AI1110 Assignment 1

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EE22BTECH11208

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Question: 12.13.6.9 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 = $2x$

$$\therefore x + 2x = 1$$

$$\implies 3x = 1$$

$$\implies x = \frac{1}{3}$$

$$\therefore 2x = \frac{2}{3}$$

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

$$= P(X \geq 4)$$

$$= P(X = 4) + P(X = 5) + P(X = 6)$$

$$= {}^{6}C_{4} \frac{1}{3}^{2} \frac{2}{3}^{4} + {}^{6}C_{5} \frac{1}{3} \frac{2}{3}^{5} + {}^{6}C_{6} \frac{2}{3}^{6}$$

$$= \frac{15 \times 2^4}{3^6} + \frac{6 \times 2^5}{3^6} + \frac{2^6}{3^6}$$

$$= \frac{31 \times 2^6}{3^6}$$

$$= \frac{31}{9}(\frac{2}{3})^4$$

$$= 0.68$$