Homework 4: Classification

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10/08/2022

1. **Estimate the conditional probabilities for P (A|+), P (B|+), P (C|+), P (A|−), P (B|−),P (C|−).**
    a. P(A/+) = (5/7)
    b. P(B/+) = 1/7
    c. C(C/+) = 6/7
    d. P(A/-) = 0/3
    e. P(B/-) = ⅔
    f. P(C/-) = 3/3
2. **Use the estimate of conditional probabilities given in the previous question to predict the class label for a test sample (A=0, B=1, C=0) using the naive Bayes approach. Work out the solution manually and show the detailed manual calculation steps.**
    P(X/+) = (2/7) * (1/7) * (1/7) = 0.00583
    P(X/-) = (3/3) * (2/3) * (3/3) = 0.66666
    P(X/+) * P(+) ___ P(X/-)*P(-)
    (2/343) * (7/10) ___ (2/3) * (3/10)
    (14/3430) < (2/10) → Class = -

3. **Estimate the conditional probabilities using the m-estimate approach, with p = ½ m = 4.**
    a. P(A/+) = (5+2/7+4) = 7/11
    b. P(B/+) = 1+2/7+4 = 3/11
    c. C(C/+) = 6+2/7+4 = 8/11
    d. P(A/-) = 0+2/3+4 = 2/7
    e. P(B/-) = 2+2/3+4 =4/7
    f. P(C/-) = 3+2/3+4 = 5/7