Assignment 7-Probability and Random Variable

Annu-EE21RESCH01010

Download latex code from here-

https://github.com/annu100/AI5002−Probability−and−Random−variables/tree/main/ASSIGNMENT_7

download python code from here

https://github.com/annu100/AI5002−Probability−and−Random−variables/blob/main/ASSIGNMENT_5/assignment_7.py

I. Problem Statement-Problem 6.10

Let E and F be events with P(E) $=\frac{3}{5}$, P(F) $=\frac{3}{10}$ and P(E $\cap F$) $=1_{\overline{5}}$. Are E and F independent? Simulation part - Also generate random variables according to normal distribution and check sum of 2 random variables is also normal.

II. SOLUTIONS

A. Probability calculation

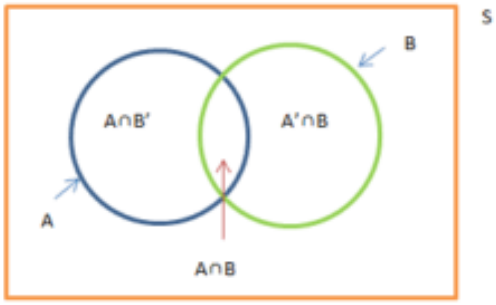
We know that for independent random variables,multiplication of probability 2 random variables must be equal to multiplication of individual probability of those random variables. P(E) $=\frac{3}{5}$ P(F) $=\frac{3}{10}$ P(E $\cap F$) $=1_{\overline{5}}$

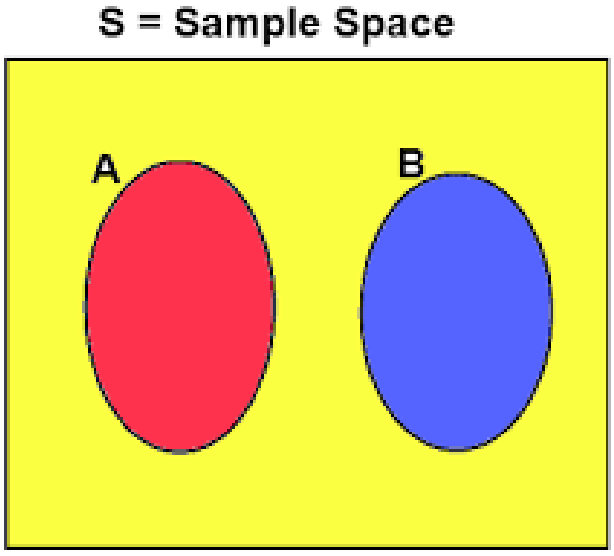
$$letX = P(E) * P(F) \tag{1}$$

$$= \frac{3}{5} * \frac{3}{10} \tag{2}$$

But from above results,X is not equal to P(E $\cap F$).

Therefore, E and F are not independent random variables. It can be verified using figure as well.Figure is attached for understanding only.

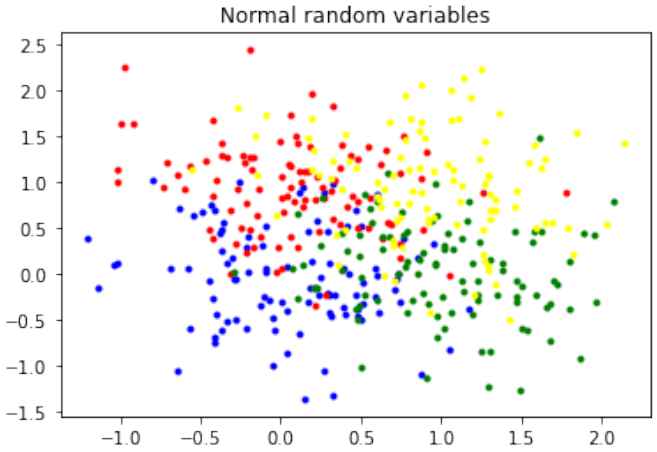


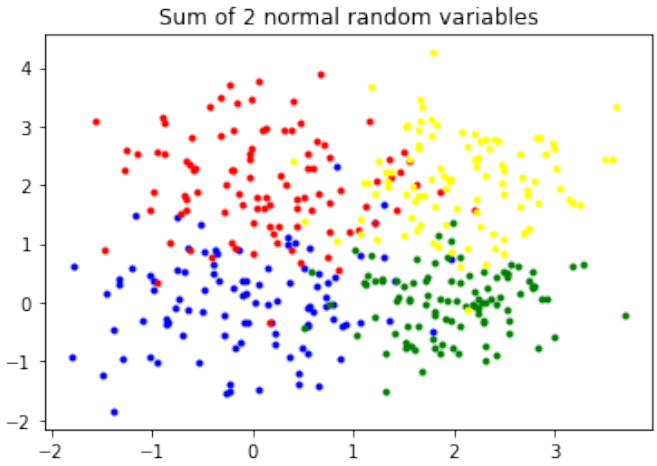


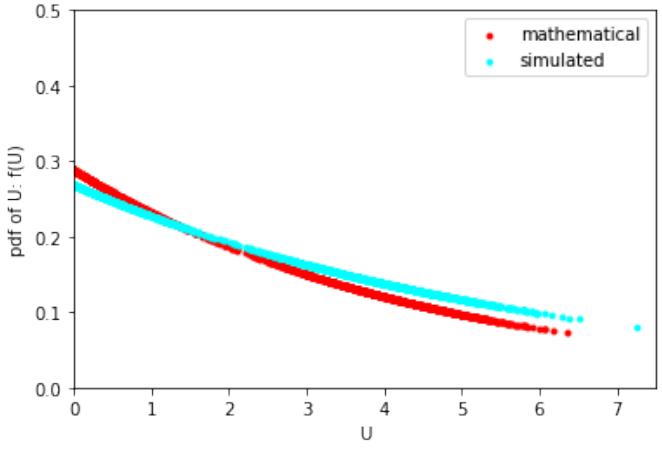
B. Gaussian Random numbers generation

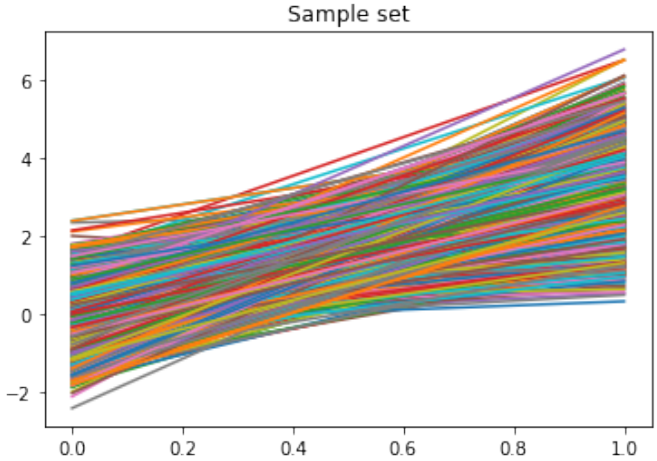
let sample size is 1000 Approach is first generated multivariate gaussian random variables and also data set is generated and then using the formula and generation concept is used for sum of 2 random variables as well. Then graph is made for simulated as well as theoritical and it is colliding with 1000 random numbers generation

U is here sum of 2 gaussian random variables. we can see that sum of 2 gaussian random variables is









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