Assignment 1
Ncert Exampler

Rajeev Kumar
EE22BTECH11042

I. Question 10.13.2.10

I toss three coins together. The possible outcomes are no heads, 1 heads, 2 heads and 3 heads. So, Isay that probability of no heads is 1/4. What's wrong with this conclusion

Solution:

Let, X_i be the sequence of independent Bernoulli random varibles

$$X_i = \begin{cases} 1, & \text{Heads} \\ 0, & \text{Tails} \end{cases} \tag{1}$$

and X be summation of all sequences

$$X = \sum_{0}^{n} X_i \tag{2}$$

which means,

$$p_X(k) = \begin{cases} \frac{1}{2} & = p \quad k = 1 \\ \frac{1}{2} & = q \quad k = 0 \end{cases} \tag{3}$$

For number of trials be n and the pmf of getting k heads is given by:

$$p_X(k) = {}^{n}C_k (p)^k (q)^{n-k} \tag{4}$$

$$= {}^{n}C_k (0.5)^k (0.5)^{n-k} \tag{5}$$

Using the above equation, for $n = 3$ and $k = 0$:

$$p_X(0) = {}^{3}C_0 (0.5)^3 (0.5)^0 \tag{6}$$

$$= \left(\frac{3!}{(3-0)!\,(0)!}\right)(0.5)^3 \tag{7}$$

$$= \left(\frac{3!}{3!}\right)\left(\frac{1}{8}\right) \tag{8}$$

$$= \frac{1}{8} \tag{9}$$

Hence, the given statement is wrong$\left(\because \frac{1}{8} \neq \frac{1}{4}\right)$