11.16.4.7.2

EE24BTECH11029 - J SHRETHAN REDDY

Question:
A and B are two events such that $P(A) = 0.54, p(B) = 0.69$ and $P(A \cap B) = 0.35$. Find $P(A' \cap B')$
Solution:

Theoretical Solution:

$$\Pr(A + B) = \Pr(A) + \Pr(B) - \Pr(AB) \tag{0.1}$$

We will start by representing A and B using Boolean algebra methods:

$$A = AB + AB' \tag{0.2}$$
$$B = AB + A'B \tag{0.3}$$
$$\Pr(A) = \Pr(AB) + \Pr(AB') \tag{0.4}$$
$$\Pr(B) = \Pr(AB) + \Pr(A'B) \tag{0.5}$$

On adding (12) and (13),

$$A + B = AB + AB + AB' + A'B \tag{0.6}$$
$$A + B = AB + AB' + A'B \tag{0.7}$$
$$\Pr(A + B) = \Pr(AB + AB' + A'B) \tag{0.8}$$
$$\Pr(A + B) = \Pr(AB) + \Pr(AB') + \Pr(A'B) \tag{0.9}$$
$$\Pr(A + B) = \Pr(AB) + \Pr(A) - \Pr(AB) + \Pr(B) - \Pr(AB) \tag{0.10}$$
$$\implies \Pr(A + B) = \Pr(A) + \Pr(B) - \Pr(AB) \tag{0.11}$$

Using the given values of $\Pr(A), \Pr(B)$ and $\Pr(AB)$,

$$\Pr(A + B) = 0.54 + 0.69 - 0.35 \tag{0.12}$$
$$\Pr(A + B) = 0.88 \tag{0.13}$$
$$\Pr(A'B') = \Pr(A + B)' \text{ (demorgan's law)} \tag{0.14}$$
$$\Pr(A'B') = 1 - \Pr(A + B) \tag{0.15}$$
$$= 1 - 0.88 \tag{0.16}$$
$$= 0.12 \tag{0.17}$$

Therefore, the value of $\Pr(A'B')$ is 0.12.

plot for

$$\Pr(A+B) = \Pr(A) + \Pr(B) - \Pr(AB) \tag{0.18}$$

$$\Pr(A'B') = \Pr(A+B)' \text{ (demorgan's law)} \tag{0.19}$$

$$= 1 - \Pr(A+B) \tag{0.20}$$

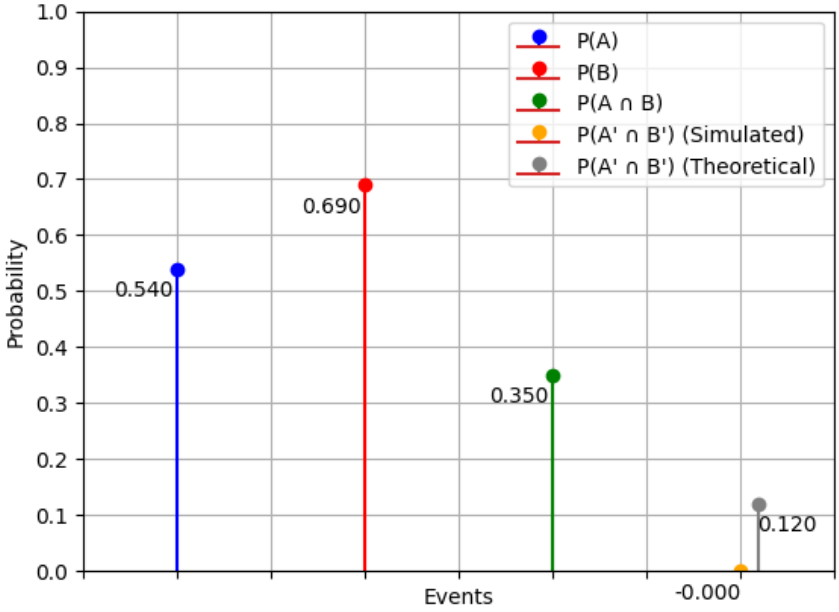

Fig. 0.1: PMF