MSPA 400: Session 9 Python

Reading

Think Python 2nd Edition Chapter 12 (12.1-12.9)

Think Python 3rd Edition Chapter 12 (pages 135-144)

Module 1

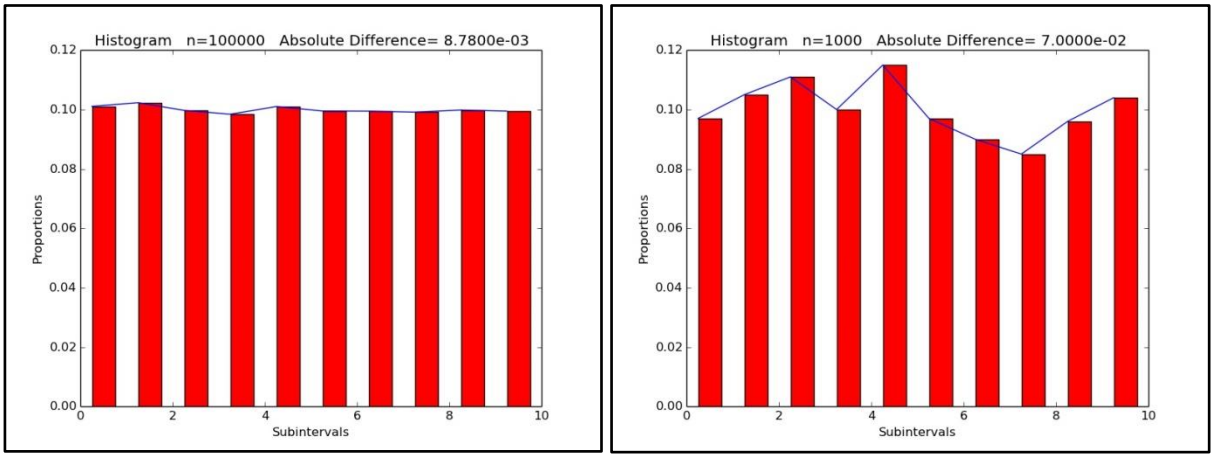
(Session 9 Module 1.py)

Objectives:

1. Show convergence of a sample distribution to a uniform distribution.
2. Demonstrate generation of random numbers.
3. Illustrate the use of Python dictionaries to plot histograms.

   (Since a random sample is being drawn students will be asked to write the code to calculate the mean value.)

Output from Module 1.py: (Plots will vary depending on sample size and particular random numbers.)



Exercises:

1. Generate a series of plotted histograms using the code. Generate five plots using nsample values increasing by powers of ten: 100, 1000, 10000, 100000, 1000000. Calculate the sample mean value and absolute difference for each plot. Evaluate the changes in absolute difference and mean values as the sample size increases. When computing the sample mean value, use the dictionary histogram[] and the ind array. The ind array needs to be centered within each subinterval. (Hint: add 0.5)

2. Add code to estimate the sample variance for each random sample. For simplicity, calculate the sum of the following terms: histogram[k]*(ind[k]-mean)**2. In the limit as nsamples approaches infinity, for sample data grouped in subintervals centered at 0.5, 1.5, ..., 8.5, 9.5, the limiting value is 8.25. Do you see convergence?

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Module 2

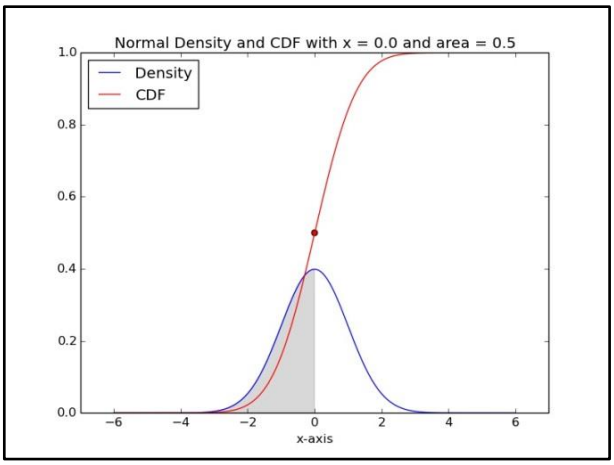
(Session 9 Module 2.py)

Objectives:

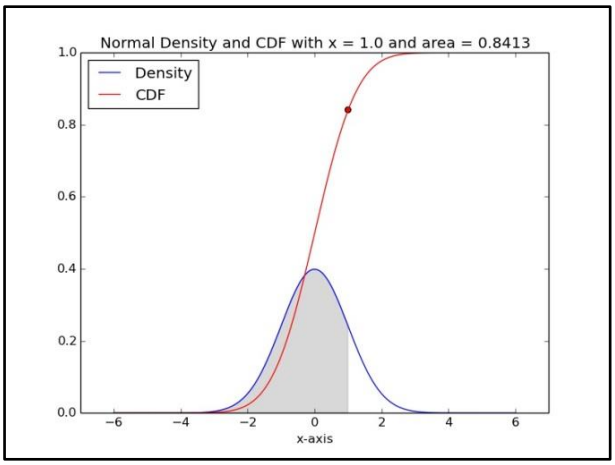
1. Use numerical integration to demonstrate the connection between the normal density function and the cumulative distribution function or cdf.
2. Use the program to verify calculations shown in Lial.

Output from Module 2.py

The code requires the user to specify a value for a normal random variable. This number must be entered at the prompt. Values specified are shown on the resulting plots.



Value of the variable x for integration=? 0
Area with x= 0.0 equals 0.5



Value of the variable x for integration=? 1
Area with x= 1.0 equals 0.841

Exercises:

1. Refer to Lial Chapter 18 Section 18.3. Reproduce the results shown in Example 3(c).

2. Refer to Lial Chapter 18 Section 18.3. Reproduce the results in Example 4 part(a).