

Second Lab Assignment (Due by 3pm on Feb. 25)

Reference MATLAB tutorial and MATLAB lab demonstrations.

Lab assignments

Assignment 1 Let X be a continuous random variable, plot the probability density function $f(x)$ if

- X is an exponential distribution, $X \sim \text{Exp}(\lambda)$, $\lambda = 0.5, 1, 2$
- X is a normal distribution, $X \sim N(\mu, \sigma^2)$, where (μ, σ^2) are from $\{(-1, 1), (0, 1), (1, 1), (0, 4), (0, 16)\}$

For each of those two cases, you have to plot multiple curves, one for each of the probability density functions when the parameter is fixed. For example, for the exponential distribution, you have to plot the probability density functions for $\text{Exp}(0.5)$, $\text{Exp}(1)$, $\text{Exp}(2)$. Please use different colors (e.g., red, blue, black) for those curves and put those curves in one figure. Please analyze those curves in this figure and draw a conclusion for how does the curve changes when we increase (or decrease) the parameter value.

You have to submit:

1. MATLAB codes, which should be put in script files (.m)
2. Two figures, which should be in png format (.png)
3. Two observations (conclusions), which should be in a plain text file (.txt), or as a comment section inside script (.m) file.

Assignment 2 Let X be a continuous random variable, plot the distribution function $F(X)$ if

- $X \sim \text{Exp}(2)$
- $X \sim N(0, 1)$

For each of those distributions, you have to plot a figure, showing the distribution function. You also have to compute the median, $q_{0.5}$, and add a special point $(q_{0.5}, 0.5)$ in this figure. Please use the "Asteris" (*) as the marker and red color for this special point. You have to submit

- MATLAB codes, which should be put in script files (.m)
- Two figures, which should be in png format (.png)

Please submit both of your MATLAB codes and the plotted figure.

Assignment 3 Let X be a continuous random variable, generate 10^5 samples if

- $X \sim \text{Exp}(2)$
- $X \sim N(0, 2)$

You can use the MATLAB function random to generate data points from a given distribution. Please check the help or doc command in order to use the random function correctly. Please plot those samples by using hist function. You can check its usage by using help hist or doc hist. You have to submit

- MATLAB codes, which should be put in script files (.m)
- Two figures, which should be in png format (.png)

Assignment 4 Suppose we only have a random number generator, which has a $U(0,1)$ distribution. But we want to generate a sequence of random numbers with a non-uniform distribution (e.g., $Exp(2)$, $Par(2)$). Now, please

- first use the random number generator to generate 10^5 uniformly ($U(0,1)$) distributed samples
- then transform those samples to data points, which should have a $Exp(2)$, or $Par(2)$ distribution
- finally plot those transformed samples by using the hist function.

You have to submit

1. MATLAB codes, which should be put in script files (.m)
2. Two figures, which should be in png format (.png)