Data Science & Artificial Intelligence

Machine Learning

Bayesian Learning
Discussion Notes

DPP- 01

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[MCQ]

#Q. Assume P(A)=0.2, P(B)=0.6, P(A U B)=0.5, Then P[A|B]=

A 0.2

B 0.3

C 0.6

D 0.5

Conditional Probability formula

$P(A|B) = P(A \cap B) / P(B)$

Inclusion exclusion principle $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$\Rightarrow 0.2 + 0.6 - P(A \cap B)$

$P(A \cap B) = 0.3$

$P(A|B) = 0.3 / 0.6 = 0.5$

[MCQ]

#Q. Match List-I with List-II

	List-I		List-II
A.	Bayer' Theorem	I.	$P(\bar{E}) = 1 - P(E)$
B.	Conditional Probability	II.	$P(E_1 \cup E_2) = P(E_1) + P(E_2)$
C.	Theorem of complementary	III.	$P(E_2/E_1) = \frac{P(E_1 \cap E_2)}{P(E_1)}$
D.	Theorem of addition	IV.	$P(H_i/E) = \frac{P(H_i \cap E)}{P(E)}$

Choose the correct answer from the options given below:

A. A-I, B-IV, C-III, D-II

B. A-III, B-IV, C-II, D-I

C. A-III, B-IV, C-I, D-II

D. A-IV, B-III, C-I, D-II

[NAT]

$\frac{6}{10} \times \frac{8}{10} \Big/ \left(\frac{6}{10} \cdot \frac{8}{10} + \frac{4}{10} \cdot \frac{4}{10}\right) = 4/7$

#Q. A bike manufacturing factory has two plants P and Q. Plant P manufactures 60 percent of bikes and plant Q manufacture 40 percent. 80 percent of the bikes at plant P and 90 percent of the bikes at plant Q are rated of standard quality. A bike is chosen at random and is found to be of standard quality. What is the probability that it has come from plant P?

Bayes theorem

$E_1, E_2 \dots E_n$

$$P(E|A) = \frac{P(E) \times P(A|E)}{\sum_{i=1}^{n} P(E) \times P(A|E_i)} \Rightarrow i = 1 \dots 2n$$

$$P(E_1|A) = \frac{P(E_1) \times P(A|E_1)}{\sum_{i=1}^{n} P(E_1) \times P(A|E_i)}$$

$$P(E_1|A) = \frac{P(E_1) \cdot P(A|E_1)}{P(E_1) \cdot P(A|E_1) + P(E_2) \times P(A|E_2)}$$

$P(E_1) = \frac{60}{100} = 0.6$

$P(E_2) = \frac{40}{100} = 0.4$

$P(A|E_1) = \frac{80}{100} = 0.8$

$P(A|E_2) = 0.9$

[MCQ]

#Q. The chance of a defective screw in three boxes A, B, C are $\frac{1}{5}, \frac{1}{6}$ and $\frac{1}{7}$ respectively. A box is selected at random and a screw drawn from it at random is found to be defective. Find the probability that it came from box A.

A $\frac{42}{107}$

B $\frac{28}{107}$

C $\frac{45}{107}$

D $\frac{66}{107}$

$\frac{\frac{1}{3} \times \frac{1}{5}}{\frac{1}{3} \times \frac{1}{5} + \frac{1}{3} \times \frac{1}{6} + \frac{1}{3} \times \frac{1}{7}}$

$= \frac{42}{107}$

$P(E_1) = P(E_2) = P(E_3) = \frac{1}{3}$.

$P(A|E_1) = \frac{1}{5}$

$P(A|E_2) = \frac{1}{6}$

$P(A|E_3) = \frac{1}{7}$

[MCQ]

#Q. Which of the following best describes Bayesian Learning?

A. It is a type of machine learning that relies on probabilistic inference.

B. It is a type of supervised learning that uses decision trees.

C. It is a type of unsupervised learning that uses clustering.

D. It is a type of reinforcement learning that uses reward systems.

[MCQ]

#Q. In Bayesian learning, the term P(H|D) represents:

A. The prior probability of the hypothesis.

B. The likelihood of the hypothesis given the data.

C. The posterior probability of the hypothesis given the data.

D. The marginal likelihood of the hypothesis.

P(H|D) Update - belief about - hypothesis after observing the data.

THANK - YOU