

**BUSITEMA
UNIVERSITY**
Pursuing excellence

FACULTY OF ENGINEERIG AND TECHONOLOGY

COMPUTER PROGRAMMING

**ASSIGNMENT REPORT ON APPLICATION OF KNOWLEDGE
OBTAINED FROM MODULES ONE TO FOUR USING MATLAB**

BY GROUP 12

PRESENTED TO MR. MASERUKA BENEDICTO

DATE OF SUBMISSION; 23rd, SEPTEMBER, 2025.

GROUP 12 MEMBERS

NAME	COURSE	REG NUMBER	SIGNATURE
LWASAMPIJJA MIKE CRISPUS	AMI	BU/UG/2024/2678	
AGABA JOSHUA	WAR	BU/UP/2024/1009	
APIO MIRIAM	WAR	BU/UP/2024/3827	
OBBO DANIEL BENJAMIN	WAR	BU/UP/2024/1054	
GINAH RUTH	PTI	BU/UP/2024/5468	
MIREMBE ROSE	WAR	BU/UP/2024/3835	
ISABIRIYE EDMOND	AMI	BU/UP/2024/3733	
TANGA RIGAN	WAR	BU/UP/2024/1071	
WANDABA ELVIS	AMI	BU/UP/2024/1076	

DECLARATION

We declare that the information in this report is our own, to the best of our knowledge and shows the skills and knowledge obtained through the continuous assignment meetings.

APPROVAL

This is to confirm that this report has been written and presented by group 12, given the details of the assignment carried out.

Signature.....

Date.....

Course lecturer.

ACKNOWLEDGEMENT

First and foremost, we would like to thank the Almighty God for giving us the knowledge and guidance while doing our assignment as group 12. We extend our gratitude to all the persons with whose help we managed to make it this far

The love of every group member to invest time and provide all they could to see the assignment a success. Finally, we would like to express our gratitude to all the sources and references that have been cited in this report.

ABSTRACT

We started our first meeting for research on 18th September, 2025 in the university library and managed to achieve successful completion of this assignment through group work and division of tasks, and the achieved knowledge through the first assignment we did as a group as a tremendous means of consolidating the knowledge obtained to further the visualization of different parameters, patterns, trends and relationships of various variables represented as detailed plots as per the second assignment.

DEDICATION.

We dedicate this report to all Group 12 members, who have been the very cooperative towards the success of this report.

To our lecturer Mr. Maseruka Benedicto whose guidance and expertise have been so needful, your mentorship and lecturing has built our understanding.

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1. CHAPTER ONE

1.1 INTRODUCTION

1.1.2 HISTORICAL BACKGROUND

MATLAB, which stands for matrix laboratory, is a high-performance programming language and environment designed primarily for technical computing. Its origins trace back to the late 1970s when Cleve Moler, a professor of computer science, developed it to provide his students with easy access to mathematical software libraries without requiring them to learn Fortran.

MATLAB is built around the concept of matrices, making it particularly effective for linear algebra and matrix manipulation. It provides a vast library of built-in functions for mathematical operations, statistics, optimization, and other specialized tasks.

MATLAB offers powerful tools for creating 2D and 3D plots, enabling users to visualize data effectively. Specialized toolboxes extend MATLAB's capabilities, providing functions tailored for specific applications like signal processing, image processing, control systems, and machine learning.

MATLAB can interface with other programming languages (like C, C++, and Python) and software tools, allowing for flexible integration into larger systems. Its interactive environment features a command window, workspace, and editor, making it accessible for both beginners and advanced users.

1.1.3 Historical Background

The first version of MATLAB was created in Fortran in the late 1970s as a simple interactive matrix calculator. This early iteration included basic matrix operations and was built on top of two significant mathematical libraries: LINPACK and EISPACK, which were developed for numerical linear algebra and eigenvalue problems, respectively.

Recent versions of MATLAB have introduced features like the *Live Editor*, which allows users to create interactive documents that combine code, output, and formatted text. This evolution reflects MATLAB's ongoing adaptation to meet the needs of its diverse user base across academia and industry.

1.1.4 STUDY METHODOLOGY

At the start, each member was given a task of making research about the assignment before our first meeting. The research concepts were obtained through watching tutorials on YouTube, reading the modules and consultations from other continuing students especially those in year three and four.

ASSIGNMENT TWO;

- a) From question 1, utilize the knowledge obtained from module one to four to visualize the different parameters, patterns, trends and relationships. Ensure that each plot is saved as an image and is well annotated.
- b) From question 2 assignment 1, utilize all the knowledge from module 1 to 4 to describe the different statistical data characteristics in the data and ensure to visualize them. Ensure that the definite attributes or data collected per individual is detailed enough to describe them.

Question 1: Kaggle.com Dataset Categorization.

The primary objective of this exercise was to create a MATLAB script suitable for handling an external dataset. Our approach was a three-step process.

Methodology's

Data Acquisition and Import: We sourced a unique dataset from Kaggle in Excel format. The MATLAB script was designed to use a function to read the entire .csv file, ensuring all data was available for processing. Our exercise required that the data be of a variety containing a field for the year. We chose a dataset of Indian water data. We went a, our next step was to import it into our MATLAB environment. For that we added the dataset file into our exercise folder for convenience purposes, MATLAB and proceeded with further processing. **Data Processing:** Our end task was to determine the various relationships mainly between maximum and minimum PH in the different graphs as per the knowledge obtained from module 1 to 4.

Using the knowledge obtained from module one to four, we were able to identify various variables such as minimum and maximum PH, conductivity and come up with various graphs describing the relationship between these variables. The steps taken to come with the graphs were , input the variables and we used the built-in MATLAB functions such as plot (), bar (), scatter (), or stem () depending on the type of the graph. We also added descriptive labels for the x-axis and y-axis and title to make the graph clearer. Add grid, legends, formatting and appearance customization were also part of the task.

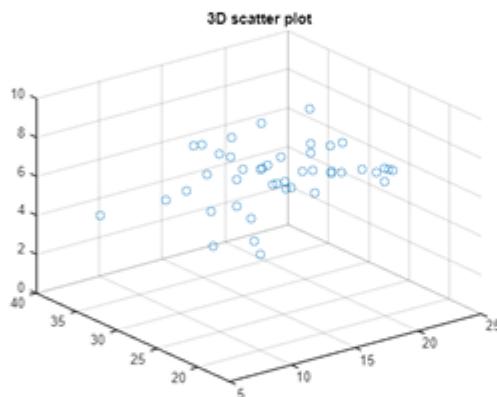
2. CHAPTER 2

2.1 DATASET AND GRAPHICAL REPRESENTATIONS ABOUT INDIAN WATER.

Question one

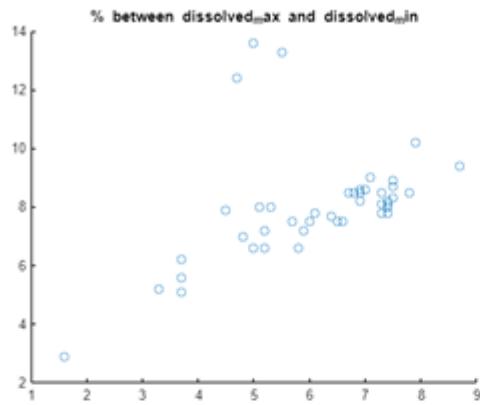
Relationship between Temperature_c_min2, temperature_c_max2 and dissolved_min2

```
temperature_c_min2 = [12 12 17 19 16 15 14 18.5 12 13 18 14 14.5 8 14 21 20 7 8  
7 20 19 8 8 19 17 21 21 5 18 22 21.4 21 22 17 18 17 22 25 25 25 25 24 22];  
temperature_c_max2 = [29 26 36 34 33 30 33.5 27 26 33 26 30 24 23.5 26 27 23 16  
18 27 27 24 23 26 32 31 31 32 32 30 32.6 34 34 32 31 31 30 30 28 29 28 27 26  
30];  
dissolved_min2 = [3.3 5.9 5.8 7.4 7.4 6.5 7.3 7.8 7.3 7.5 6.7 7.3 7.1 8.7 7.5  
7.4 7 6.9 7.5 6.9 7.4 6.8 6.9 7.4 4.7 6 6.1 5 5.5 6.6 7.9 3.7 3.7 3.7 1.6 5 6.4  
5.2 5.2 4.8 4.5 5.3 5.7 5.1];  
scatter3(temperature_c_min2,temperature_c_max2,dissolved_min2);  
title('3D scatter plot');
```



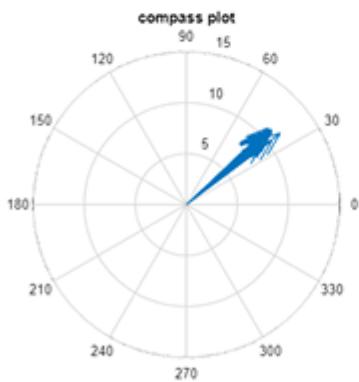
Relationship between dissolved_max and dissolved_min

```
dissolved_min2 = [3.3 5.9 5.8 7.4 7.4 6.5 7.3 7.8 7.3 7.5 6.7 7.3 7.1 8.7 7.5  
7.4 7 6.9 7.5 6.9 7.4 6.8 6.9 7.4 4.7 6 6.1 5 5.5 6.6 7.9 3.7 3.7 3.7 1.6 5 6.4  
5.2 5.2 4.8 4.5 5.3 5.7 5.1];  
dissolved_max2 = [5.2 7.2 6.6 7.8 8 7.5 8.1 8.5 7.8 8.7 8.5 8.5 9 9.4 8.3 8.2  
8.6 8.6 8.9 8.2 8.1 8.5 8.5 8 12.4 7.5 7.8 13.6 13.3 7.5 10.2 5.6 5.1 6.2 2.9  
6.6 7.7 7.2 6.6 7 7.9 8 7.5 8];  
scatter(dissolved_min2,dissolved_max2);  
title('% between dissolved_max and dissolved_min');
```



Relationship between minimum_ph3 and maximum_ph3

```
maximum_ph3 = [8 8.3 8 8.4 8.4 7.7 7.8 7.3 7.4 7.8 8.3 8 9.2 7.6 7.4 7.5 7.2
7.3 7.7 7.5 7.7 7.2 8 7.3 7.4 7.5 7.3];
minimum_ph3 = [6.7 7.3 7.5 6.3 7.2 6.9 7.1 5.7 5.9 6.7 7.4 6.6 7 7 6.8 7 6.8
6.9 6.8 6.6 7.1 7 6.6 6.7 6.5 6.8 6.8 7 6.8];
compass(maximum_ph3,minimum_ph3);
title('compass plot');
```

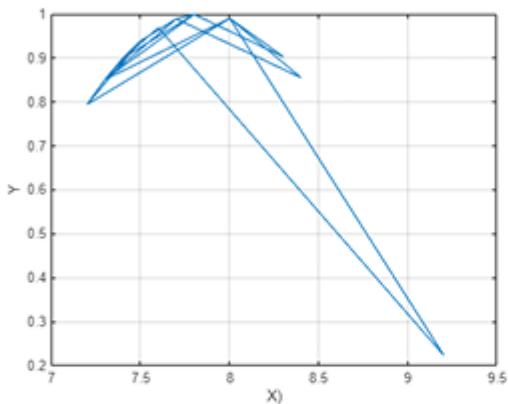


```
maximum_ph3 = x
```

```

x = [8 8.3 8 8.4 8.4 7.7 7.8 7.3 7.4 7.8 8.3 8 9.2 7.6 7.4 7.5 7.2 7.3 7.7 7.5
7.7 7.5 7.2 8 7.3 7.3 7.4 7.5 7.3];
y = sin(x);
plot(x,y,'Markeredgecolor','g');
xlabel('X');
ylabel('Y');
grid on;

```

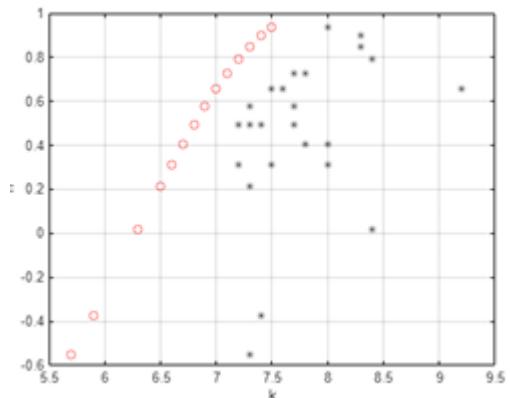


Minimum_ph3 = k

```

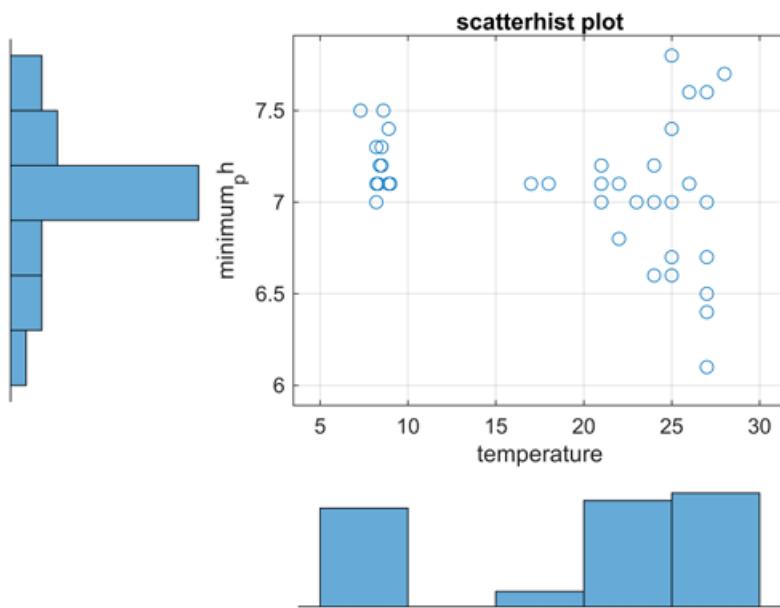
k = [6.7 7.3 7.5 6.3 7.2 6.9 7.1 5.7 5.9 6.7 7.4 6.6 7 7 6.8 7 6.8 6.9 6.8 6.6
7.1 7 6.6 6.7 6.5 6.8 6.8 7 6.8];
h = sin(k);
plot(k,h,'ro');
xlabel('k');
ylabel('h');
grid on;
hold on;
b = [8 8.3 8 8.4 8.4 7.7 7.8 7.3 7.4 7.8 8.3 8 9.2 7.6 7.4 7.5 7.2 7.3 7.7 7.5
7.7 7.5 7.2 8 7.3 7.3 7.4 7.5 7.3];
plot(b,h,'k*');

```



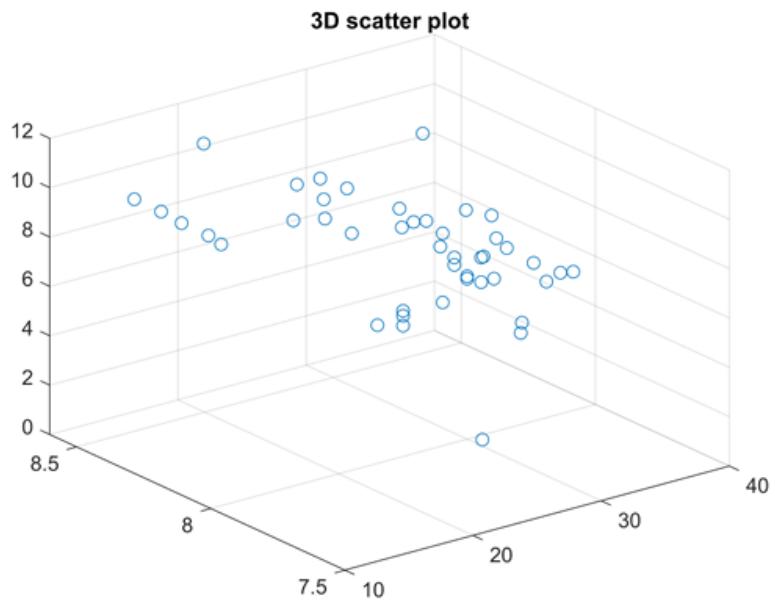
Relationship between temperature_c_min and minimum_ph according to 2021

```
temperature_c_min = [21 25 26 24 23 23 24 25 21 22 22 18 25 25 27 27 27 28 27 22 24 24  
25 22 23 17 27 27 26 25 21 8.5 8.6 8.4 8.3 8.2 8.9 8.9 9 8.2 8.5 8.2 8.9 7.3];  
minimum_ph = [7.2 7.4 7.1 7.7 7.7 7.7 7.1 7.1 6.8 7.1 6.6 7.6 7 6.5 7.7 6.7 6.8 6.6  
7.2 6.7 7.1 7 7.1 6.1 6.4 6.1 7.6 7.8 7 7.3 7.5 7.2 7.1 7.1 7.4 7.1 7.1 7.3 7.2 7  
7.1 7.5];  
scatterhist(temperature_c_min,minimum_ph);  
xlabel('temperature');  
ylabel('minimum_ph');  
title('scatterhist plot');  
grid on;
```



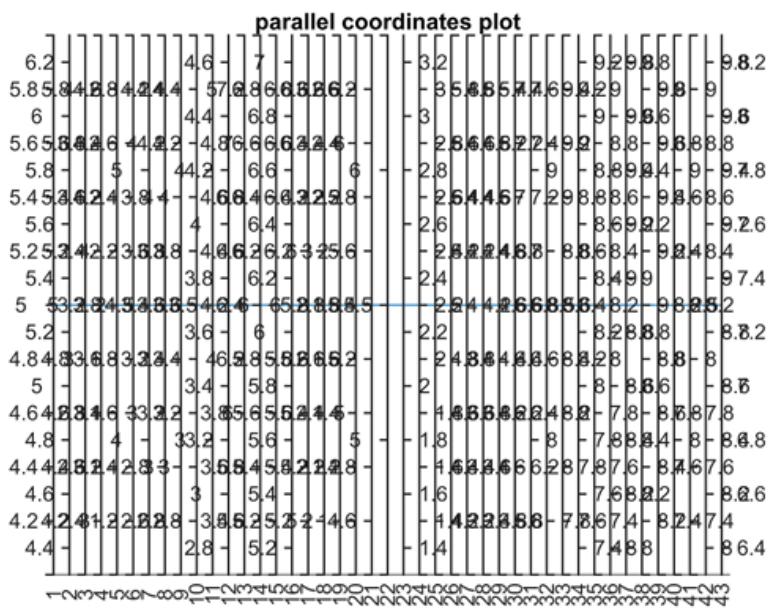
Relationship between temperature_c_max, dissolved_max and maximum_ph according to 2021

```
temperature_c_max = [34 32 29 29 29 30 30 30 25 25 25 23 32 31 29 30 31 32 29 30 26  
29 28 27 27 31 31 31 30 37 29 15 14.5000 14.5000 23 23 14 14 25 21 21 26 26 22];  
maximum_ph = [8.1 8.1 8.5 7.9 8 8 8.2 7.8 8 8 8 7.7 8.2 8 7.9 8.3 7.8 8.6 8 7.9  
7.9 7.7 8.1 7.8 7.9 7.8 7.7 8.1 8.5 8.4 8.2 8.5 8.4 8.3 8.2 8.3 8.2 7.7 8.1 8 7.9  
7.7 8.6];  
dissolved_max = [8 8.5 8.2 7 7.2 6.6 7.8 5.3 5.3 5.9 5.7 5.6 8 7.7 7.5 7 7.7 7.1 6  
6.5 6.6 8 6.5 8.5 1.4 8.1 8 8.1 7.3 8.9 8.3 9 9.4 9.4 9.8 9.7 9.5 9.5 9.6 9.7 9.6  
9.4 10.2 10.1];  
scatter3(temperature_c_max, maximum_ph, dissolved_max);  
title('3D scatter plot');
```



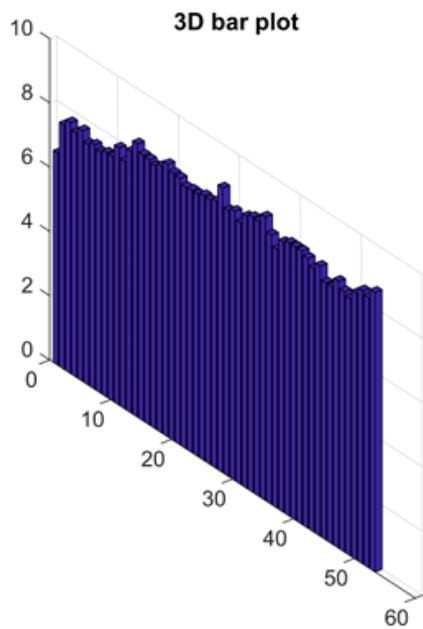
Parallel Coordinates plot of dissolved_min according to 2021

```
dissolved_min = [5 5.3 5 3.2 3.8 2 4.5 3.4 3.6 3.6 3.5 3.7 4.2 4.6 6.4 6 6.1 6 5.8 2.8  
1.8 5.4 5.5 2.3 2.2 5 4. 4.2 4.6 6.6 6.8 8.5 8.6 8.4 8.3 8.2 8.9 8.9 9 8.2 8.5 8.2  
8.9 7.3];  
parallelplot(dissolved_min);  
title('parallel coordinates plot');
```



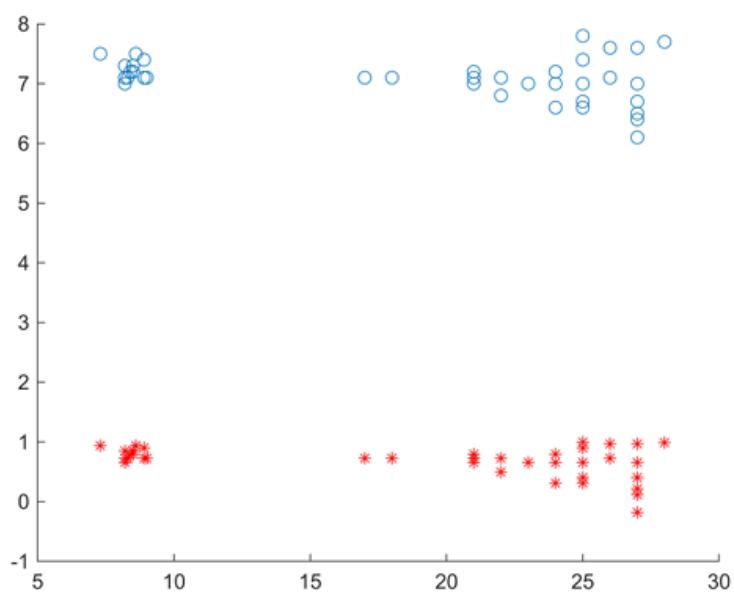
3D Bar plot of maximum ph according 2022

```
maximum_ph = [6.6 7.6 7.8 7.6 7.8 7.5 7.6 7.5 7.6 7.6 8 7.7 8.14 8.5 8.27 8.25 8.18
8.3 8.48 8.32 8.29 8.13 8.17 8.16 8.25 8.22 8.32 8.86 8.27 8.38 8.14 8.46 8.56 8.55
8.82 8.38 8.05 8.4 8.5 8.5 8.5 8.4 8.2 8.4 8 8 8.3 8.1 8 8.3 8.5 8.4 8.7];
bar3(maximum_ph);
title('3D bar plot');
```



```
maximum_ph = x
```

```
temperature_c_min = [21 25 26 24 23 23 24 25 21 22 22 18 25 27 27 27 28 27 22 24 24  
25 22 23 17 27 27 27 26 25 21 8.5 8.6 8.4 8.3 8.2 8.9 8.9 9 8.2 8.5 8.2 8.9 7.3];  
minimum_ph = [7.2 7.4 7.1 7 7 7 7 7 7.1 7.1 6.8 7.1 6.6 7.6 7 6.5 7.7 6.7 6.8 6.6  
7.2 6.7 7.1 7 7.1 6.1 6.4 6.1 7.6 7.8 7 7.3 7.5 7.2 7.1 7.1 7.4 7.1 7.1 7.3 7.2 7  
7.1 7.5];  
scatter(temperature_c_min,minimum_ph);  
hold on;  
y = sin(minimum_ph);  
plot(temperature_c_min,y,'r*');
```



Exercise 2: Group Member Data Storage

This exercise focused on a different aspect of data management: structuring varied data types into a single variable. The task was to take a set of attributes for each group member including home district, religion, tribe, interests, age, name, and a description for facial representation and store them collectively and then represent them graphically in various graphs.

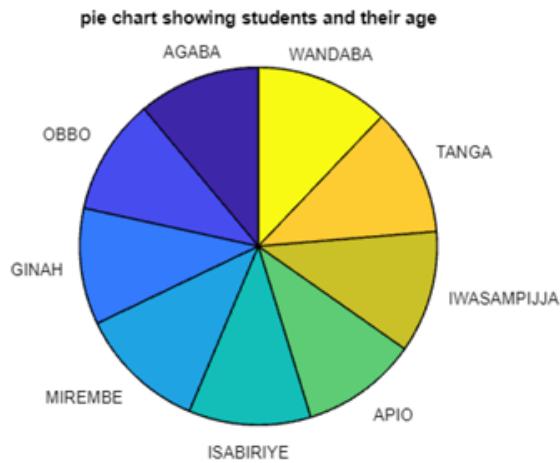
To accomplish these, we identified the variables to be plotted e.g. x and y generated the data points by defining the mathematical functions

Our main task here was to get the data into the MATLAB environment, for that we utilized the MATLAB input feature, input the variables and we used the built-in MATLAB functions such as plot (), bar (), scatter (), or stem () depending on the type of the graph. We also added descriptive labels for the x-axis and y-axis and title to make the graph clearer. Add grid, legends, formatting and appearance customization were also part of the task.

Below are the codes and graphs for the MATLAB script we used to achieve the intended outcome of the exercise. Codes and Graphs for our MATLAB script for exercise 2.

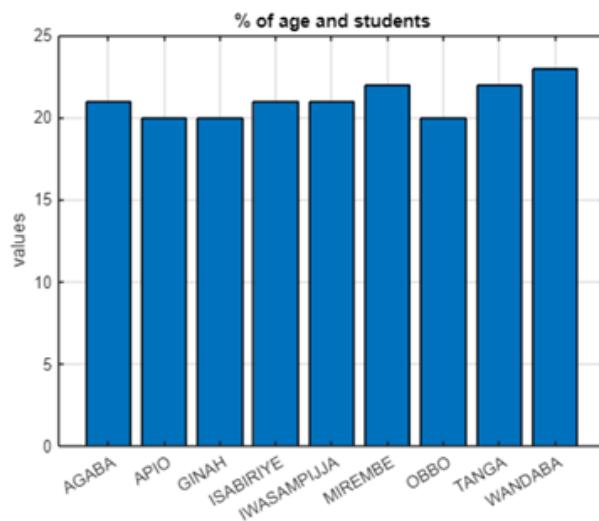
Relationship between students and age

```
Age = [21, 20, 20, 22, 21, 20, 21, 22, 23];
Names = ["AGABA"; "OBBO"; "GINAH"; "MIREMBE"; "ISABIRIYE"; "APIO";
IWASAMPIJJA"; "TANGA"; "WANDABA"];
pie(Age,Names);
title("pie chart showing students and their age");
```



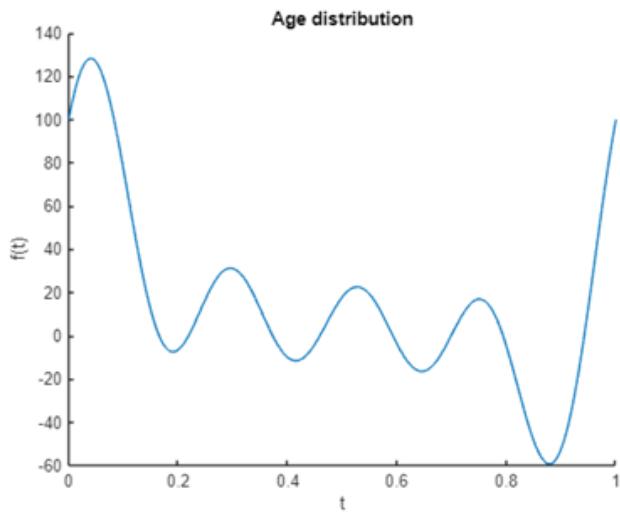
% of age and students

```
Names = categorical({'AGABA', 'OBBO', 'GINAH', 'MIREMBE', 'ISABIRIYE', 'APIO',
'IWASAMPIJJA', 'TANGA', 'WANDABA'});
Age = [21, 20, 20, 22, 21, 20, 21, 22, 23];
bar(Names,Age);
ylabel('values');
title('% of age and students');
grid on;
```



Age patterns of students

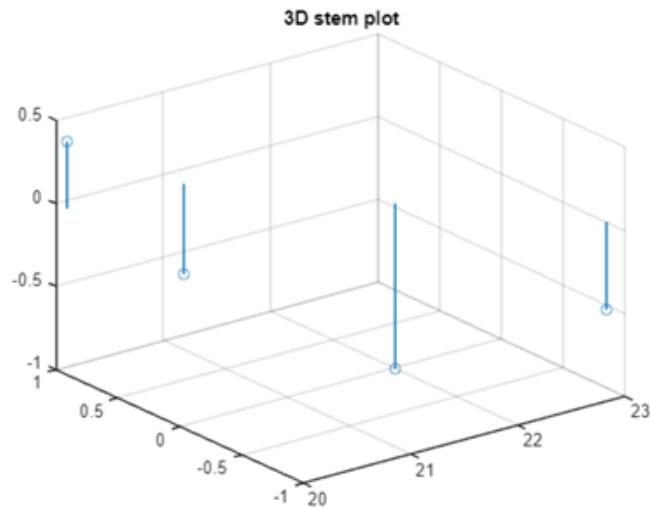
```
Age = [21, 20, 20, 22, 21, 20, 21, 22, 23];
andrewsplot(Age);
title('Age distribution');
```



Age distribution

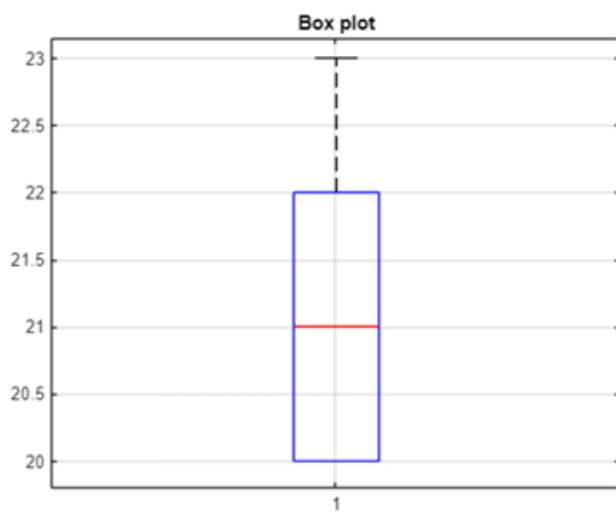
```
x = [21, 20, 20, 22, 21, 20, 21, 22, 23];
y = sin(x);
```

```
z = cos(x);
stem3(x,y,z);
title('3D stem plot');
```



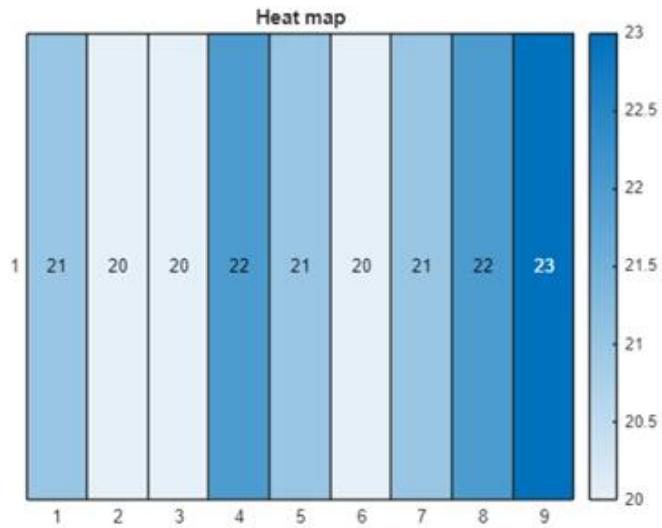
Age distribution using a box plot

```
Age = [21, 20, 20, 22, 21, 20, 21, 22, 23];
boxplot(Age);
title('Box plot');
grid on;
```



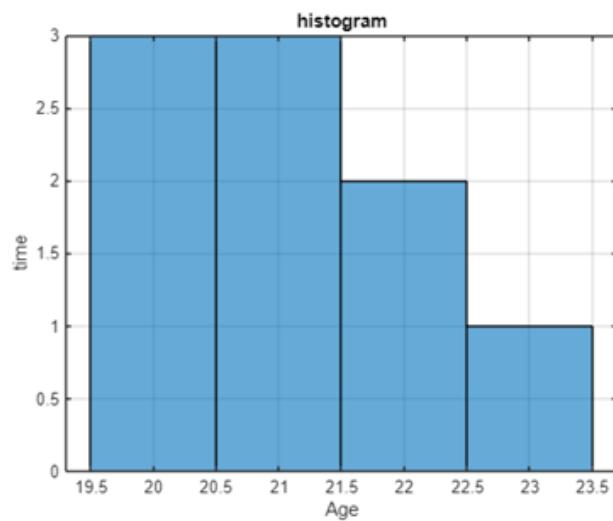
Student's age distribution

```
Age = [21, 20, 20, 22, 21, 20, 21, 22, 23];
heatmap(Age);
title('Heat map');
```



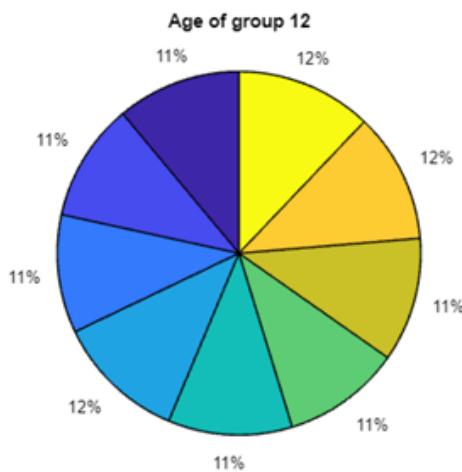
Histogram of age

```
Age = [21, 20, 20, 22, 21, 20, 21, 22, 23];
histogram(Age);
xlabel('Age');
ylabel('time');
title('histogram');
grid on;
```



Pie chart of age

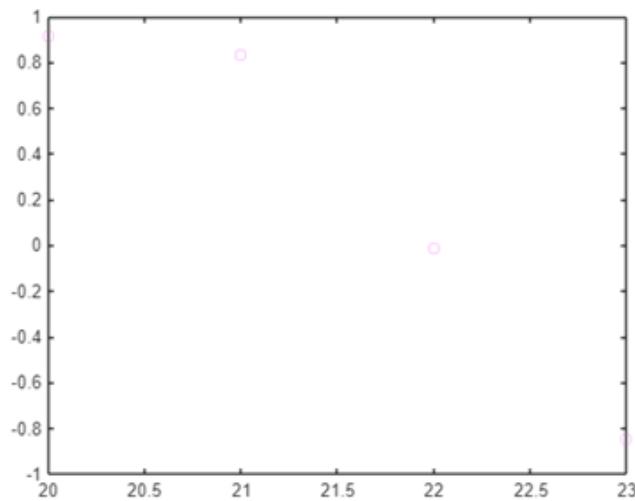
```
Age = [21, 20, 20, 22, 21, 20, 21, 22, 23];
pie(Age);
title('Age of group 12');
```



Graph of age(x)

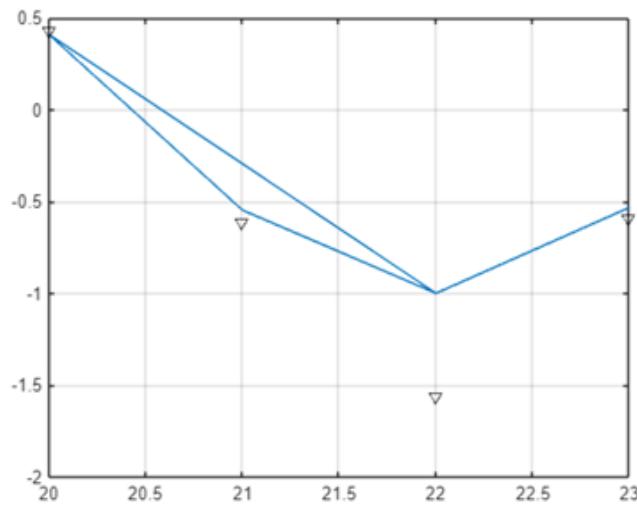
```
x = [21, 20, 20, 22, 21, 20, 21, 22, 23];
y = sin(x);
```

```
plot(x,y, 'ms');
```



GRAPH 2

```
x = [21, 20, 20, 22, 21, 20, 21, 22, 23];
y = cos(x);
plot(x,y);
hold on;
z = tan(y);
plot(x,z, "kv");
grid on;
```



3. CHAPTER 3

Conclusion and Learning Experience

Completing this assignment was a valuable learning experience that reinforced key MATLAB programming concepts and gave us hands-on experience with the foundations we had acquired from Modules 1 to 4. We gained a deeper understanding of how to handle real-world data, which we realized is often messy and requires careful structuring. The process of importing from a third-party source like Kaggle, transforming the data into a more usable format like a structural array, and then exporting it and using it to describe and represent useful information graphically.