FACULTY OF ENGINNEERING AND TECHNOLOGY

REPORT ABOUT COMPUTER PROGRAMMING ASSIGNMENT ON MODULE 4

GROUP NAME: GROUP 9

COURSE UNIT: COMPUTER PROGRAMMING

GROUP LINK. https://github.com/Groupematlab/group-E.git

This assignment report is submitted to the lecturer of computer programming Mr. BENEDICTO MASERUKA by group 9 for the award of coursework marks.

Submitted on…/……/……….

APPROVAL

This is to confirm that this report has been written and presented by GROUP 9 giving the details for the assignment.

LECTURER'S NAME:……….

SIGNITURE:………

DATE:………

DECLARATION

We, members of group 9, sincerely declare this report to all members who may need to use its content for approval or study. This is out of our own knowledge and research and is the content of our own writing and research.

Date of declaration……………………………………………………………………………

Group representative signature…………………………………………………………………

ACKNOWLEDGEMENT

We first of all thank GOD for the gift of understanding and unity among our group members from the start of the assignment to the point of accomplishment.

In addition, great thanks go to the lecturer for the teaching method he used to make us understand more techniques in MATLAB through giving us this assignment.

Lastly, we also appreciate each member for the support in researching and documenting the results of this assignment.

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ABSTRACT

This report is about the assignment which was given to all groups in computer programming including our group 9 on September 4, 2025. We started with further research on addition to the knowledge which was given to us by our lecturer. We managed to succeed with the assignment by generating right codes that are matching to the assignment given.

The work was contributed by group members whose details are indicated in the table below.

GROUP MEMBER'S DETAILS

NAME	REG. NUMBER	COURSE	SIGNATURE
1. NAMARA ROMUS	BU/UG/2024/2596	WAR	
2. BIIRA EDITOR	BU/UG/2024/5058	WAR	
3. ABONGO CHRISTOPHER	BU/UP/2024/1002	WAR	
4. KANYANGE SHEEBAH M	BU/UG/2024/2630	MEB	
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6. NUWAMANYA MUGISHA EVANS	BU/UP/2024/0877	APE	
7. NAMWANJE SAMALE	BU/UP/2024/3821	PTI	
8. MUHAIRWE VICTOR	BU/UP/2024/5254	AMI	
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CHAPTER ONE.

1. NUMBER ONE

1.1 INTRODUCTION.

This number aimed at helping learners to improve their data analysis skills as well as communication through graphics using Matlab software. We were required to use data obtained from kaggle.com, in the previous assignment. This was supposed to be done automatically using MATLAB software, which we succeeded to do as group 9 members. We were required to write the code that imports data from excel file into Matlab for creating some operations on data. The choice of data we made was the same data we used in assignment one which was 'the world population from 1970 to 2022''.
Matlab, through coding, creates multiple visualizations to display population trends across different years from 1970 to 2022).
The code extracts population data for various years and presents it using different types of graphs and charts as for the requirements of the assignment.

1.2 DATA HANDLING AND VISUALISATION

1.2.1. Data loading into Matlab.
 We imported Data into Matlab using the code;

```
 worldpopulation=readtable("C:\Users\Sober\Desktop\NAMARA ROMUS\matlab
assignment\world_population.xlsx");
```

This code reads excel document into Matlab through the file path mentioned above.

1.2.2. Data extraction from the imported table.
The name of the command for extracting data is;
```
%%to extract data from the table
```

To extract data for population of 2022, we used the code;
```
Populationof2022 = worldpopulation(:,1:6);
```
This code extracts all rows and columns from 1 to 6 of table worldpopulation.

 To extract data for population of 2020, we used the code;
```
 populationof2020=worldpopulation (:,[1:5 7]);
```
This code extracts all rows and columns from 1 to 5, then 7 of table worldpopulation.

To extract data for population of 2015, we used the code;
```
 populationof2015=worldpopulation(:,[1:5 8]);
```
This code extracts all rows and columns from 1 to 5, then 8 of table worldpopulation.

To extract data for population of 2010, we used the code;
```
populationof2010=worldpopulation (:,[1:5 9]);
```
This code extracts all rows and columns from 1 to 5, then 9 of table worldpopulation.

To extract data for population of 2000, we used the code;
```
populationof2000=worldpopulation(:,[1:5 10]);
```
This code extracts all rows and columns from 1 to 5, then 10 of table worldpopulation.

To extract data for population of 1990, we used the code;
```
populationof1990=worldpopulation(:,[1:5 11]);
```
This code extracts all rows and columns from 1 to 5, then 11 of table worldpopulation.

To extract data for population of 1980, we used the code;
```
populationof1980=worldpopulation(:,[1:5 12]);
```
This code extracts all rows and columns from 1 to 5, then 12 of table worldpopulation.

To extract data for population of 1970, we used the code;
```
populationof1970=worldpopulation(:,[1:5 13]);
```
This code extracts all rows and columns from 1 to 5, then 13 of table worldpopulation.
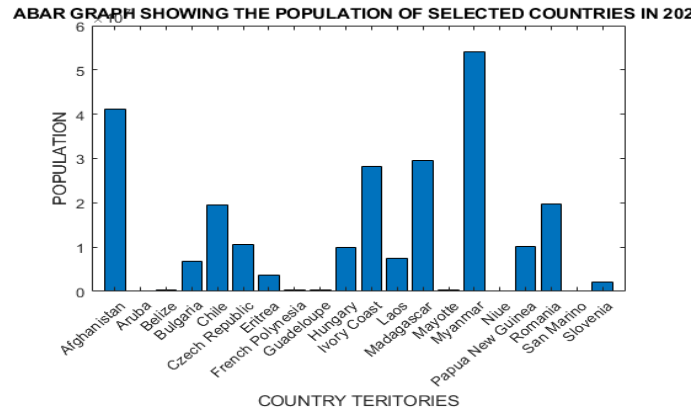
1.3. DATA VISUALIZATION ANALYSIS

1.3.1. 2022 Population - Vertical Bar graph

The code below displays the graph type called Vertical bar graph with the X-axis indicating the Country territories (every 10th country).The Y-axis indicated the Population values for 2022. The purpose is to compare population sizes across different countries in 2022.

```
%POPULATION OF 2022
figure;
bar(categorical(Populationof2022.Country_Territory(1:10:200)),Populationof2022.x2022P
opulation(1:10:200));
xlabel('COUNTRY TERITORIES');
ylabel('POPULATION');
title('ABAR GRAPH SHOWING THE POPULATION OF SELECTED COUNTRIES IN 2022');
```

The outcome of the plot is as shown below;
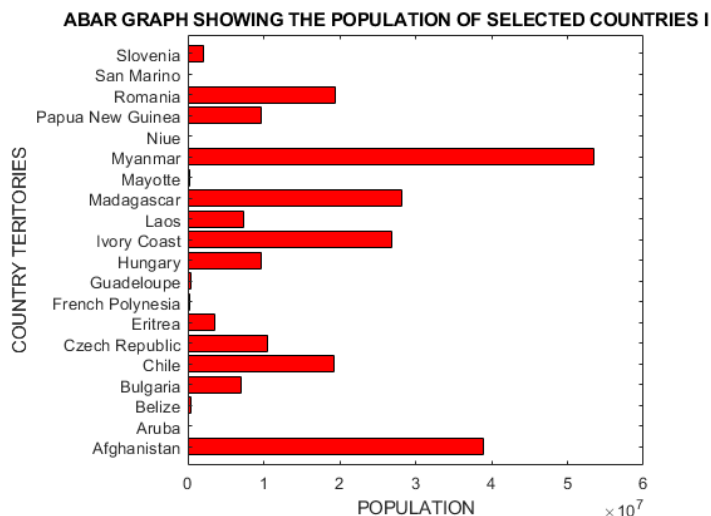
1.3.2. Horizontal Bar graph

The code below type represents a Horizontal bar graph, with Color, Red ('r'). On the y-axis, it shows the Country territories while on x-axis represents population values.

The Purpose of the graph is to easily comparison of country populations with country names displayed vertically.

The code is showh below.
```
%POPULATION OF 2020
figure;
barh(categorical(populationof2020.Country_Territory(1:10:200)),populationof2020.x2020
Population(1:10:200),'r');
ylabel('COUNTRY TERITORIES');
xlabel('POPULATION');
title('ABAR GRAPH SHOWING THE POPULATION OF SELECTED COUNTRIES IN 2020');
```

The output of the plot is as shown below;

1.3.3. Pie Chart

The code below shows the data visualization type using a Pie chart with labels and legend.

The purpose is to Show proportional distribution of population among selected countries
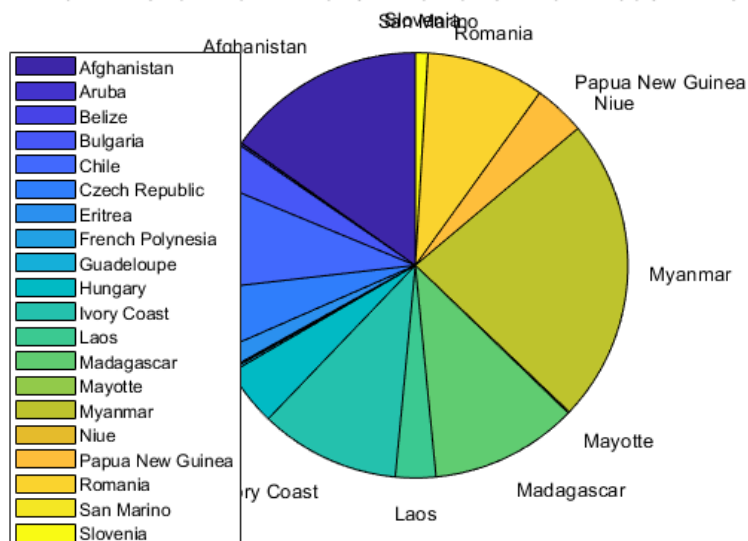
Advantage: Visualizes percentage contribution of each country to the total

The code is described as below.

```
%POPULATION 2015
figure;
pie(populationof2015.x2015Population(1:10:200),populationof2015.Country_Territory(1:1
0:200)),
legend;
title('A PIE CHART SHOWING THE POPULATION OF SELECTED COUNTRIES OF 2015');
```

The display of the output is as shown below

A PIE CHART SHOWING THE POPULATION OF SELECTED COUNTRIES OF 201
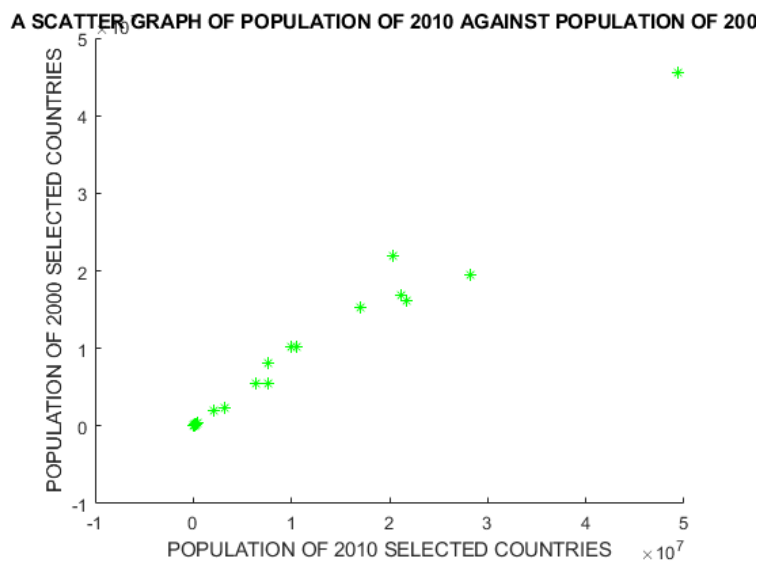
1.3.4. Population - Scatter Plot

The code below shows the data visualization in a Scatter plot type with green asterisk markers. The x-axis represent 2010 population, y-axis represents 2000 population and the, axis limits, Set between -10 million and 50 million

The Purpose is to show correlation analysis between population data from 2000 and 2010

The code is as shown below

```
%POPULATION OF 2010 AND 2000
figure;
scatter(populationof2010.x2010Population(1:10:200),populationof2000.x2000Population(1
:10:200),'*g');
xlabel('POPULATION OF 2010 SELECTED COUNTRIES');
ylabel('POPULATION OF 2000 SELECTED COUNTRIES');
title('A SCATTER GRAPH OF POPULATION OF 2010 AGAINST POPULATION OF 2000')
ylim([-1e7 5e7]);
xlim([-1e7 5e7]);
```

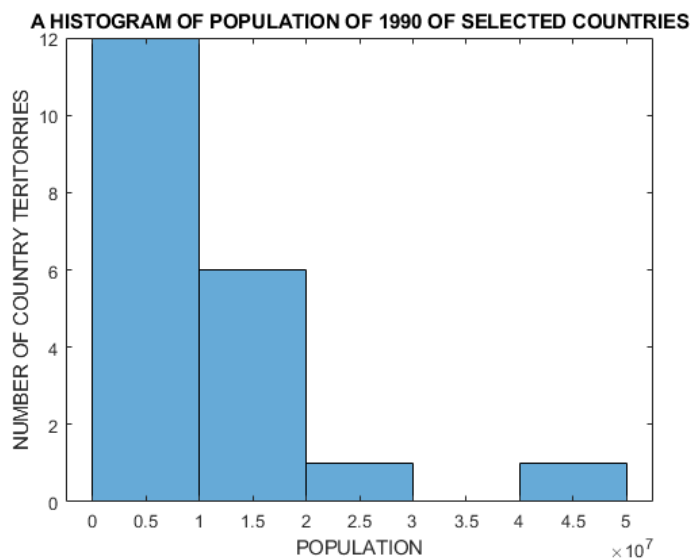**The output of the code is as shown below**

1.3.5. 1990 Population - Histogram

The code below plots a histogram type data visualization with frequency distribution having population ranges on x-axis and number of countries in each population range on y-axis.

```
%POPULATION OF 1990
figure;
histogram(populationof1990.x1990Population(1:10:200));
xlabel('POPULATION');
ylabel('NUMBER OF COUNTRY TERITORRIES')
title('A HISTOGRAM OF POPULATION OF 1990 OF SELECTED COUNTRIES');
```
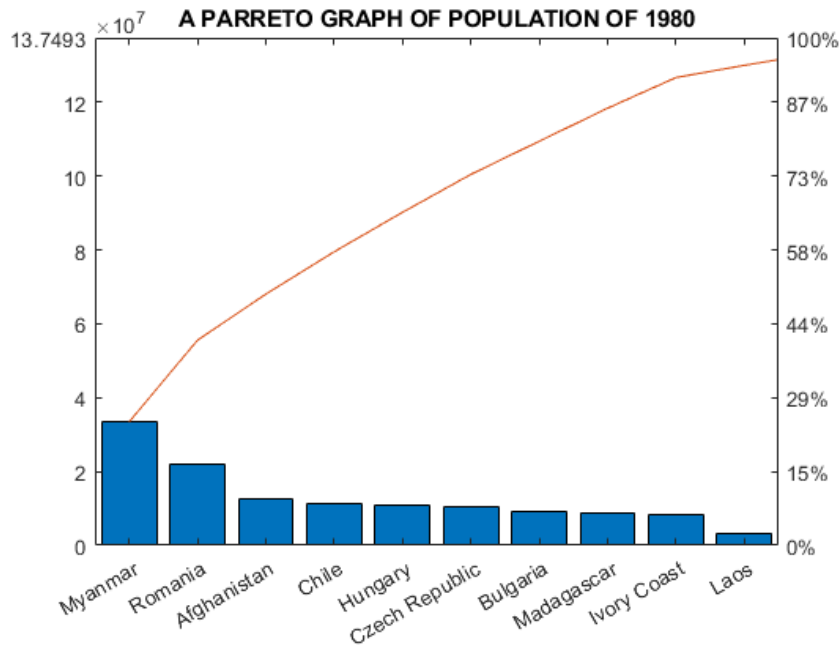**The output of the plot is as shown below.**

1.3.6. 1980 Population - Pareto Chart

The code below displays the parreto chart type data of visualization. The plot combines the bar graph and the cumulative line.

The plot identifies the most significant countries contributing to total population

```
%POPULATION OF 1980
figure;
pareto(populationof1980.x1980Population(1:10:200),populationof1980.Country_Territory(
1:10:200));
title('A PARRETO GRAPH OF POPULATION OF 1980');
```

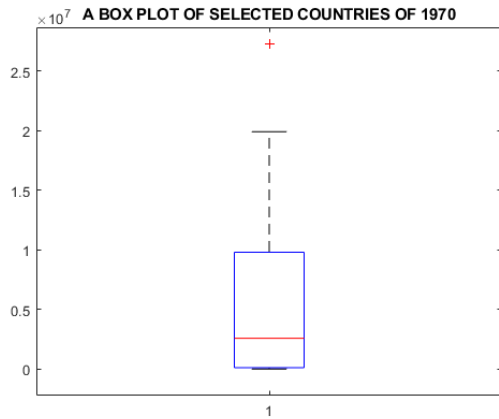**The above code displays the data as shown below.**

1.3.7. 1970 Population - Box Plot

The code below display the Box plot (box-and-whisker plot) of population of 1970

```
%POPULATION OF 1970
figure;
boxplot(populationof1970.x1970Population(1:10:200));
title('A BOX PLOT OF SELECTED COUNTRIES OF 1970');
```

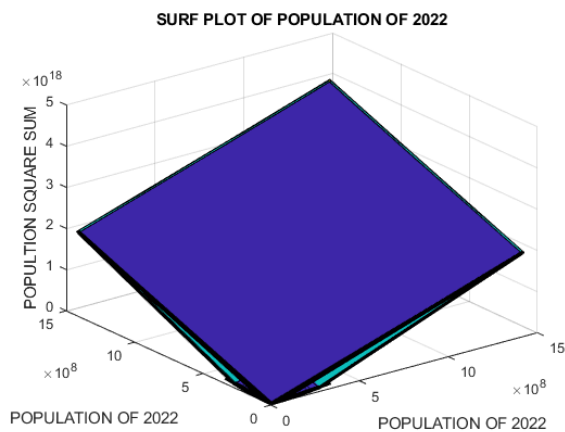**The display of the code is shown below.**

1.3.8. 2022 Population - 3D Surface Plot

The code below displays data type as 3D surface plot with z-values being the sum of the squares of population values.

```
%POPULATION OF 2022
figure;
[X Y]=meshgrid(Populationof2022.x2022Population);
Z=X.^2 + Y.^2;
surf(X,Y,Z);
title('SURF PLOT OF POPULATION OF 2022');
xlabel('POPULATION OF 2022');
ylabel('POPULATION OF 2022');
zlabel('POPULTION SQUARE SUM');
```
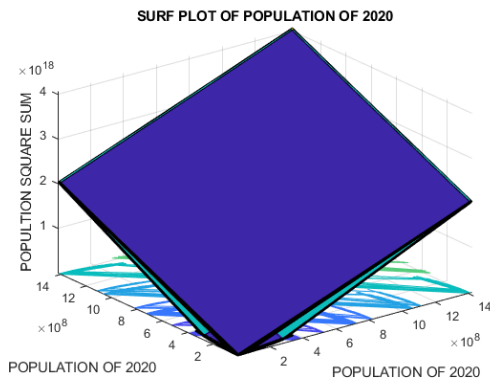
The code displays the plot a shown below.

1.3.9. 2020 Population - Surface Contour Plot

The code creates a surface plot with contour lines underneath.

The code is as shown below.
```
%POPULATION OF 2020
figure;
[A B]=meshgrid(Populationof2022.x2022Population);
C=A.^2 + B.^2;
surfc(A,B,C);
title('SURF PLOT OF POPULATION OF 2020');
xlabel('POPULATION OF 2020');
ylabel('POPULATION OF 2020');
zlabel('POPULTION SQUARE SUM');
```

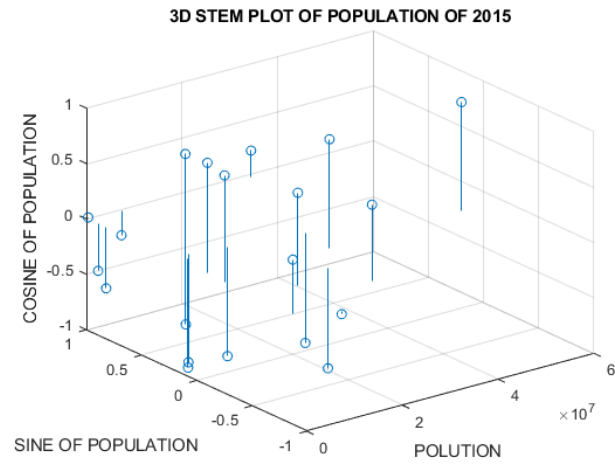**The code displays the data in surface plot as shown below below**

1.3.10. 2015 Population - 3D Stem Plot

The code below plots a 3D stem plot with a population values on x-axis, sine of population values on y-axis and cosine of population values on z-axis.

The Code is shown below;
```
%POPULATION OF 2015
figure;
H=populationof2015.x2015Population(1:10:200);
J=sin(H);
K=cos(H);
stem3(H,J,K);
title('3D STEM PLOT OF POPULATION OF 2015');
xlabel('POLUTION');
ylabel('SINE OF POPULATION');
zlabel('COSINE OF POPULATION');
```

The code displays the data in a stem plot as shown on the next page.

3D STEM PLOT OF POPULATION OF 2015

CHAPTER TWO

NUMBER TWO.

INTRODUCTION**.**

This section of the report deals with the data visualization for different parameters using Matlab software. It required us to describe different statistical characteristics of data. Data was in form of individual attributes detailed to describe each person. We were also required to generate different visual effects using MATLAB code. The code that creates a comprehensive team member database using structures and generates multiple visualizations to analyze member demographics and demonstrate various plotting techniques.

METHODOLOGY AND DATA INPUT.

Data entry into matlab for every individual was manually input into the Matlab software for proper visualization in different forms. We generated a code that allows the entry of each member's attributes in fields. We used the code;

```
Members =
struct('Name',{},'Age',{},'Religion',{},'Tribe',{},'HomeDistrict',{},'Course',{},
'Interest',{},'Background',{},'FacialRepresentation',{});
```

The code defines a structured array with the following fields for each team member:

- **Name**: Full name of the member
- **Age**: Age as a string
- **Religion**: Religious affiliation
- **Tribe**: Ethnic tribe
- **Home District**: Home district in Uganda
- **Course**: Academic course/program
- **Interests**: Personal hobbies/interests
- **Background**: Personal background description
- **Facial Representation**: Facial image loaded from file path

DATA VISUALISATION

2D Visualizations
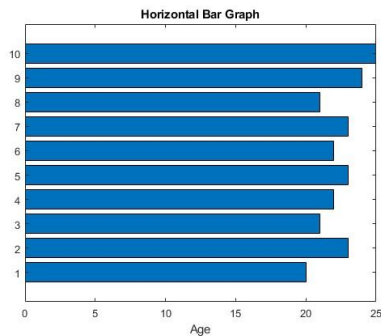
1. Horizontal Bar Graph - Age Distribution

```
% horizontal bar graph
figure('Name','horizontal bar graph');
```

```
y = [20,23,21,22,23,22,23,21,24,25];
barh(y);
xlabel("Age");
title('Horizontal Bar Graph');
% line plot
```

The code displays age distribution across team members on a horizontal bar graph with Age values on y-axis and it shows that the ege range from 20-25 years, with 23 being most common
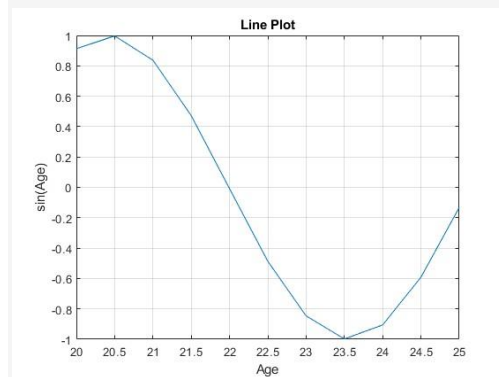

2. Line Plot - Mathematical Function

The code below plots a line plot of type data visualization with Age range (20-25) with 0.5 increments on x- axis and sine values of ages on y- axis

```
% line plot
figure('Name','Lineplot');
x = 20:0.5:25;
y = sin(x);
plot(x,y);
xlabel('Age');
ylabel('sin(Age)');
title('Line Plot');
grid on
```
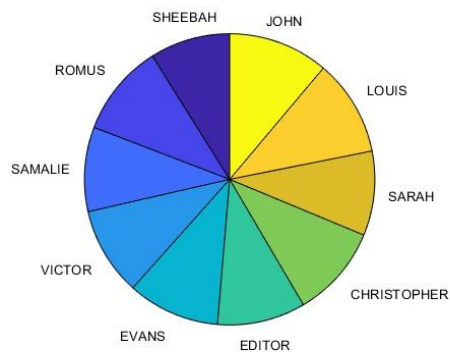
4. Pie Chart - Age Proportion

```
%% Pie Chart
figure('Name','piechart');
data = [20,23,21,22,23,22,23,21,24,25];
labels =
{'SHEEBAH','ROMUS','SAMALIE','VICTOR','EVANS','EDITOR','CHRISTOPHER','SARAH','LOU
IS','JOHN'};
pie(data,labels);
```

- **Purpose**: Show percentage contribution of each member's age to total
- **Features**: Direct labeling of each segment

5. Step Plot - Mathematical Function

```
%% Pie Chart
figure('Name','piechart');
data = [20,23,21,22,23,22,23,21,24,25];
labels =
{'SHEEBAH','ROMUS','SAMALIE','VICTOR','EVANS','EDITOR','CHRISTOPHER','SARAH','LOU
IS','JOHN'};
pie(data,labels);
```
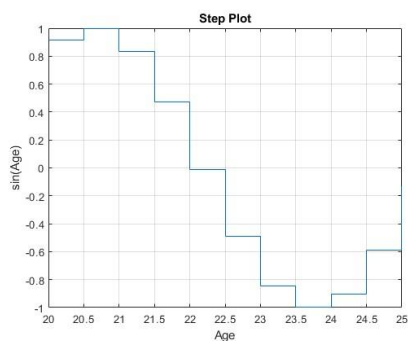
- **Type**: Staircase plot showing discrete changes
- **Application**: Useful for displaying digital signals or quantized data

6. Histogram - Random Data Distribution

```
%% Histogram
```

```matlab
figure('Name','histogram');
data = randn(10,1);
histogram(data);
xlabel('Data');
ylabel('Frequency');
title('Histogram');
grid on;
```
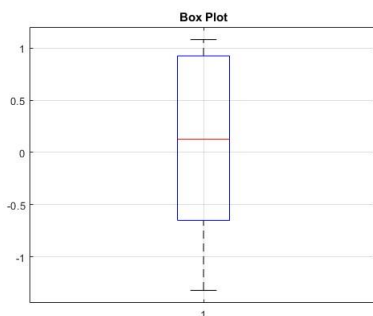
- **Data**: 10 random values from normal distribution
- **Purpose**: Show frequency distribution of random data

Step Plot

7. Box Plot - Statistical Summary

```matlab
%% Box plot
figure('Name','box plot');
data = randn(10,1);
boxplot(data);
title('Box Plot');
grid on;
```

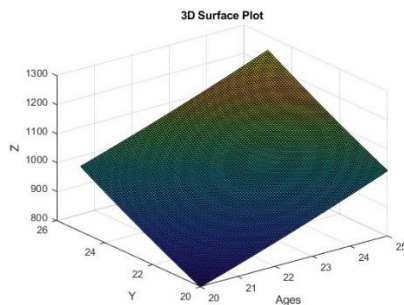The code displays statistical measures (median, quartiles, outliers)

Box Plot

3D Visualizations

8. 3D Surface Plot

```
figure('Name','3DSurfacePlot');
x=20:0.05:25;
[X,Y]=meshgrid(x);
Z=X.^2 + Y.^2;
surf(X,Y,Z);
xlabel('Ages');
ylabel('Y');
zlabel('Z');
title('3D Surface Plot');
grid on;
```
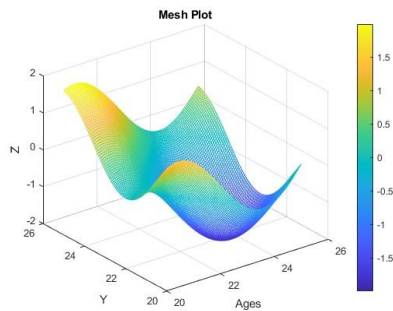
- **Function**: $Z = X^2 + Y^2$
- **Grid**: Fine resolution (0.05 increments)
- **Appearance**: Parabolic surface

9. Mesh Plot

```
% Mesh plot
figure('Name','MeshplotofAges');
b=20:0.05:25;
[B,C]=meshgrid(b);
d=sin(B)+cos(C);
mesh(B,C,d);
colorbar;
xlabel('Ages');
ylabel('Y');
zlabel('Z');
title('Mesh Plot');
grid on;
```
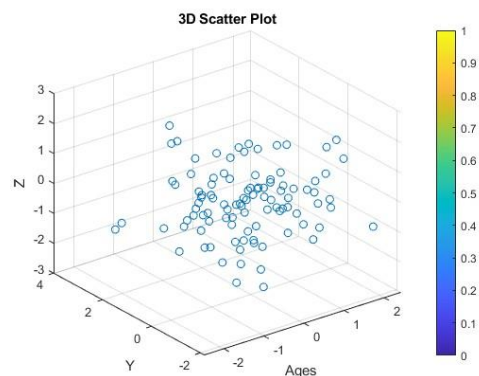
- **Function**: d = sin(B) + cos(C)
- **Features**: Colorbar added for value reference
- **Style**: Wireframe mesh representation

11. 3D Scatter Plot

```
% 3D Scatter plot
figure('Name','ScatterplotofAges');
b=randn(100,1);
c=randn(100,1);
d=randn(100,1);
scatter3(b,c,d);
colorbar;
xlabel('Ages');
ylabel('Y');
zlabel('Z');
grid on;
title('3D Scatter Plot');
```
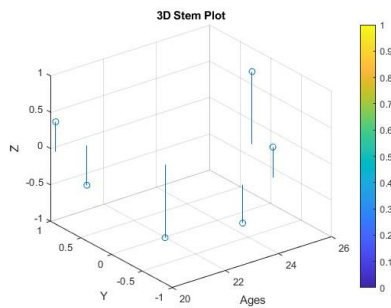
- **Points**: 100 random points in 3D space
- **Distribution**: Normal distribution in all dimensions

-

12. 3D Stem Plot

```
% 3D Stem plot
figure('Name','StemplotofAges');
b=20:25;
c=sin(b);
d=cos(b);
stem3(b,c,d);
colorbar;
xlabel('Ages');
ylabel('Y');
zlabel('Z');
grid on;
title('3D Stem Plot');
```

- **X**: Age values (20-25)
- **Y**: Sine of ages
- **Z**: Cosine of ages
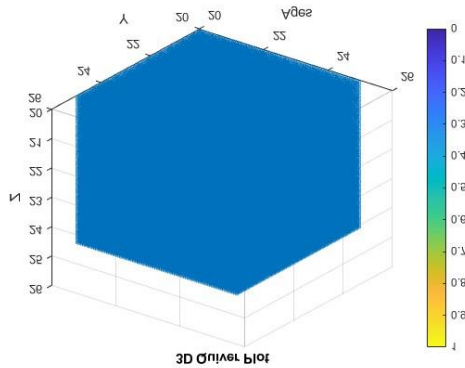- **Appearance**: Discrete lines with markers

13. 3D Quiver Plot

```
% 3D Plot of vectors as arrows in space plot
figure('Name','QuiverplotofAges');
b=20:0.05:25;
[b,c,d]=meshgrid(b);
e=sin(b);
f=cos(c);
g=d;
quiver3(b,c,d,e,f,g);
colorbar;
xlabel('Ages');
ylabel('Y');
zlabel('Z');
grid on;
```
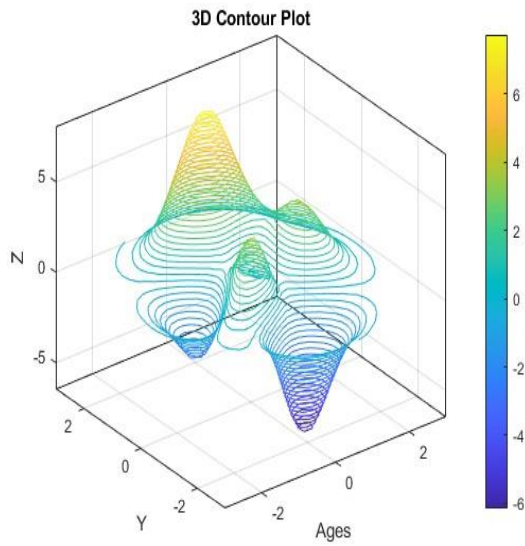
```matlab
title('3D Quiver Plot');
```

- **Purpose**: Display vector field
- **Vectors**: Direction components based on trigonometric functions

-

14. 3D Contour Plot

```matlab
% 3D Contour plot
figure('Name','contourplotofAges');
b=20:0.05:25;
[b,c,d]=peaks(30);
contour3(b,c,d,50);
colorbar;
xlabel('Ages');
ylabel('Y');
zlabel('Z');
grid on;
title('3D Contour Plot');
```

- **Function**: Uses MATLAB's built-in `peaks` function
- **Contours**: 50 contour levels
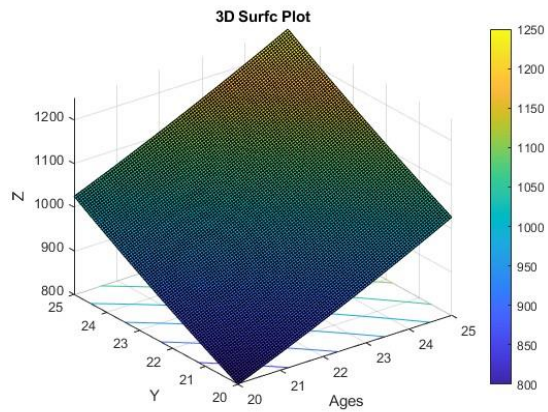- **Appearance**: Elevated contour lines in 3D space

15. Surface with Contour Plot (surfc)

```matlab
% 3D surfc plot
figure('Name','surfcplotofAges');
b=20:0.05:25;
[b,c]=meshgrid(x);
d=b.^2+c.^2
surfc(b,c,d);
colorbar;
xlabel('Ages');
ylabel('Y');
zlabel('Z');
grid on;
```

Function: $Z = X^2 + Y^2$ (same as surface plot)

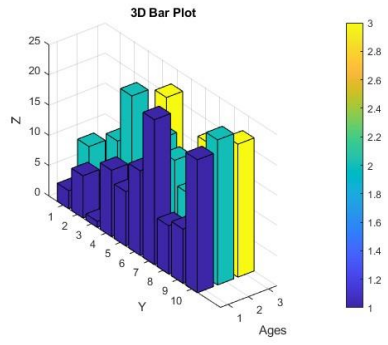**Combination**: Surface plot with contour plot underneath.

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16. 3D Bar Plot

```matlab
% 3D surfc plot
figure('Name','surfcplotofAges');
b=20:0.05:25;
[b,c]=meshgrid(x);
d=b.^2+c.^2
surfc(b,c,d);
colorbar;
xlabel('Ages');
ylabel('Y');
zlabel('Z');
grid on;
```

Data: 10×3 matrix of random integers (1-25)

Appearance: Three-dimensional bars

The code desplays the graph as shown below

3D Bar Plot

CHAPTER THREE

3. CHALLENGES, RECOMMENDATION AND CONCLUSION

3.1. CHALLENGES

- ✓ Understanding MATLAB syntax. Matlab has its own unique syntax, which can be challenging to learn, especially for those without prior programming experience.
- ✓ Visualizing data in matlab was challenging, especially when we were dealing with large complex datasets.
- ✓ Meeting assignment requirement was challenging especially when we were dealing with complex problems.

3.2. RECOMMENDATIONS.

- ➢ Start working on the assignment early to avoid last-minute rushes and ensure that we have enough time to test the code.
- ➢ Use Matlab built-in functions and tools to simplify the code
- ➢ Testing the code thoroughly to ensure that it works correctly and meets all the requirements of the assignment.
- ➢ Don't hesitate to seek help from the instructor and classmates when struggling with a concept or a problem.

3.3. CONCLUSIONS

- ➢ Matlab is a powerful tool for data analysis, visualization and simulation and is widely used in many fields, including engineering, physics and finance.
- ➢ Practice is a key to becoming proficient in Matlab, and working on assignments and projects and is an excellent way to gain hands-on experience.
- ➢ Attention to detail is important when working on matlab assignment, as small mistakes can lead to large errors