

11.16.3.16

EE24BTECH11021 - Eshan Ray

Question: Events E and F are such that $P(\text{not } E \text{ or not } F) = 0.25$, State whether E and F are mutually exclusive.

Solution:

Theoretical Solution:

Given,

$$P(E' + F') = 0.25 \quad (0.1)$$

Using De-Morgan's Law, we get,

$$(E' + F')' = (EF) \quad (0.2)$$

$$P((E' + F')) = P(EF) \quad (0.3)$$

$$P(EF) = 1 - P(E' + F') \quad (0.4)$$

$$P(EF) = 0.75 \neq 0 \quad (0.5)$$

Since, $P(EF) \neq 0$ proving that the events E and F are not mutually exclusive.

Computational Solution:

Let X_1 be an indicator random variable of the event $(E' + F')$.

X_1 is defined as:

$$X_1 = \begin{cases} 1, & (E' + F') \\ 0, & (E' + F')' = EF \end{cases} \quad (0.6)$$

The PMF of the random variable X_1 is:

$$p_{X_1}(n) = \begin{cases} p_1, & n = 1 \\ 1 - p_1, & n = 0 \end{cases} \quad (0.7)$$

where,

$$p_1 = 0.25 \quad (0.8)$$

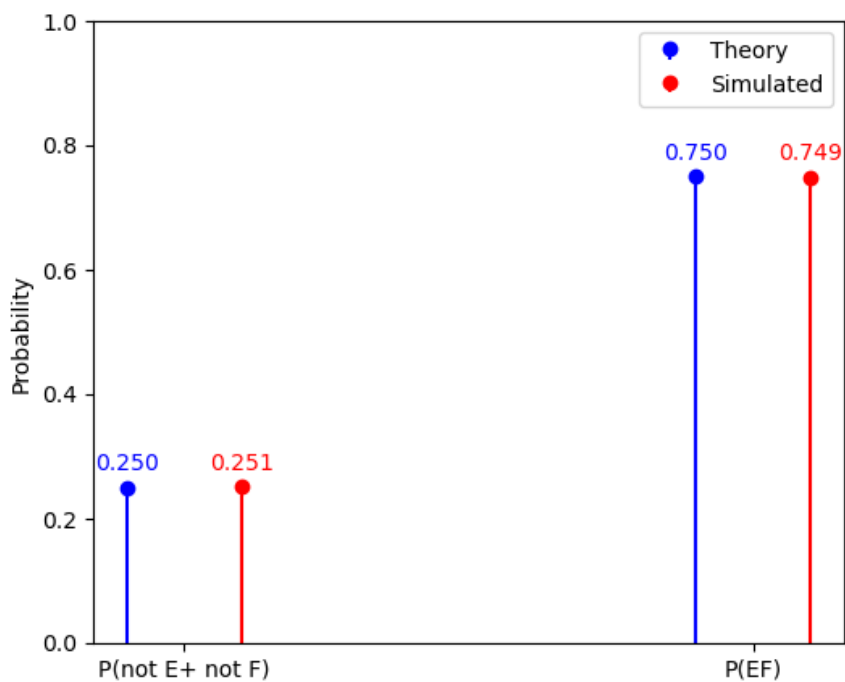


Fig. 0.1: Theoretical vs Simulation