CAE - 1

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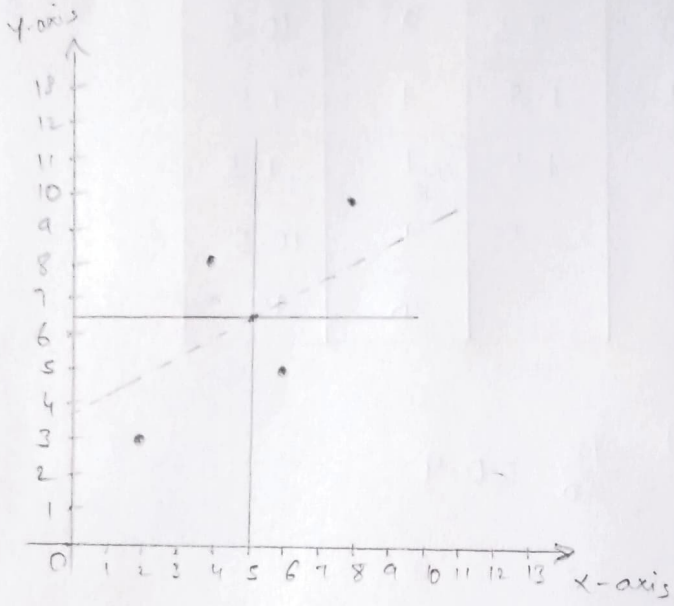
PART - B

(7)

a)



x	y
2	3
4	8
6	5
8	10

No, x and y do not seem to have linear relationship.

b)

straight line formula

$$\hat{y} = b_0 + b_1 x$$

$$b_1 = \frac{\Sigma (x - \bar{x})(y - \bar{y})}{\Sigma (x - \bar{x})^2}$$

x	y
2	3
4	8
6	5
8	10
5	6.5

$$\text{Mean}(x) = \frac{(2+4+6+8)}{4} = \frac{20}{4} = 5$$

$$\text{Mean}(Y) = \frac{(3+8+5+10)}{4} = \frac{25}{4} = 6.25$$

x	Y	$(x-\bar{x})$	$(Y-\bar{Y})$	$(x-\bar{x})^2$	$(x-\bar{x})(Y-\bar{Y})$
2	3	-3	-3.5	9	10.5
4	8	-1	1.5	1	-1.5
6	5	1	-1.5	1	-1.5
8	10	3	3.5	9	10.5
5	6.5			20	18

$$b_1 = \frac{\sum (x-\bar{x})(Y-\bar{Y})}{\sum (x-\bar{x})^2} = \frac{18}{20} = 0.9$$

$$\hat{y} = b_1 x + b_0 = 0.9x + b_0$$

At mean $(5, 6.5) \rightarrow b_0 = 6.5 - 0.9 * 5 = 2$

$$\boxed{\hat{y} = 0.9x + 2} \rightarrow \text{Model}$$

$\hat{y} = 0.9x + 2$

$x = 15$

$\hat{y} = 0.9(15) + 2$

$= 13.5 + 2$

$= 15.5$

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(9) $X = \{age = youth, Income = Medium, student = yes, Credit rate = Fair\}$

We need to maximize $P(X/C_i)P(C_i)$, for $i = 1, 2$. $P(C_i)$, the prior probability of each class, can be computed based on the training tuples:

$P(buys\_computer = yes) = 9/14 = 0.643$

$P(buys\_computer = no) = 5/14 = 0.357$

To compute $P(X/C_i)$, for $i = 1, 2$, we compute the following conditional probabilities:

$P(age = youth \mid buys\_computer = yes) = 2/9 = 0.222$

$P(age = youth \mid buys\_computer = no) = 3/5 = 0.6$

$P(income = medium \mid buys\_computer = yes) = 4/9 = 0.444$

$P(income = medium \mid buys\_computer = no) = 2/5 = 0.400$

P(student = yes | buys - computer = yes) = 6/9 = 0.667

P(student = yes | buys - computer = no) = 1/5 = 0.2

P(creditrate = fair | buys - computer = yes) = 6/9 = 0.667

P(creditrate = fair | buys - computer = no) = 2/5 = 0.4

P(X | buys - computer = yes) = P(age = youth | buys - computer = yes)
× P(age income = medium | buys - computer = yes)
× P(student = yes | buys - computer = yes)
× P(Creditrate = Fair | buys - computer = yes)

= 0.222 × 0.444 × 0.667 × 0.667

= 0.098568 × 0.444889

= 0.043851 81895 ≃ 0.044 //

similarly, for buys - computer = no.

= 0.600 × 0.400 × 0.200 × 0.400 = 0.019

P(X | buys - computer = yes) P(buys - computer = yes) = 0.044 × 0.643 = 0.028

P(X | buys - computer = no) P(buys - computer = no) = 0.019 × 0.357 = 0.007

Therefore, the naive bayesian classification predicts that buys - computer = yes for tuple X.

PART-A

① Types of Machine Learning

- → Supervised Learning
- → Unsupervised Learning
- → Transductive Learning
- → Active Learning
- → Reinforcement Learning
- → Self-supervised Learning
- → Inductive Learning
- → Deductive Learning
- → Semi-supervised Learning
- → Multi-task Learning

② The disadvantage of this method (Cross fold validation) is that the training algorithm has to be rerun from scratch k times, which means it takes k times as much computation to make an evaluation. A variant of this method is to randomly divide the data into a test and training set k different times.

③ Underfitting can be defined as the difference between the expected ~~and~~ prediction of the model and the correct value which we are trying to predict. Underfitted models are forced to make a lot of assumptions which can cause inaccurate prediction. This is also known as bias.

(4) LDA is a supervised classification technique that is considered a part of crafting competitive machine learning models. This category of dimentionality reduction is used in areas such as image recognition and predictive analysis in marketing.

(5) Naive Bayes (NB) is 'naive' because it makes the assumption that features of a measurement are independent of each other. This is naive because it is never true. NB is a very intuitive classification of algorithm. Now, instead we make the naive assumptions that all features are independent of each other.