Assignment

Barath surya M — EE22BTECH11014

Question 11.16.3.11

The accompanying venn diagram shows three events, A, B and C, and also the probabilities of the various intersections (for instance, $\Pr(AB) = 0.7$. Determine

1) $\Pr(A)$
2) $\Pr(BC')$
3) $\Pr(A + B)$
4) $\Pr(AB')$
5) $\Pr(BC)$
6) Probability of exactly one of the three occurs

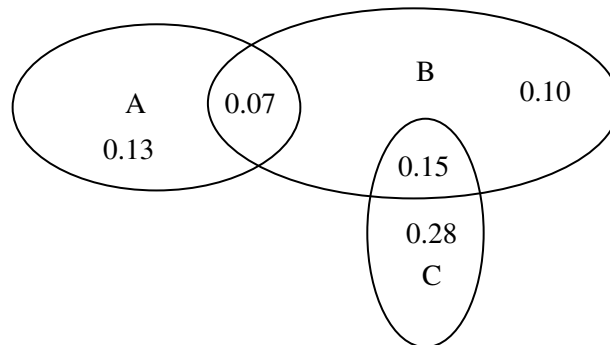Fig. 1: generated by Latextikz

Solution:

1)

$$\Pr(A) = 0.13 + 0.07 \tag{1}$$
$$= 0.2 \tag{2}$$

2)

$$\implies B = B(C + C') \tag{3}$$
$$\implies \Pr(B) = \Pr(BC + BC') \tag{4}$$
$$= \Pr(BC) + \Pr(BC') - \Pr(BCC') \tag{5}$$
$$= \Pr(BC) + \Pr(BC') \tag{6}$$
$$\Pr(BC') = \Pr(B) - \Pr(BC) \tag{7}$$
$$= 0.07 + 0.10 + 0.15 - 0.15 \tag{8}$$
$$= 0.17 \tag{9}$$

3)

$$\Pr(A + B) = \Pr(A) + \Pr(B) - \Pr(AB) \tag{10}$$
$$= 0.20 + (0.07 + 0.10 + 0.15) - 0.07 \tag{11}$$
$$= 0.45 \tag{12}$$

4)

$$\implies A = A(B + B') \tag{13}$$
$$\implies \Pr(A) = \Pr(AB + AB') \tag{14}$$
$$= \Pr(AB) + \Pr(AB') - \Pr(ABB') \tag{15}$$
$$= \Pr(AB) + \Pr(AB') \tag{16}$$
$$\Pr(AB') = \Pr(A) - \Pr(AB) \tag{17}$$
$$= 0.20 - 0.07 \tag{18}$$
$$= 0.13 \tag{19}$$

5)

$$\Pr(BC) = 0.15 \tag{20}$$

6)

$$\Pr(\text{exactly one of the 3 occurs}) = 0.13 + 0.10 + 0.28 \tag{21}$$
$$= 0.51 \tag{22}$$