Week 10 : Continuous probability distribution Lab

Importing Library: Numpy

(From Last week's Lab, you can find more information about **"NumPy"** library).

NumPy is the fundamental Python library for numerical computing.

[ ]

import numpy as np

Importing Library: SciPy

(From Last week's Lab, you can find more information about **"SciPy"** library).

**SciPy** stands for Scientific python. For some statistical calculation we do need Scipy e.g, during last week, you have used stats from Scipy to calculate "Mode".

[ ]

from scipy import stats

Importing Library: Math

**Math** is a library you can apply for performing mathematical tasks by using different Math methods in this library.

[ ]

import math as mt

Importing Library: Random

Python has a built-in library **random** which can be used for generating random numbers/values

[ ]

import random as rnd

Generating Normal Distribution:

We will now see how we can generate a Normal Distribution and we will find the PDF, CDF and other statistical measures using Stats function from SciPy library. Here, we will also use Math library fr some mathematical calculation.

Following is an example code given, for function norm(μ=3,σ2=16), where, μ is the mean and σ2 is the Variance. In theory we can use Variance for calculation, however, in **SciPy we need to use Standard Deviation**. Hence, we will calculate square root of Variance.

[ ]

import math  
from scipy import stats  
A = stats.norm(3, math.sqrt(16)) # Declare A to be a normal random variable  
print(A.pdf(4))                  # f(4), the probability density at 4  
print(A.cdf(2))              # f(2)

0.09666702920071232

0.4012936743170763

Question:1

Write a code to calculate the probability density function and cumulative distrbution function for a normal distribution with μ=9 ,σ2=64, for probability density 6

[ ]

Question:2

Write a code to calculate the probability density function for value "11" in the range, given, mean=10 and standard deviation=2. **Hint:** remember to use standard deviation instead of variance in the code.

[ ]

Exponential Distribution

The exponential distribution is the probability distribution that describes a process in which events occur continuously and independently at a constant average rate. This distribution is a continuous analog of the geometric distribution. With exponential distribution, we can find the probability of event occur before/after some moment of time. Lambda is the average number of events in one unit of time(hours, minutes, seconds, …).

How to Calculate Probabilities Using an Exponential Distribution

Suppose the mean number of minutes between eruptions for a certain geyser is 40 minutes. What is the probability that we’ll have to wait less than 50 minutes for an eruption? We can use the expon.cdf() function from SciPy to solve this problem in Python:

[ ]

from scipy.stats import expon

#calculate probability that x is less than 50 when mean rate is 40

expon.cdf(x=50, scale=40)

0.7134952031398099

Question 3

Some pizzeria receives an average of 20 orders per hour. Find the probability that in just two minutes the pizzeria will receive an order. Using the hints and description given above, solve this question by writing a code.