ENGG 319, L03
Thursday, 29 September 2016

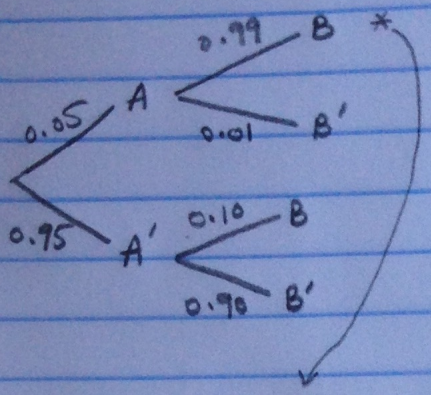
Name: _____ Student's ID: _____

1. There may be a flying aeroplane up in the sky. From experience, you know there is a 5% chance that there is an aeroplane up there. A specific kind of radar is available that can detect an object if there is an aeroplane flying with 99% probability. If there is no aeroplane in the sky, the radar may still register something (false alarm) with 10% chance.

   A. What is the probability that the radar registers something and there is actually an aeroplane up in the sky?
   B. What is the probability that there is actually a plane in the sky if the radar detects something?

2. A, B, and C are three events such that A and C are mutually exclusive. If P(A) = 0.4, P(B) = 0.3, P(A ∩ B) = 0.1, P(B ∩ C') = 0.2, and P(A ∪ B ∪ C) = 0.9, what is the probability of C?

1) A: The event of flying an aeroplane.
B: The radar detects something



a) $P(B \cap A) = P(A) \cdot P(B|A) = 0.05 \times 0.99 = 0.0495$

b) $P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{0.0495}{P(B \cap A) + P(B \cap A')} = \frac{0.0495}{0.0495 + 0.95 \times 0.10}$

$= \frac{0.0495}{0.1445} = \underline{\underline{0.342}}$

2) Additivity rule:

$P(A \cup B \cup C) = P(A) + P(B) + P(C) - P(A \cap B) - P(B \cap C) - P(A \cap C) + P(A \cap B \cap C)$

$0.9 \quad 0.4 \quad 0.3 \quad 0.1 \quad 0 \quad 0$

Since A & C are mutually exclusive

$P(B) = P(B \cap C) + \underbrace{P(B \cap C')}_{P(B-C) = P(B \cap C')} \Rightarrow P(B \cap C) = 0.3 - 0.2 = 0.1$

$\Rightarrow P(C) = 0.9 - 0.4 - 0.3 + 0.1 + 0.1 = \underline{\underline{0.4}}$