AI1110 Assignment 1

Indian Institute of Technology, Hyderabad

EE22BTECH11208

Gargi Behera

Question: 10.13.2.12 An experiment succeeds twice as often as it fails. Find the probability that in the next six trials, there will be atleast 4 successes.

Solution:
Given that probability of failure = x
The probability of success = $2x$

$$\therefore x + 2x = 1 \tag{1}$$
$$\implies 3x = 1 \tag{2}$$
$$\implies x = \frac{1}{3} \tag{3}$$
$$\therefore 2x = \frac{2}{3} \tag{4}$$

Let X be the random variable that represents the number of trials.
Hence, by binomial distribution, we have

$$P(X = x) = {}^{n}C_{x} p^{n-x} q^{x}$$

$\therefore$ Probability of having at least 4 successes

$$= P(X \geq 4) \tag{5}$$
$$= P(X = 4) + P(X = 5) + P(X = 6) \tag{6}$$
$$= {}^{6}C_{4} \frac{1}{3}^{2} \frac{2}{3}^{4} + {}^{6}C_{5} \frac{1}{3} \frac{2}{3}^{5} + {}^{6}C_{6} \frac{2}{3}^{6} \tag{7}$$
$$= \frac{15 \times 2^4}{3^6} + \frac{6 \times 2^5}{3^6} + \frac{2^6}{3^6} \tag{8}$$
$$= \frac{31 \times 2^6}{3^6} \tag{9}$$
$$= \frac{31}{9}(\frac{2}{3})^4 \tag{10}$$
$$= 0.68 \tag{11}$$