

Project 3

Due date: Wednesday June 2nd, 2021

Teamwork

Everyone will turn in the report of the team through Canvas by 11:59PM on the due date. You should include the front page and the references used (do not use web links unless is for an electronic and validated bibliography material).

Part 1 Fundamentals: This is the part where you conduct some research to describe what you are asked for. You must read the support document given to you and then search for your own references

1. Provide the equations or formulas of the cumulative distribution functions (CDF) and the probability density functions (PDF) of the following random variables
 - a. **Gaussian or Normal**
 - b. **Lognormal**
 - c. **Uniform**
 - d. **Exponential**
 - e. **Pareto**
 - f. **Weibull**
2. For the same random variables provide the formulas for the mean value (expectation), and the variance
3. Write the fundamental ideas about the *mean excess value* and the *survival functions*, and obtain or provide the formulas for the same random variables
4. Provide plots of the mean excess value and survival functions of the random variables given.
5. Provide a description of two of the models of the list. Your report in this part **must not be longer** than four pages for each model. Provide bibliography as possible.
 - a. Interrupted Poisson Process (IPP)
 - b. Poisson regression
 - c. Knapsack
 - d. Leaky bucket
 - e. DARMA model, especially Jacobs or Lewis

Part 2 Experimental Work: you will need to capture traffic packets from the internet using *wireshark*, and then process all the information using Matlab.

1. Capture WiFi traffic using *Wireshark* or any other tool.
2. Generate your data to obtain the following information
 - a. bps
 - b. Interpacket time (interarrivals)
3. Obtain plots of your information (bps, IPT)
4. Obtain CDF and PDF of each (bps, IPT) by using Matlab
5. Obtain statistics from your data (mean, median, max, min, var, std, dispersion=var/mean)
6. Plot survival functions of your data (bps, IPT)

7. In the same plot compare your survival functions against the exponential distribution with the same mean values and discuss your findings
8. Obtain the histograms (you could use MATLAB tools or kernel)
9. Obtain the mean excess function (theoretically or empirically) of one of your pieces of information
10. Compare the mean excess function of some known random variables with yours and discuss your findings
11. You must turn in a report document with all the information (free style), all your plots with explanation and discussion about them.