CSE 5525 Homework 1: Probability Review

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1 Joint and Marginal Probabilities

Assume the following joint distribution for $P(A, B)$:

$$
\begin{aligned}
P(A = 0, B = 0) &= 0.1 \\
P(A = 0, B = 1) &= 0.3 \\
P(A = 1, B = 0) &= 0.5 \\
P(A = 1, B = 1) &= 0.1
\end{aligned}
$$

(a) What is the marginal probability of $P(B = 0)$?

(b) What is $P(A = 1|B = 0)$?

(c) What is $P(A = B)$?

2 Independence

Assume X is conditionally independent of Y given Z. Which of the following statements are always true?

(a) $P(X, Y) = P(X) + P(Y) - P(Z)$

(b) $P(X, Y, Z) = P(X) + P(Y) + P(Z)$

(c) $P(X, Y) = \sum_{c \in \mathcal{X}_Z} P(X, Y, Z = c)$

(d) $P(X, Y|Z) = P(X|Z)P(Y|Z)$

(e) $P(X, Y) = P(X)P(Y)$

3   Bayes Rule

Derive Bayes Rule in the form:

$$P(A|B) = \frac{P(B|A)P(A)}{P(B)}$$

from the definition of conditional probability:

$$P(A, B) = P(A|B)P(B)$$

4   Survey

(a) What is your favorite programming language?

(b) What programming languages do you feel comfortable using?

(c) What are you hoping to get out of this class?