Probability & Statistics (MAT271E)

Term Project

Mert Kahyaoğlu
040110804
Department of Electronics and Communication Engineering
mert.kahyaoglu35@gmail.com

Atalay Akturk
04015040
Department of Electrical Engineering
akturkatalay@gmail.com

Faculty of Electrical and Electronics Engineering
Istanbul Technical University
Istanbul, Turkey

***Abstract*— This document deals with a study about any vital statistical parameters and analyzing them via Matlab programme.**

Keywords— correlation; histogram ; kurtosis ; mean ; normal distribution ; skewness ; standart deviation

I. INTRODUCTION

At this study; firstly for any random 100 numbers as a data ‘ x ’ which being chosen from any random 100000 numbers which being created in Matlab, we will analyze and check results of skewness, kurtosis, standart distribution and mean with showing this normal distribution at any graphics. After that; using data ‘ x ’ we will create a new data ‘ y ’ with unit mean value and 3 standard deviation and we will plot its histogram. In addition to these steps; we will calculate the correlation coefficient between ‘ x ’ and ‘ y ‘.

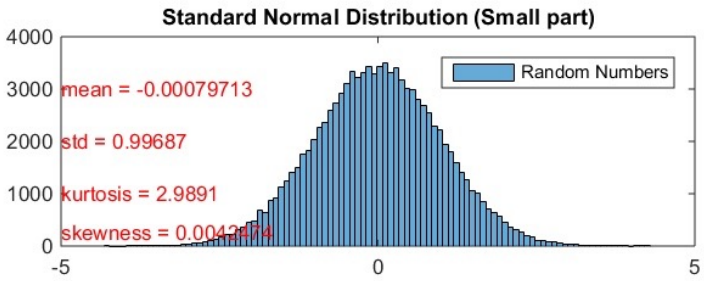
II. METHODS

A. Producing any random numbers ‘ x ‘ at Matlab

At the beginning of this example; to produce 100000 random numbers with standard distribution and then to plot it’s a small part (100 numbers) as a new data and its histogram, we wrote this code at Matlab :

```
close all
        clc
        rng default


        x = randn (1,100000);  % producing our random numbers

        nbins =  100;  % 100 random numbers (as a small part)
        subplot (2,1,1)
h = histogram (x, nbins);

title (‘ Standart Normal Distribution  (Small part)’)

legend (‘Random Numbers’);
```

After this code; we can see the histogram of 100 random numbers at below **Figure 1**.



B. Calculation vital parameters of random numbers ‘ x’

To calculate mean value, standard deviation, skewness and kurtosis of our 100000 random numbers of ‘x ‘, we can basicly use this code by adding to our main Matlab code and we can also notice this at **Figure 1.**

```
mean_value  = mean (x)

standard_deviation = std (x)

skewness_value = skewness (x)

kurtosis_value = kurtosis (x)
```

% to show these parameters on our histogram graphs.

text (-5,3000 , [‘ mean = ‘ , num2str(mean_value),] , ‘Color ‘ , ‘r’);

text (-5,2000, [‘ std = ‘ , num2str(standard_deviation),] , ‘Color ‘ , ‘r’);

text (-5,1000 , [‘ kurtosis = ‘ , num2str(kurtosis_value),] , ‘Color ‘ , ‘r’);

text (-5,250 , [‘ skewness = ‘ , num2str(skewness_value),] , ‘Color ‘ , ‘r’);

After this code; we get this results for ‘ x’ as it is shown also at **Figure 1.**

mean value = - 0.00079713

standard deviation = 0.99687

kurtosis = 2.9891

skweness = 0.0042474

C. Creating a new data ‘ y ‘ and calculation of the correlation coefficient between ‘ x ‘ and ‘ y’

To produce a new data ‘ y ‘ with unit mean value and 3 standard deviation and plot its histogram; we can add basicly this code to our programme :

y = (x * 3) + 1 ;

subplot (2,2,4);

h= histogram (y);

% to calculate mean value, standard deviation, skewness and kurtosis of ‘ y ‘

mean_value = mean (y)

standard_deviation = std (y)

skewness_value = skewness (y)

kurtosis_value = kurtosis (y)

% to show these parameters at Figure 2

Calculation of the correlation coefficient between ‘ x ‘ and ‘y '

we can add this code :

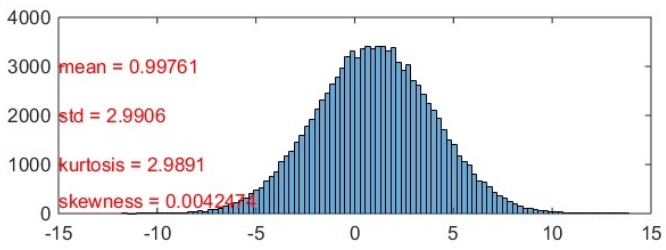
text (-5,3000 , [‘ mean = ‘ , num2str(mean_value),] , ‘Color ‘ , ‘r’);

text (-5,2000, [‘ std = ‘ , num2str(standard_deviation),] , ‘Color ‘ , ‘r’);

text (-5,1000 , [‘ kurtosis = ‘ , num2str(kurtosis_value),] , ‘Color ‘ , ‘r’);

text (-5,250 , [‘ skewness = ‘ , num2str(skewness_value),] , ‘Color ‘ , ‘r’);

After this code; we can see our new histogram graph for ‘y’ below at **Figure 2 .**



b = regress (x (: 1); [ones (size (x (: ,1)) x (: ,1)]);

t = [min (x (: ,1)) max (x (:,1)];

yht = b(1) + b(2). * t;

z = zscore (x);

r = corrcoef (y (: ,1), x(:,1)) ;

t2 =[min(x (:,1) max (x(:,1))];

yht2 = t2.* r(2);

figure (2)

subplot (2,1,1);

plot (x(:,1), y(:,1), ‘b.’);

hold on;

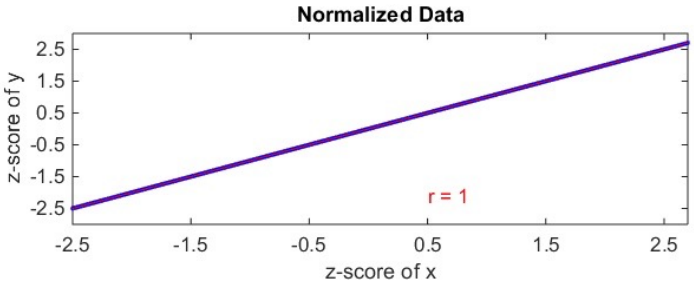
plot (t, yht, ‘-r’);

title (‘Raw data’);

xlabel (‘x values’);

ylabel (‘y values’);

Ater this code, we can notice this result below at **Figure 3.**

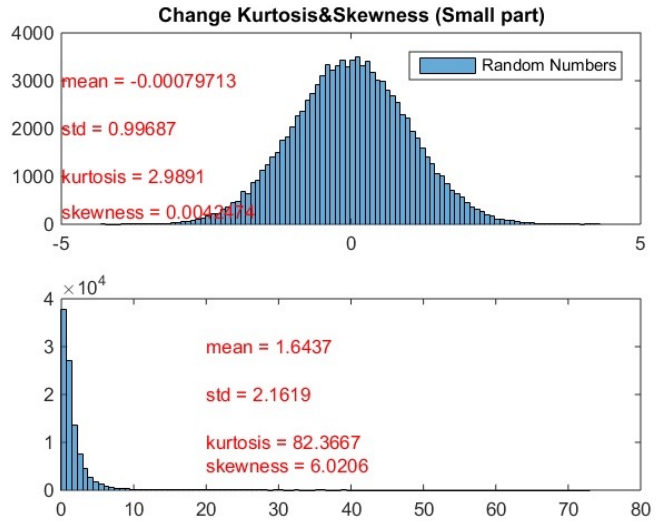


III. DISCUSSIONS AND CONCLUSION

It was a good example to analyze and notice any vital basic chrasteristic behavior of any random numbers via Matlab. For some any basic vital parameters for any random numbers, it can help to knowledge of improve general informaiton about statistics science as we see today in our daily life so much. At another point,when we look at our example; after we use as new data ‘y’, at this time its skewness and standard deviation didn’t change after we generalize it with ‘ x ‘ data. Now, to change these two vital value, we can use this equation by using exponantial value of ‘ x ‘ and apply it to our programme:

```
y = exp (x);

subplot ( 2,2,4)

h = histogram (y);

subplot (2,1,2)

h = histogram ( y,nbins);

mean_value  = mean (y)

standard_deviation = std (y)

skewness_value = skewness (y)

kurtosis_value = kurtosis (y)

text (-5,3000 , [‘ mean = ‘ , num2str(mean_value),] , ‘Color ‘ , ‘r’ );

text (-5,2000, [‘ std = ‘ , num2str(standard_deviation),] , ‘Color ‘ , ‘r’ );

text (-5,1000 , [‘ kurtosis = ‘ , num2str(kurtosis_value),] , ‘Color ‘ , ‘r’ );

text (-5,250 , [‘ skewness = ‘ , num2str(skewness_value),] , ‘Color ‘ , ‘r’ );
```

After this code; we can see and analyze our histogram graph for ‘y’ and its new skewness and kurtosis below at **Figure 4.**



REFERENCES

[1] http: // www.mathworks.com /help/matlab/ref/corroef