Assignment 8-Probability and Random Variable

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Download latex code from here-

https://github.com/annu100/AI5002−Probability−and−Random−variables/tree/main.tex/ASSIGNMENT_8

Download python code from here-

https://github.com/annu100/AI5002−Probability−and−Random−variables/tree/main.py/ASSIGNMENT_8

I. Problem Statement-Problem 6.18

If P(A) $=\frac{7}{13}$, , P(B) $=\frac{9}{13}$ and P(A $\cap$ B) = $\frac{4}{13}$. Evaluate $P(A|B)$? Simulation part - Also generate random variables according to 2 given probabilities and using simulated probabilities ,calculate $P(A|B)$ and cross check with actual result of $P(A|B)$ using baye's theoram formula.

II. SOLUTIONS

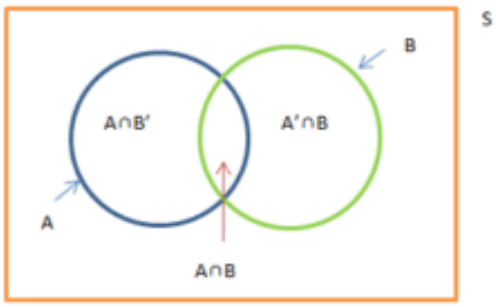
A. Probability calculation

We know that for independent random variables,multiplication of probability 2 random variables must be equal to multiplication of individual probability of those random variables. P(A) $=\frac{7}{13}$ P(B) $=\frac{9}{13}$ P(A $\cap$ B) $=\frac{4}{13}$ From baye's theoram ,we know that $P(A|B) = \frac{P(A\cap B)}{P(B)}$

$$P(A|B) = \frac{P(A \cap B)}{P(B)} \tag{1}$$

$$= \frac{(\frac{4}{13})}{(\frac{9}{13})} \qquad = \frac{4}{9} \tag{2}$$

Therefore,$P(A|B) = \frac{4}{9}$



B. Simulation using Random variables geeneration

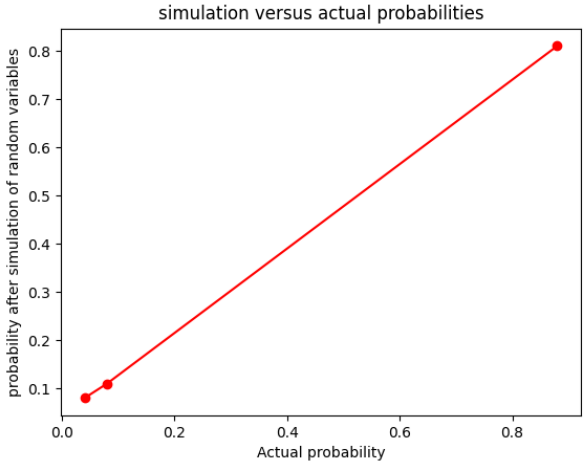
Now generating numtrials=100 samples according to 2 given probability distribution described in above table.
Generated samples according to the probability distribution is

['1', '0', '1', '0', '1', '1', '1', '0', '0', '0', '1', '0', '0', '1', '1', '1', '0', '0', '0', '0', '1', '1', '1', '0', '0', '0', '0', '1', '0', '1', '1', '1', '1', '1', '0', '1', '1', '0', '1', '1', '1', '1', '1', '1', '0', '1', '1', '1', '0', '0', '1', '1', '0', '1', '1', '0', '0', '0', '1', '1', '1', '0', '0', '1', '1', '1', '0', '0', '0', '1', '1', '0', '0', '0', '1', '0', '0', '0', '1', '1', '1', '0', '0', '1', '1', '0', '0', '0', '1', '1', '1', '0', '1', '1', '0', '0', '0', '0', '0', '0']

C. Simulation using Random variables generation Results

simulation versus actual probabilities
Actual probabilities i.e P(A),P(B)are [0.5384615384615384, 0.6923076923076923]
simulation probabilities are given by

Probability for X=0 i.e P(A)is 0.48
Probability for X=1 i.e P(B)is 0.52
simulation versus actual probabilities for $P(A|B)$
simulated prob is i.e $P(A|B)$ 0.591715976331361
using baye"s probabilities i.e P(A/B)is 0.4444444444444445



We can increase the number of samples in order to get more appropriate results.Here, graph is linear which is implying same i. e simulated and actual probability More linear implies more appropriate result.