CS-559: Machine Learning

Homework-1

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Answers

Problem 1: Probability

1) The probability of select a student majored in CS.

A:-

Let S1 be the event of selecting Session 1
Let S2 be the event of selecting Session 2
Let S3 be the event of selecting Session 3
Let A be the event of selecting a student majored in CS.

Given, $P(S1) = 0.2$
$P(S2) = 0.2$
$P(S3) = 0.6$

Using total probability theorem,

$$P(A) = P(S1).P(A|S1) + P(S2).P(A|S2) + P(S3).P(A|S3)$$
$$= 0.2 \times 6/20 + 0.2 \times 10/20 + 0.6 \times 6/20$$
$$= 0.06 + 0.1 + 0.18$$

$$\boxed{P(A) = 0.34}$$

Therefore, the probability of selecting a student majored in CS is 0.34.

2) If we know that the selected student is from STAT what is the probability that the student comes from session 3?

A: Let A : event that the student comes from session 3
B: event the selected student is from STAT.

Using Bayes Theorem,

$$P(A|B) = \frac{P(B|A).P(A)}{P(B)} \quad \text{---} \quad (1)$$

Where $P(B) = P(S1).P(B|S1) + P(S2).P(B|S2) + P(S3).P(B|S3)$

$$\therefore P(B) = 0.2 \times 8/20 + 0.2 \times 10/20 + 0.6 \times 6/20$$

$$= 0.08 + 0.1 + 0.18$$

$$\boxed{P(B) = 0.36}$$

Substituting in equation 1,

$$P(A|B) = \frac{6/20 \times 0.6}{0.36} = \frac{0.3 \times 0.6}{0.36}$$

$$\therefore \boxed{P(A|B) = 0.5}$$

Therefore, the probability of selected student is from ~~STAT~~ session 3, given that he is majored in STAT is 0.5