person 'Rudra', even after having the alarm.

→ Similarly 'P_2' sometimes fails to call the person 'Rudra' as he is only able to hear the alarm, from a certain distance.

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③

Q3. (a) sigmoid function $\sigma(x) = \frac{1}{1+e^{-x}}$

The derivative of sigmoid is

$$\frac{d\sigma(x)}{dx} = \frac{d}{dx}\left[\frac{1}{1+e^{-x}}\right]$$

$$= \frac{d}{dx}(1+e^{-x})^{-1}$$

$$= -(1+e^{-x})^{-2}(-e^{-x})$$

$$= \frac{e^{-x}}{(1+e^{-x})^2}$$

$$= \frac{1}{1+e^{-x}} \cdot \frac{e^{-x}}{1+e^{-x}}$$

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

$$= \frac{1}{1+e^{-x}}\left(\frac{1+e^{-x}}{1+e^{-x}} - \frac{1}{1+e^{-x}}\right)$$

$$= \frac{1}{1+e^{-x}}\left(1 - \frac{1}{1+e^{-x}}\right)$$

$$= \sigma(x).(1-\sigma(x))$$

GIVEN $\sigma(x) = 0.5$ $\rightarrow$ $0.5 = \frac{1}{1+e^{-x}}$

$\rightarrow$ $1+e^{-x} = 2$

$\rightarrow$ $e^{-x} = 1$

$\rightarrow$ $(-x) = \log_e 1$

$\rightarrow$ $\boxed{x = -\log_e 1}$

$x = 0$

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(b) A decision tree has many analysis in real life and turns out, it has infwencial a wide area of machine learning, covering both classification and regression

As the name goes, it uses tree-like model of decisions They can be used either to drive informal discussions or to map out an algorithm that predicts the best chance mathematically.

A decision tree typically starts with a single node, which branches into possible outcomes. Each of those outcomes leads to additional nodes, which branch off into other possibilities. this gives it a tree-like shape.

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Q1.

X	Y
72	84
50	63
81	77
74	78
94	90
86	75
59	49

X = unit test marks
Y = final exam marks

→ We know that linear regression hypothesis is:

$$h_\theta(x) = \theta_0 + \theta_1 x$$

Let's suppose it is $y = a + bx$

Using the method of least sequence:

$$\Sigma y = a\Sigma 1 + b\Sigma x \quad \text{--- (1)}$$
$$\Sigma xy = a\Sigma x + b\Sigma x^2 \quad \text{--- (2)}$$ multiply 1 by x

Calculating the parameters :-

$\Sigma x = 516$ $\quad$ $\Sigma x^2 = 39434$

$\Sigma y = 516$ $\quad$ $\Sigma xy = 39008$

$\therefore$ $7a + 516b = 516$

$516a + 39434b = 39008$

(we get this by substituting parameters in above eq^n)

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(a) On solving equations, we get

$a = 22.47 \qquad b = 0.695$

(b) Predicted final exam marks of the student who scored 85 in unit test can be calculated as :-

$$y(x) = \underset{[a/\theta_0]}{22.47} + \underset{[b/\theta_1]}{0.695}\, x$$

$$y(85) = 22.47 + (0.695 \times 85)$$
$$= 81.5$$

$$\underline{y(85) = 82}$$