भारतीय प्रौद्योगिकी संस्थान हैदराबाद
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Random Numbers

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Contents

***Abstract*—This manual provides a simple introduction to various concepts in optimization.**

1 Uniform Random Numbers

Let U be a uniform random variable between 0 and 1.

1.1 Generate 10^6 samples of U using a C program and save into a file called uni.dat .

1.2 Load the uni.dat file into python and plot the empirical CDF of U using the samples in uni.dat.

1.3 Verify that your CDF in the above problem is correct by plotting the theoretical $F_U(x)$.

1.4 The mean of a random variable U is defined as

$$E[U] = \frac{1}{N}\sum_{i=1}^{N} U_i \tag{1.1}$$

and its variance as

$$\text{var}[U] = E[U - E[U]]^2 \tag{1.2}$$

Find the mean and variance of U. How would you obtain it theoretically?

1.1 Central Limit Theorem

1.5 Generate $U_i, i = 1, 2, \ldots, 12$, a set of independent uniform random variables between 0 and 1 using a C program.

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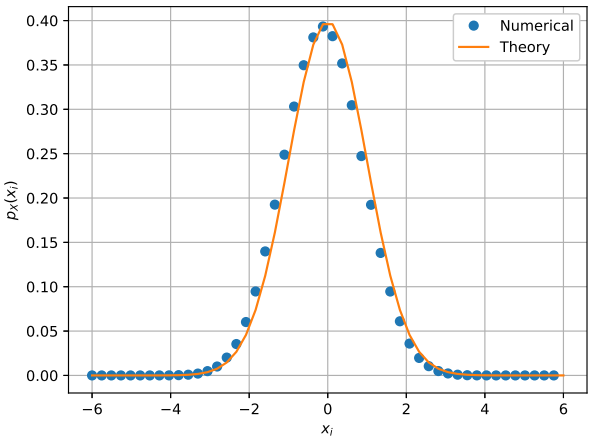

Fig. 1.8: The PDF of X

1.6 Generate 10^6 samples of the random variable

$$X = \sum_{i=1}^{12} U_i - 6 \tag{1.3}$$

and save in a file called gau.dat

1.7 Load gau.dat in python and plot the empirical CDF of X using the samples in gau.dat. What properties does a CDF have?

1.8 Load gau.dat in python and plot the empirical PDF of X using the samples in gau.dat. What properties does the CDF have?

Solution:

https://github.com/gadepall/EE1390/raw/master/manuals/supervised/linear_class/codes/1.4.py

1.9 Find the mean and variance of X

1.2 From Uniform to Other

1.10 Generate samples of

$$V = -2\ln(1 - U) \tag{1.4}$$

and plot its CDF. Comment.