Assignment 7

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Question : Suppose there are r successes in n independent Bernoulli trials. Find the conditional probability of a success on the ith trial.

Solution :

Let us assume events A and B such that :
A= r successes in n Bernoulli trials
B=success at the ith Bernoulli trial
C= $r-1$ successes in the remaining $n-1$ Bernoulli trials excluding the ith trial

$$P(A) = \binom{n}{r} p^r q^{n-r} \tag{1}$$

$$P(B) = p \tag{2}$$

$$P(C) = \binom{n-1}{r-1} p^{r-1} q^{n-r} \tag{3}$$

So the conditional probability of a success on the ith trial ,

$$P(B|A) = \frac{P(AB)}{P(A)} \tag{4}$$

$$= \frac{P(BC)}{P(A)} \tag{5}$$

$$= \frac{P(B)P(C)}{P(A)} \tag{6}$$

$$\implies P(B|A) = \frac{r}{n} \tag{7}$$