

## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 Introduction to Internship**

This internship is all about Power BI. An introduction to Power BI which will help to understand the concepts behind Business Intelligence. In this Internship program, we have also discussed various popular topics such as History of Power BI, applications of BI, Power BI, visualizations, Data modeling, Power query, etc.

Today's world, technology is growing very fast, and we are getting in touch with different new technologies day by day. Here, one of the booming technologies of computer science is Business Intelligence which is ready to create a new revolution in the world by making intelligent machines.

#### **1.2 Internship Program Objective**

The major objectives of internship are:

- ❖ To understand what is Power BI and its features
- ❖ To understand what is Data modeling using Power BI
- ❖ To know what is visualizations and its types
- ❖ To create insightful dashboard in Power BI

#### **1.3 Introducing Power BI**

Microsoft's Power BI is a business and data analytics service that enables professionals to process, analyze, and visualize vast volumes of data. It helps extract insights, draw conclusions, and share results in the form of reports and dashboards across various departments. It provides an easy drag and drops feature with a range of interactive data visualizations to generate reports and dashboards.

#### **1.4 Flow Of Work In Power BI**

One common workflow in Power BI begins by connecting to data sources in Power BI Desktop and building a report. You then publish that report from Power BI Desktop to the Power BI service, and share it so business users in the Power BI service and on mobile devices can view and interact with the report.



### **1.5 Features of Power BI :**

- 1.5.1 Power BI is faster and performs better when there is a smaller volume of data
- 1.5.2 Power BI provides an interface based on Microsoft Office 365 that is user- friendly,intuitive, and easy to understand
- 1.5.3 Using Power BI, you can work with several data sources, such as Excel, Text/CSV,JSON, SQL Server databases, IBM DB2, MySQL, etc.
- 1.5.4 Power BI can connect with the R programming language, and it also supportsvarious Data Analysis Expression (DAX) functions and measures
- 1.5.5 Power BI has functional integration with the Microsoft Azure cloud platform. It helps to analyze insights and patterns in datasets

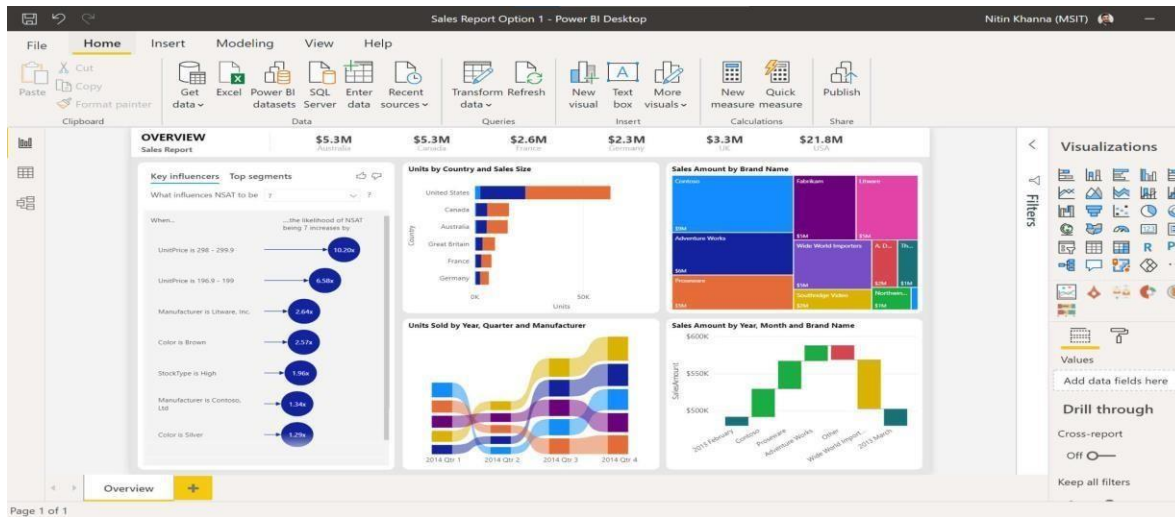
### **1.6 Using Data Modeling**

Data Modeling is one of the features used to connect multiple data sources in BI tool using a relationship. A relationship defines how data sources are connected with each other and you can create interesting data visualizations on multiple data sources.

With the modeling feature, you can build custom calculations on the existing tables and these columns can be directly presented into Power BI visualizations. This allows businesses to define new metrics and to perform custom calculations for those metrics.

### **1.7 Creating Simple Visualizations**

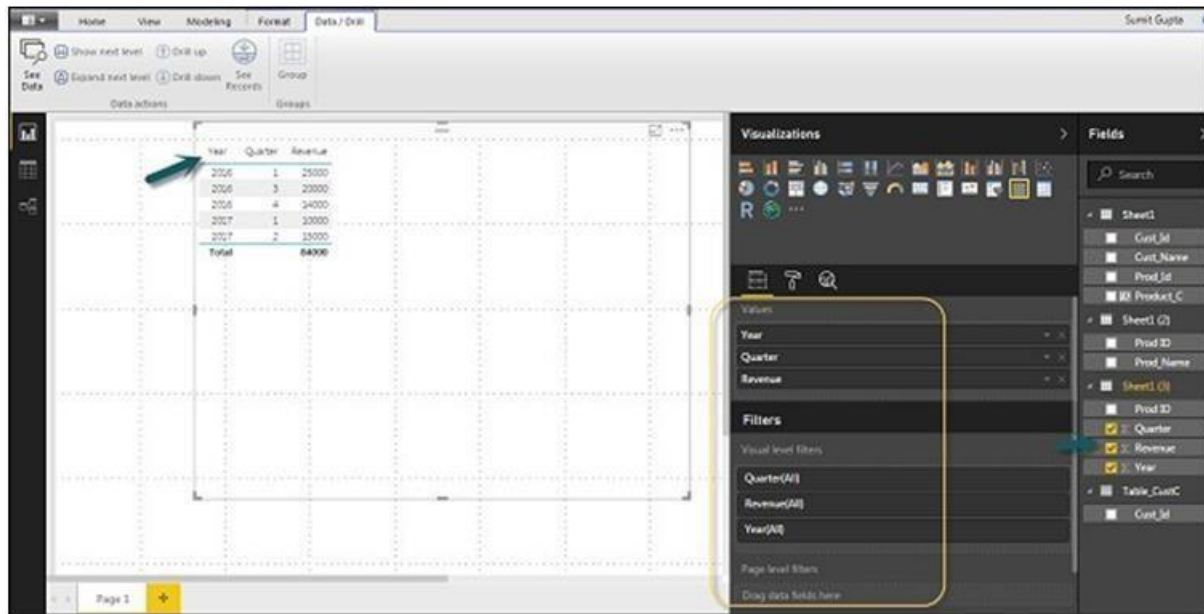
Visualizations are used to effectively present your data and are the basic building blocks of any Business Intelligence tool. Power BI contains various default data visualization components that include simple bar charts to pie charts to maps, and also complex models such as waterfalls, funnels, gauges, and many other components.



In Power BI, you can create visualization in two ways. First is by adding from the right side pane to Report Canvas. By default, it is the table type visualization, which is selected in Power BI. Another way is to drag the fields from the right sidebar to the axis and value axis under Visualization. You can add multiple fields to each axis as per the requirement.

Visualizations (**known as visuals for short**) **display insights that have been discovered in the data**. A Power BI report might have a single page with one visual or it might have pages full of visuals. In the Power BI service, visuals can be pinned from reports to dashboards.

Visualization is **any technique for creating images, diagrams, or animations to communicate a message**. Visualization through visual imagery has been an effective way to communicate both abstract and concrete ideas since the dawn of humanity.



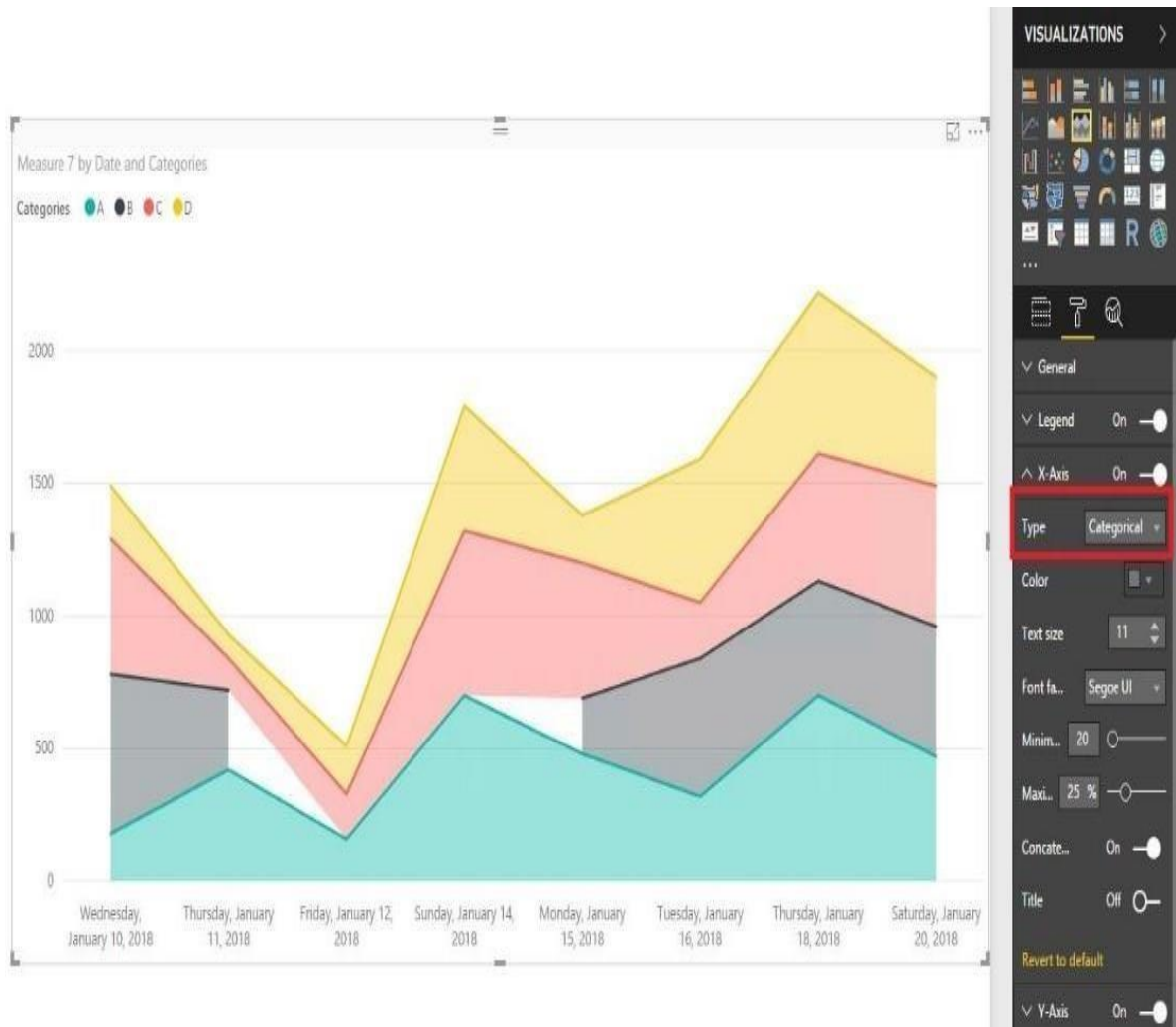
In Power BI, it is also possible to move your visualization on the reporting canvas by clicking and then dragging it. You can also switch between different types of charts and visualizations from the Visualization pane. Power BI attempts to convert your selected fields to the new visual type as closely as possible.

### Here are the chart types in Power BI :

1. Area charts
2. Line charts
3. Bar charts
4. Column charts
5. Pie charts
6. Doughnut charts
7. Gauge charts
8. Ribbon charts
9. Scatter charts
10. Bubble charts

### 1.8 Chart Types Used in Dashboard of Power BI:

## 1. Area Chart



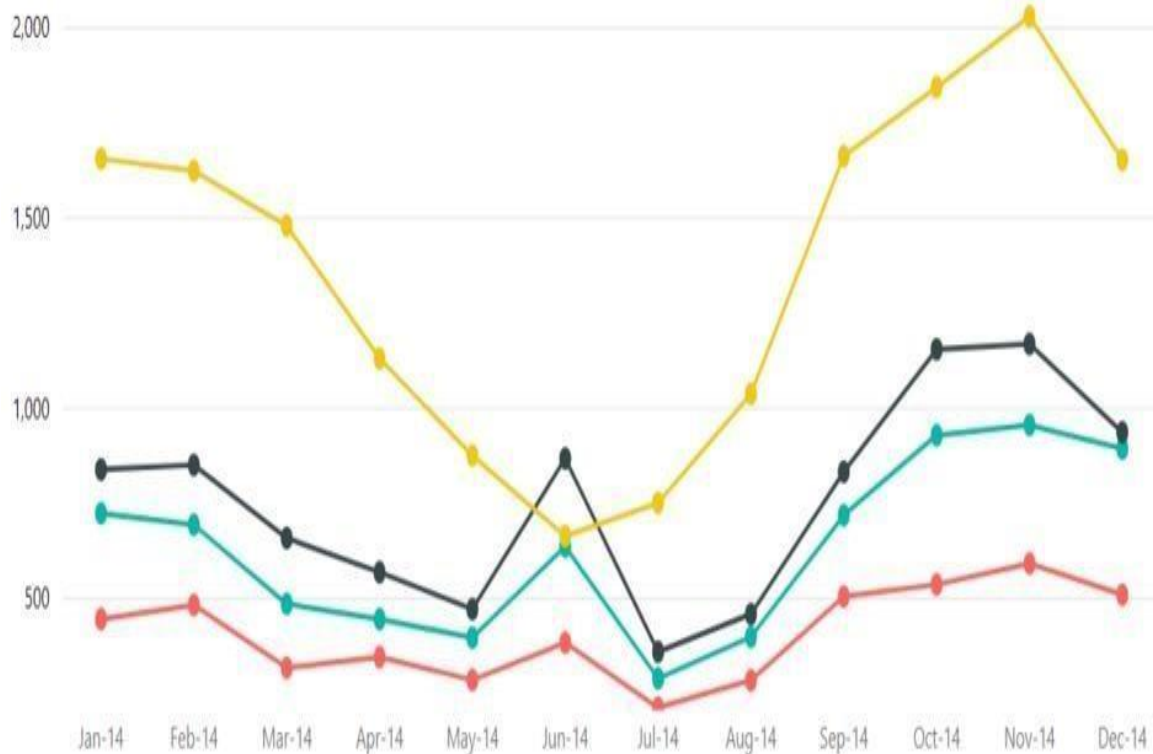
Area charts emphasize the magnitude of change over time, and can be used **to draw attention to the total value across a trend**. The basic area chart (also known as layered area chart.) is based on the line chart. The area between axis and line is filled with colors to indicate volume.

An area chart or area graph **displays graphically quantitative data**. It is based on the line chart. The area between axis and line are commonly emphasized with colors, textures and hatchings. Commonly one compares two or more quantities with an area chart.

## 2. Line Chart

Total Units by Month and Manufacturer

Manufacturer Aliqui Natura Pirum VanArsdel



A line chart is a popular visualization chart used to represent a series of data points connected by a straight line. It is used to **represent continuous data sets**. Time series forecasting and stock market trend analysis are common applications of line charts.

A line chart is a type of chart used **to show information that changes over time**. Line charts are created by plotting a series of several points and connecting them with a straight line. Line charts are used to track changes over short and long periods of time.

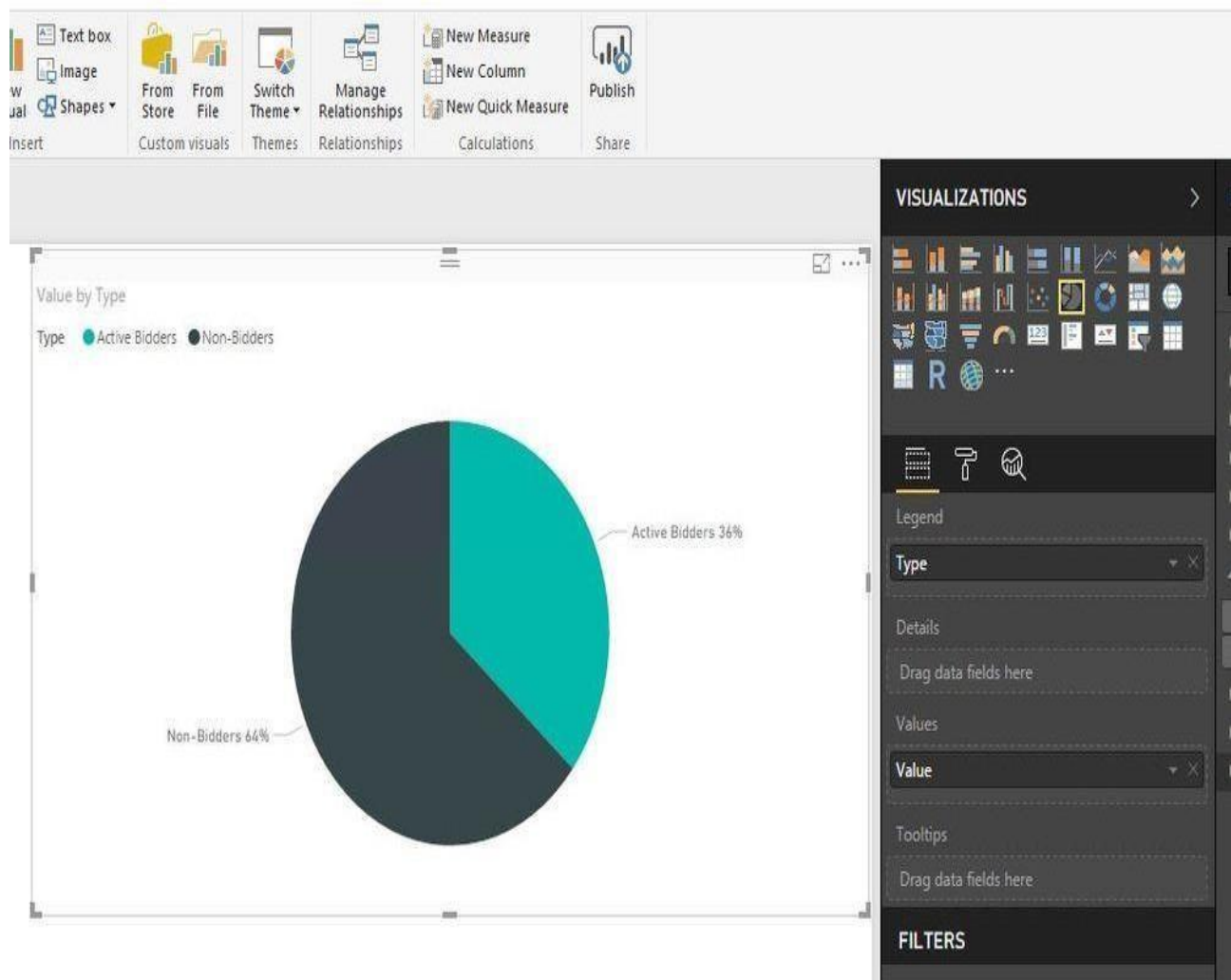
## 3. Bar chart



One of the most important chart types in Power BI is the bar chart. A bar chart is used to **represent categorical data in rectangular bars by the length of the rectangle denoted by a specific measure value.**

Bar graphs are used to **compare things between different groups or to track changes over time.** However, when trying to measure change over time, bar graphs are best when the changes are larger.

#### 4. Pie Chart

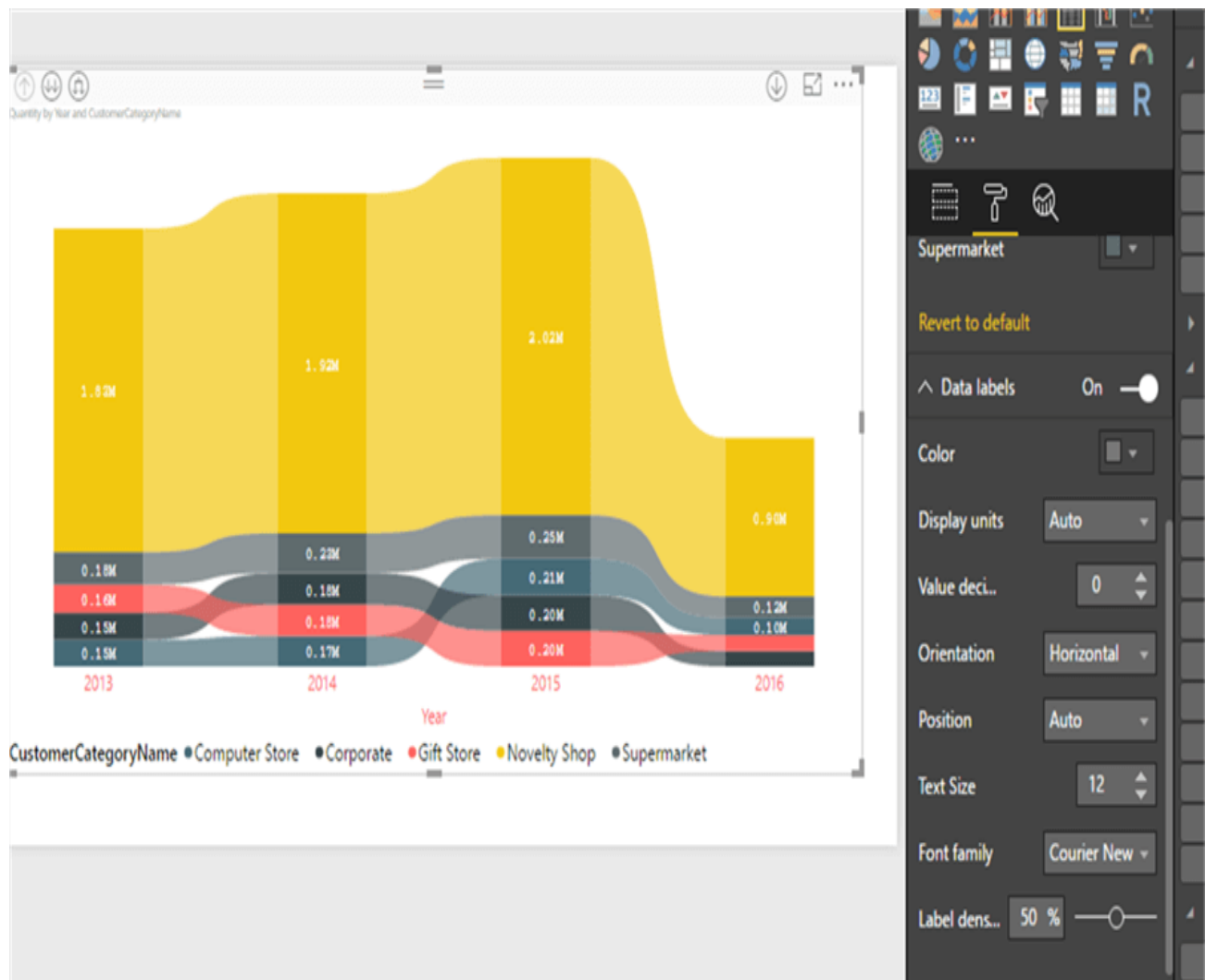


The purpose of a Pie chart is **to illustrate the contribution of different values to a total**. For example, to see the total sales split by product category. You can then see the percentage contribution of each product category to the total revenue.

A pie chart is another most commonly used chart types in Power BI. It is used to understand the proportion of a dimension relative to the other members of the same dimension. The proportion is calculated by a measured value which calculates the area in percentage and allocates to each of the members. Pie charts are useful if the dimension has 5-6 members only to visualize.

## 5. Ribbon chart





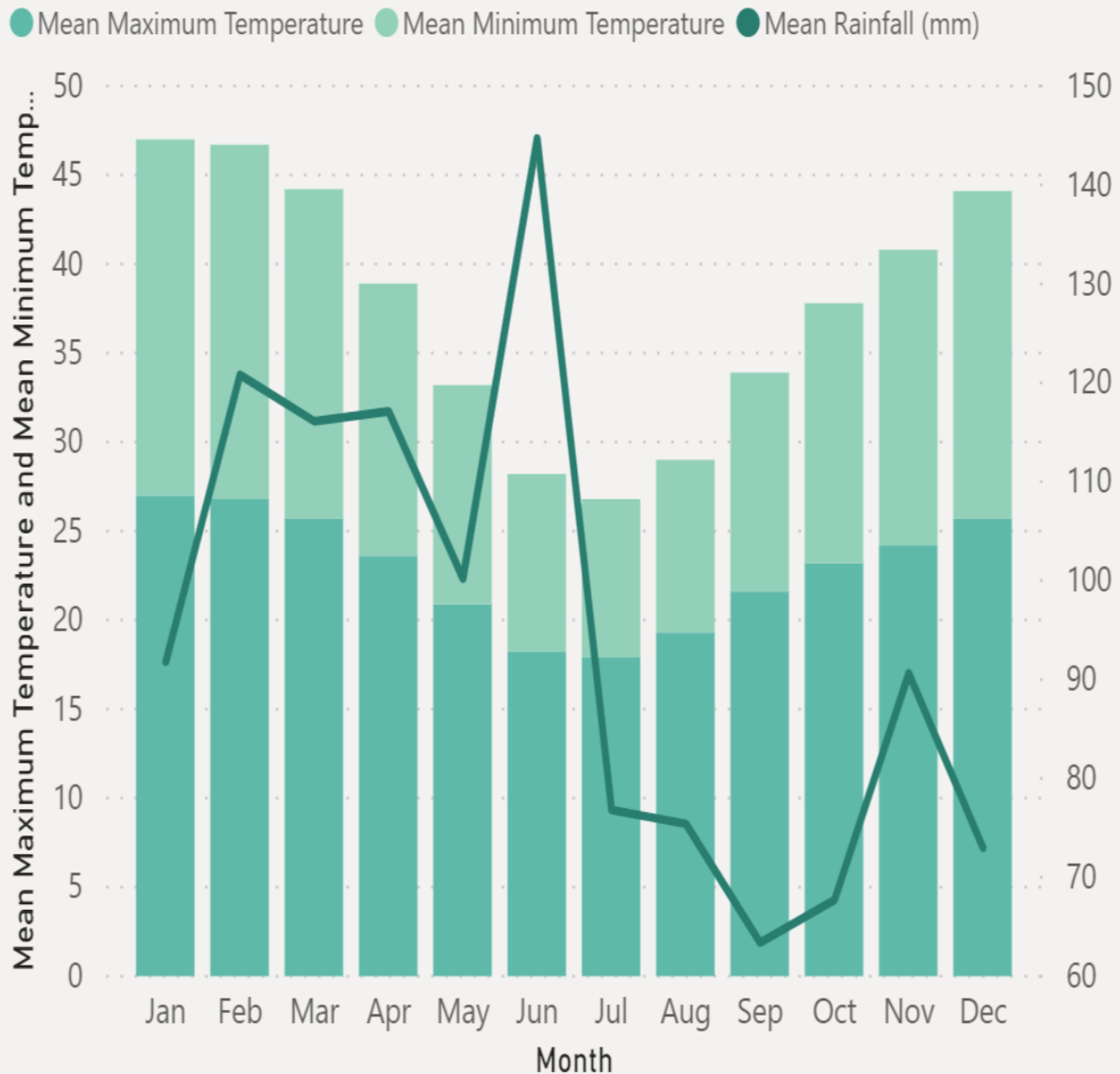
Ribbon Chart is a **stacked chart similar to stacked column chart with one big difference**. In stacked column chart values shown in the order of items in legend. However, in Ribbon chart items ordered based on which item has the majority of that measure in that particular axis value.

Ribbon chart is **Power BI native visual** and it is similar like stacked column chart in Power BI with some advance functionality. With Ribbon Chart you can see the rank & sales changes difference between categories. It always shows large value in each column at the top then the next value comes after.

## 6 . Stacked Line And Column Chart

# Line and Stacked Column Chart

Mean Rainfall by Max and Min Temperature by Month



The Line and Stacked Column Chart is a combo charts that combines the Line chart and Column chart together in **one visual**. By combining these two visuals together, you can make a very quick comparison between two sets of measures.

## CHAPTER 2

# POWER BI DASHBOARD

## 2.1 What is a Power BI Dashboard?

A single page visualization with multiple charts and graphs to tell a story is called a Power BI dashboard. This one-page visualization in a dashboard is also known as a Canvas. The Power BI dashboard is a feature only available in Power BI Service. Since a Power BI dashboard is limited to one page, it only contains the highlights of a story. You cannot create a dashboard on Power BI Desktop.



Fig. 2.0: Power BI Dashboard on Power BI

In a dashboard, visualizations are generated from reports, and each report is based on one dataset. The visualizations present on the dashboard are called tiles, and report designers pin these tiles to the dashboard.

## 2.2 Advantages of a Power BI dashboard

- A Power BI dashboard enables users to analyze reports and view all important metrics at a glance
- Using a Power BI dashboard, users can create visualizations from multiple datasets or multiple reports
- Can customize dashboards to meet the requirements of any enterprise
- Power BI dashboards can be embedded into applications to provide a unified user experience
- Can instantly share a dashboard with other colleagues in your organization

## 2.3 Create a Dashboard in Power BI?

Building reports on Power BI Desktop and publishing them to Power BI Service is one of the best ways to understand how a Power BI dashboard works.

For our demo, we'll be looking at a Heart Disease Prediction dataset that contains patient's medical information. The dataset contains various customer patient details, including Age, Sex, Chest Pain, Resting BP, Cholesterol, Fasting BS, Resting ECG, Max HR, Exercise Agina, Oldpeak, ST\_Slope and Heart Disease. This dataset is commonly known as a Heart Disease Prediction dataset. We'll analyze this dataset to Number of patient affected by Heart Diseases.

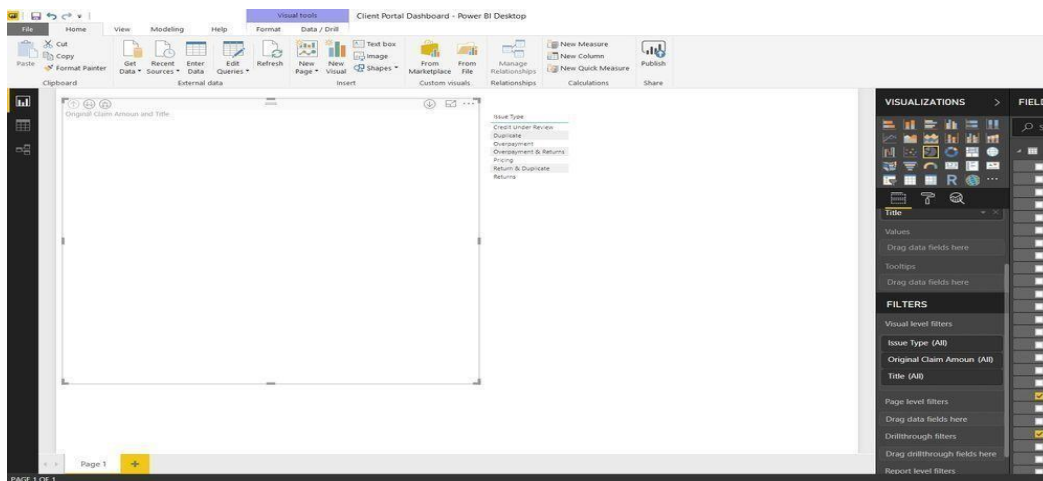


Fig:2.1 Heart Disease Prediction Dataset

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Age	Sex	ChestPain	RestingBP	Cholesterc	FastingBS	RestingEC	MaxHR	ExerciseAr	Oldpeak	ST_Slope	HeartDisease	
2	40	M	ATA	140	289	0	Normal	172	N	0	Up	0	
3	49	F	NAP	160	180	0	Normal	156	N	1	Flat	1	
4	37	M	ATA	130	283	0	ST	98	N	0	Up	0	
5	48	F	ASY	138	214	0	Normal	108	Y	1.5	Flat	1	
6	54	M	NAP	150	195	0	Normal	122	N	0	Up	0	
7	39	M	NAP	120	339	0	Normal	170	N	0	Up	0	
8	45	F	ATA	130	237	0	Normal	170	N	0	Up	0	
9	54	M	ATA	110	208	0	Normal	142	N	0	Up	0	
10	37	M	ASY	140	207	0	Normal	130	Y	1.5	Flat	1	
11	48	F	ATA	120	284	0	Normal	120	N	0	Up	0	
12	37	F	NAP	130	211	0	Normal	142	N	0	Up	0	
13	58	M	ATA	136	164	0	ST	99	Y	2	Flat	1	
14	39	M	ATA	120	204	0	Normal	145	N	0	Up	0	
15	49	M	ASY	140	234	0	Normal	140	Y	1	Flat	1	
16	42	F	NAP	115	211	0	ST	137	N	0	Up	0	
17	54	F	ATA	120	273	0	Normal	150	N	1.5	Flat	0	
18	38	M	ASY	110	196	0	Normal	166	N	0	Flat	1	
19	43	F	ATA	120	201	0	Normal	165	N	0	Up	0	
20	60	M	ASY	100	248	0	Normal	125	N	1	Flat	1	
21	36	M	ATA	120	267	0	Normal	160	N	3	Flat	1	
22	43	F	TA	100	223	0	Normal	142	N	0	Up	0	
23	44	M	ATA	120	184	0	Normal	142	N	1	Flat	0	

## Introduction to Heart disease dataset

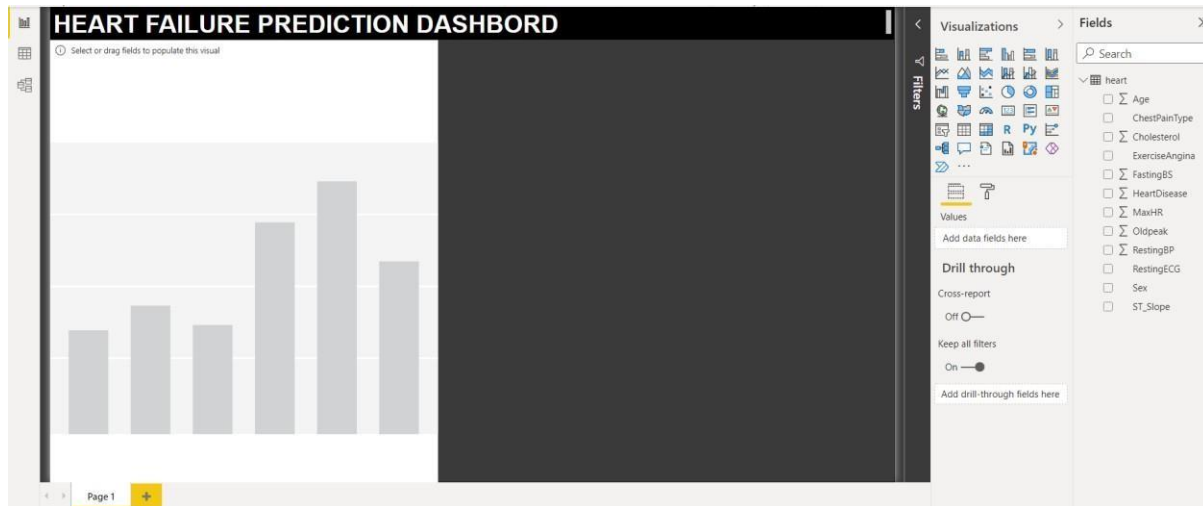
This database contains 76 attributes, but all published experiments refer to using a subset of 14 of them. In particular, the Cleveland database is the only one that has been used by ML researchers to this date.

- 
- It is integer valued from 0 (no presence) to 4.
- The dataset contains various patient details, including Age, Sex, Chest Pain, Resting BP, Cholesterol,

The "goal" field refers to the presence of heart disease in the patient.

Fasting BS, Resting ECG, Max HR, Exercise Agina, Oldpeak, ST\_Slope and Heart Disease.

First, we will see how many people are affected by heart disease based on the sex. From the Visualization panel in the Dashboard we can choose Stacked column chart, which will create an column chart.



Drag the HeartDisease and sex column on to the fields, which will give you the total number of people affected by Heart Disease. You can edit this chart by changing the font size and the color of the Total number value. Also, you can add a title to this chart.

After that, we may add a slicer to our visualization to slice the data based on the total number of persons affected by Heart Disease



Fig:2.2 Bar Graph on Heart Disease By Sex

Suppose when we are looking to visualize and analyze Age and sex. In order to do this, we can create a pie chart. Select the pie chart from the visualization panel and drag the “Age” column on to “Shared Axis.” Put “Sex” under “Column” values, and insert the “Age” column into “Line” values. That will generate the graph. You can edit the color of the bars and the line under the format tab.

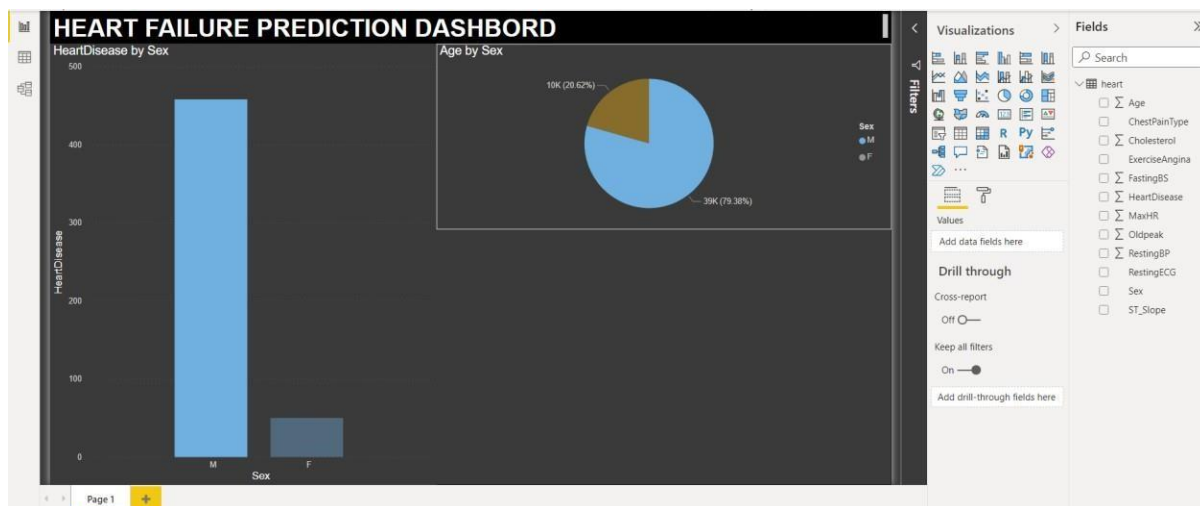


Fig:2.3 Pie Chart on Age By Sex

In the chart above, the pie chart represent the Age and Sex. The Pie chart of Age by Sex reveals that the count of people are getting affected by HeartDisease Based on their Sex and Age.

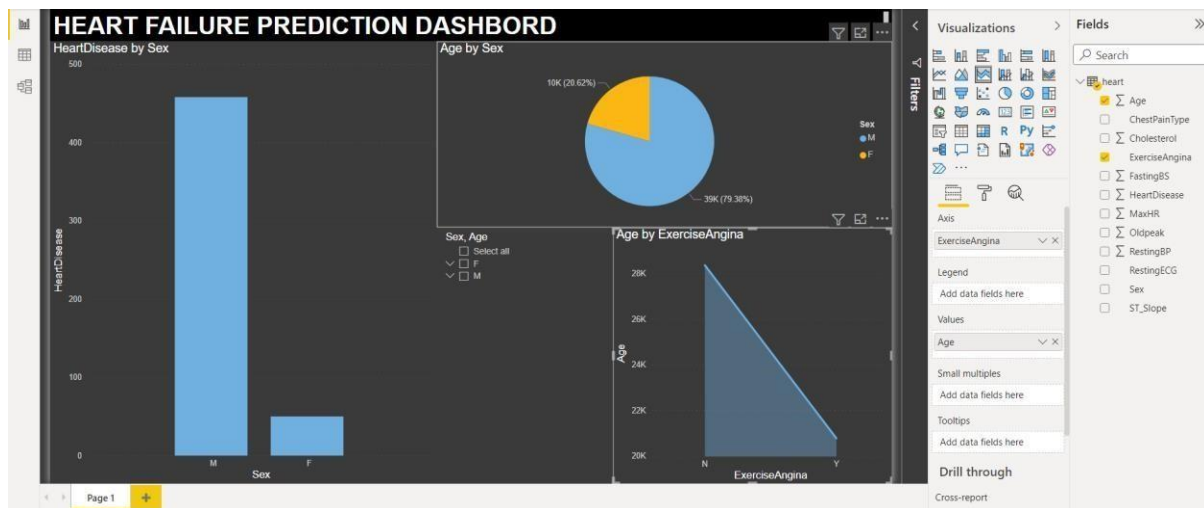


Fig:2.4 Stacked Area Chart on Exercise Angina

From the above Visualization, we can see that count of patient affected by Heart Disease.

As we have used Stacked Area Chart by implementing values as Age and ExerciseAngina. Exercise angina is a **condition in which your heart doesn't get enough blood flow and oxygen**. It may lead to a heart attack. Angina is a type of chest discomfort caused by poor blood flow through the blood vessels (coronary vessels) of the heart muscle (myocardium).



Fig:2.5 Heart Disease By Exercise Angina & ST\_Slope

From the above visualization, we have used stacked area chart here and we have taken the Exercise Angina as Axis, ST\_Slope as Legend and HeartDisease as Values. The chart is given as HeartDisease by Exercise Angina and ST\_Slope which reveals how bad is the disease for the patients who have ExerciseAngina.



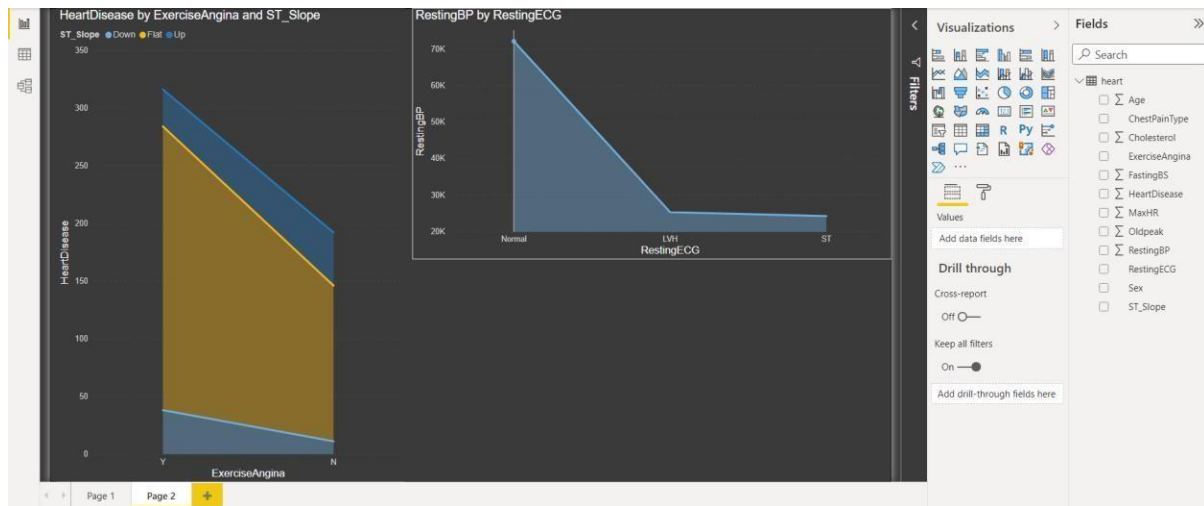


Fig:2.6 Stacked Area Chart on Resting BP by Resting ECG

In this Visualization also we have used stacked area chart by taking values as Resting ECG as Axis and Resting BP as Values. This reveals that lower the Resting BP lowers the Resting ECG which results in Heart Disease. We can also add the labels to the graph by clicking the “Format” tab and switching on the data labels.

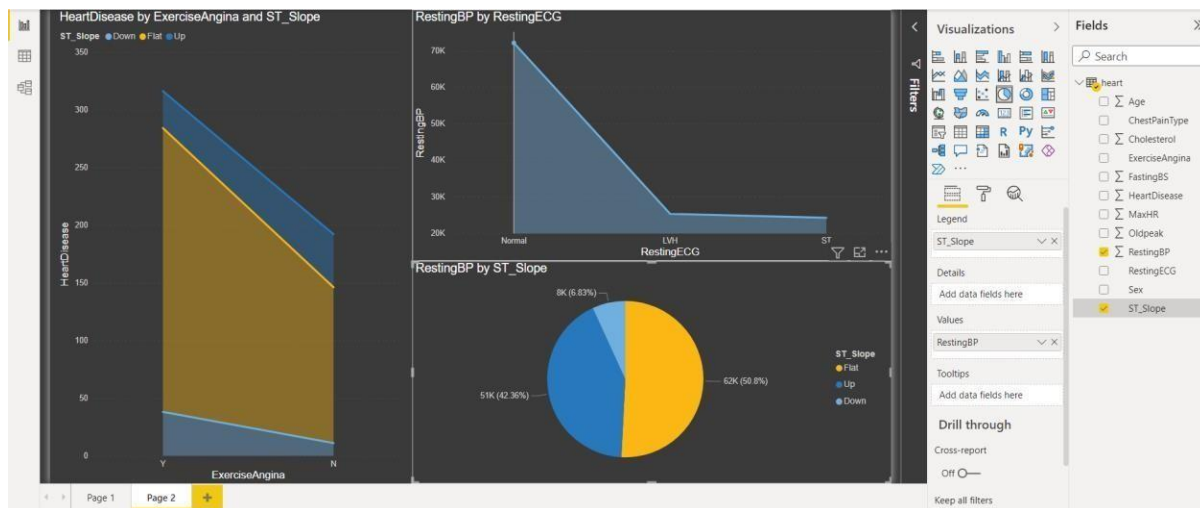


Fig:2.7 Pie Chart on Resting BP by ST\_Slope

The Graph above shows Resting BP by ST\_Slope. This reveals that the more than 50 percentage of the ST-Slope is Flat by the Resting BP which is lower in Up and Down of ST\_Slope. Only 6.8% of patient Resting BP is very low By ST\_slope which made them very critical In their disease.

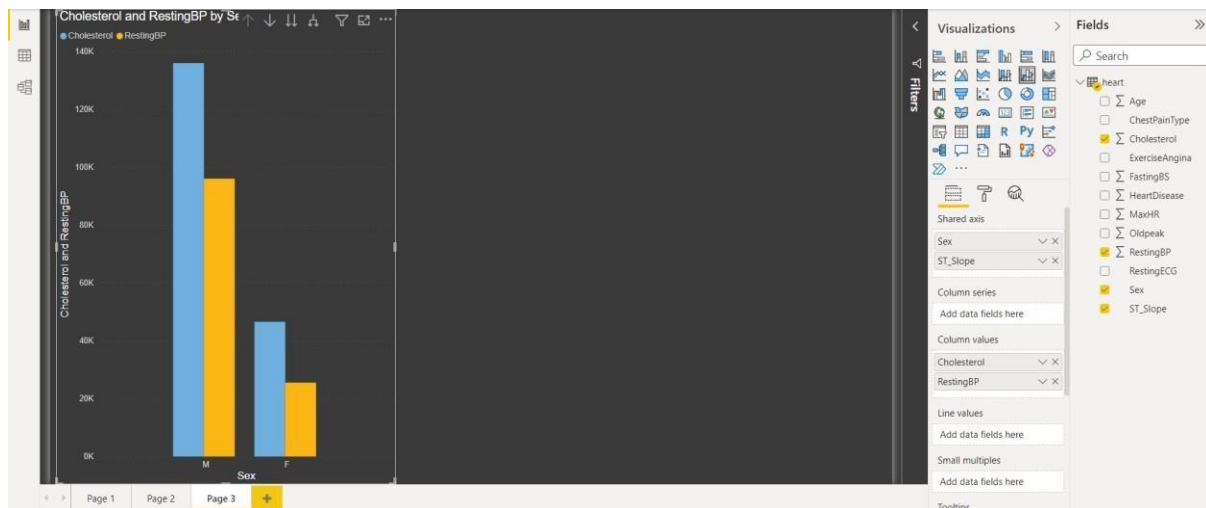


Fig:2.8 Clustered Line and Column Chart on Resting BP & Cholesterol

From this above Visualization, we have used clustered line and column chart. Here we have taken Sex and ST\_Slope as shared axis and Cholesterol and Resting BP as Column values. This chart shows as the average range of Cholesterol and Resting BP based on the Sex(Male or Female).This is one of the component which results in Heart Disease.

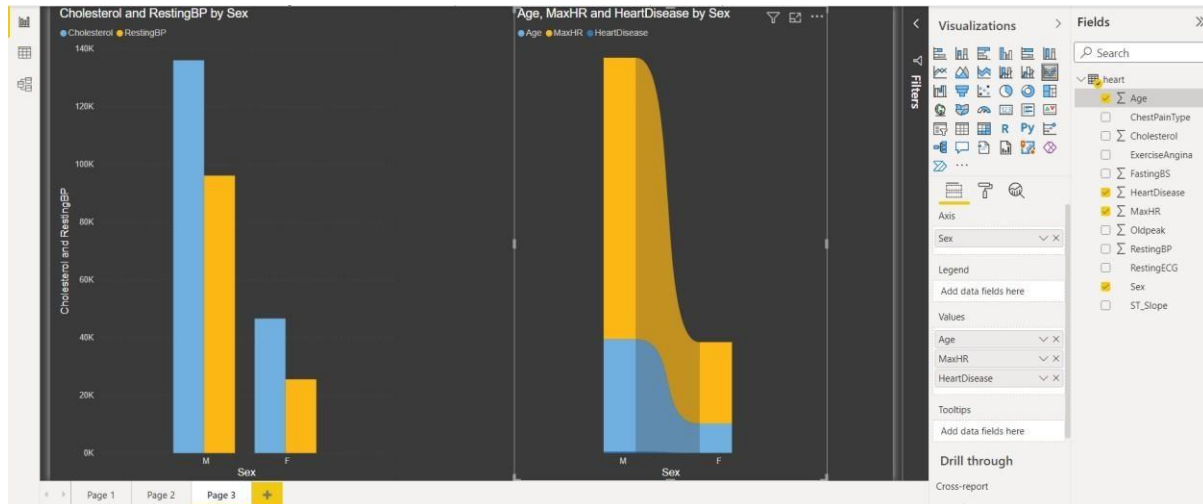


Fig:2.9 Ribbon Chart on Age, MaxHR and HeartDisease By Sex

In this Visualization we have used ribbon chart. As shown here we have taken Sex as the Axis and Age, MaxHR and HeartDisease as the Values. Ribbon charts are effective at showing rank change, with the highest range (value) always displayed on top for each time period. Here ribbon chart is used to find out the range of Max heart rate of the patient's who have Heart Disease Based on their Sex.

This gives us the range the Patient who are affecting by the Heart Disease. These are major Components which results in the critical health condition called Heart Disease in patients.

It's vital that people learn to identify and manage heart disease risk factors, such as heart-healthy eating, regular exercise, and seeing a doctor to measure blood pressure, cholesterol, and weight.

Over time, these risk factors cause changes in the heart and blood vessels that can lead to heart attacks, heart failure, and strokes.

It is critical to address risk factors early in life to prevent these devastating events and other potential complications of chronic cardiovascular disease

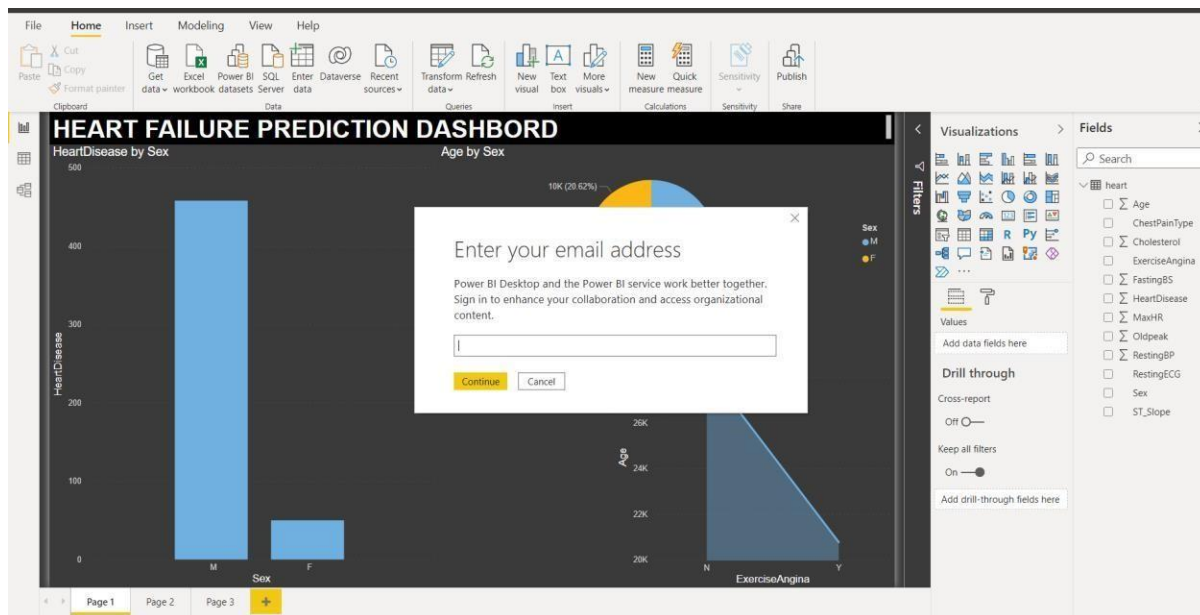


Fig:2.10 Publishing the Dashboard on Power BI Service

We will now publish an Overall Heart Disease Prediction Report on Power BI Service and Create a Dashboard. Save Your Reports on Power BI Desktop. Then click on home menu and Select the “Publish” Button.

After the Success message appears, select **Go to dashboard**. There you see the tiles you pinned from the report. In the example below, we've pinned two tiles from page one of the report and one live tile, which is page two of the report.

## CHAPTER 3

### REAL TIME PROJECT SAMPLE

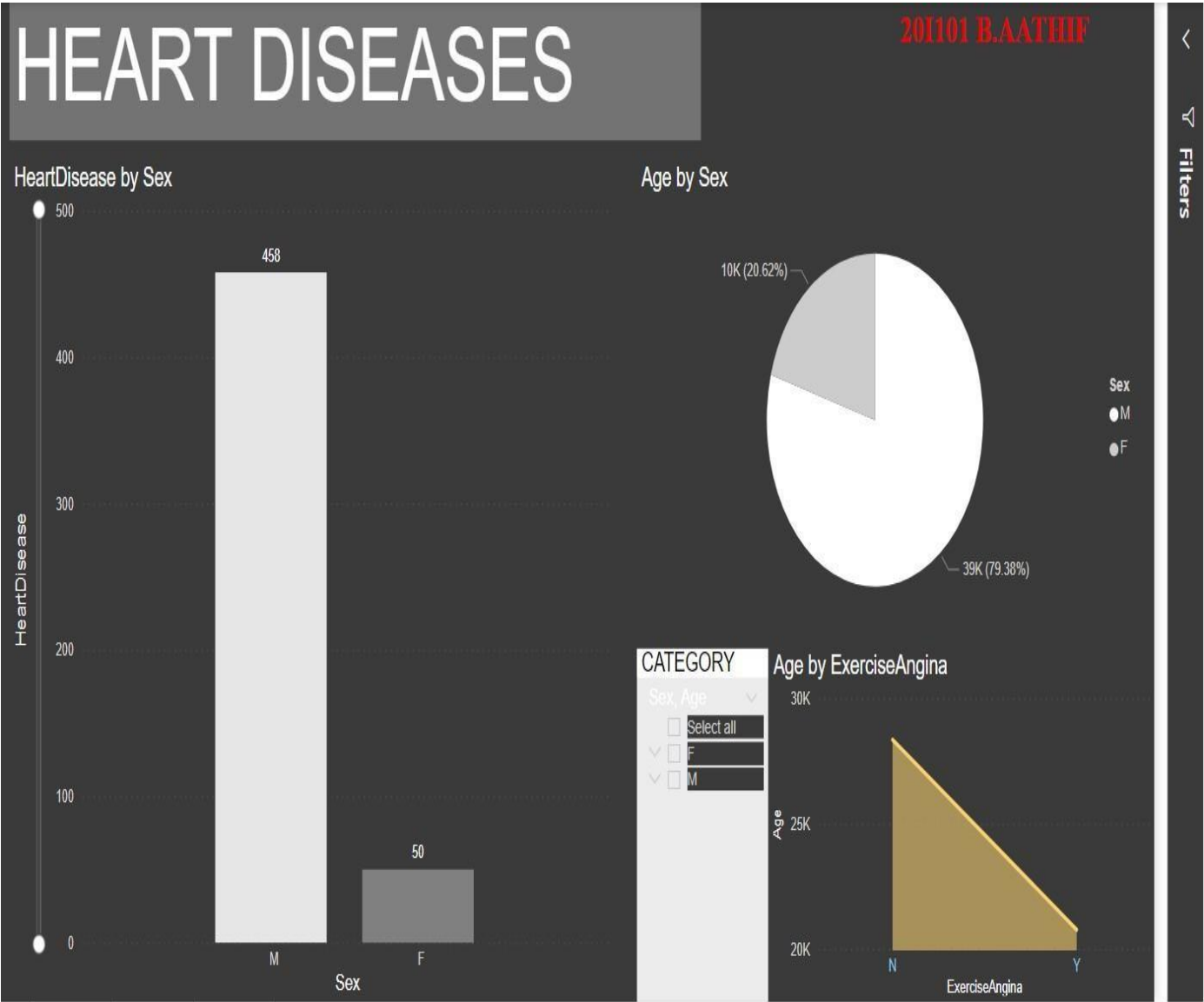
#### 3.1 ABOUT HEART DSEASE DATASET

- AGE- Age of the patient.
- SEX- Patient is Male or Female.
- Chest Pain Type- [ 0: asymptomatic, 1: atypical angina, 2: non-anginal pain, 3: typical angina]
- Resting BP- Resting Blood Pressure in mm/hg
- Cholesterol- Serum Cholesterol in mg/dl
- Fasting BS- (Fasting Blood Sugar > 120 mg/dl): [0 = no, 1 = yes]).
- Resting ECG- [0: showing probable or definite left ventricular hypertrophy by Estes' criteria, 1: normal, 2: having ST-T wave abnormality].
- Max HR- maximum heart rate achieved.
- Old Peak- (Exercise Induced Angina): [1 = yes, 0 = no].
- ST-Slope- (The slope of the peak exercise ST segment): [0: downsloping; 1: flat; 2: upsloping]

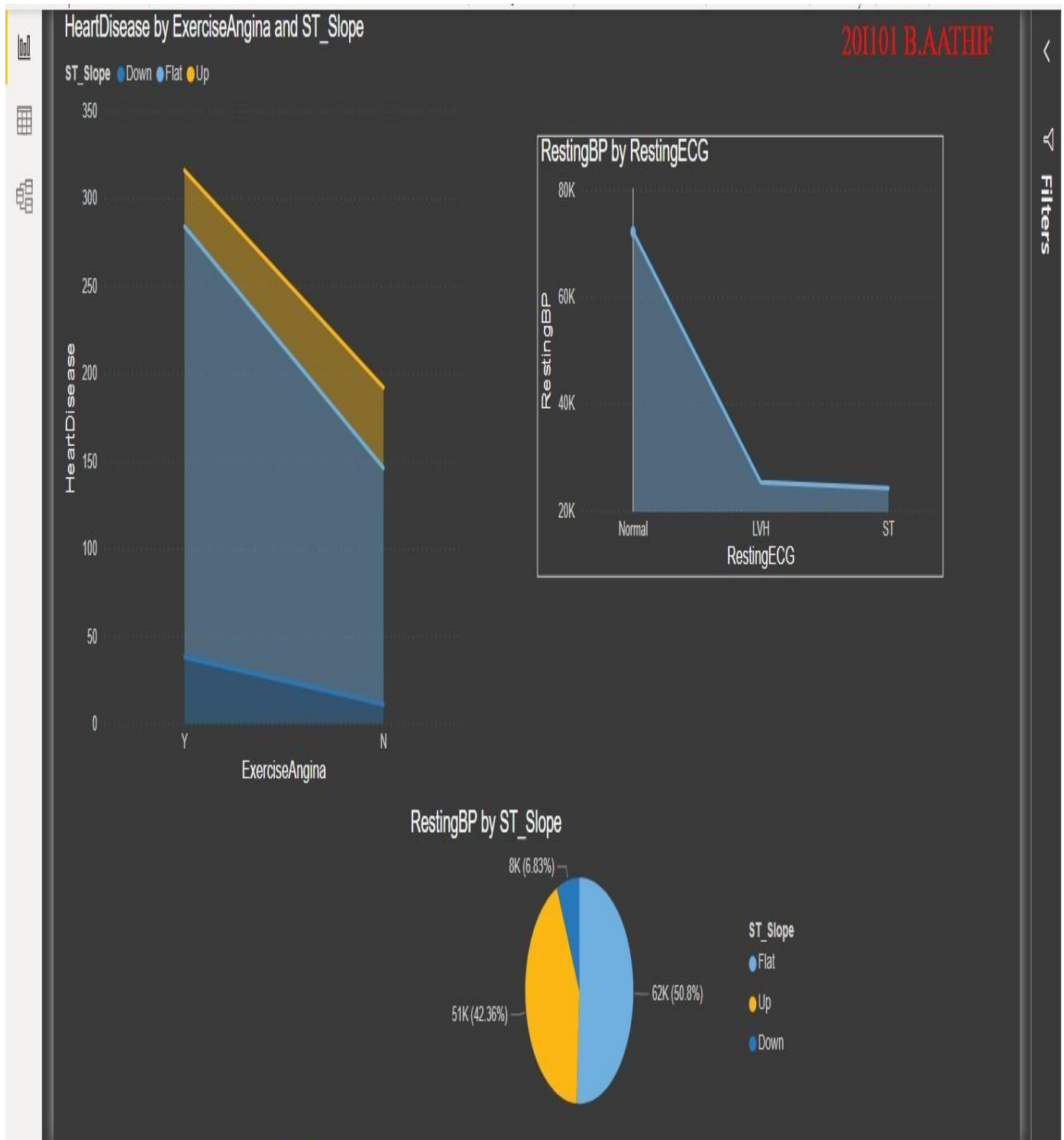
Heart Disease - Whether patient has heart disease it returns 1 otherwise  
It return 0

### 3.2 Sample project done on Internship

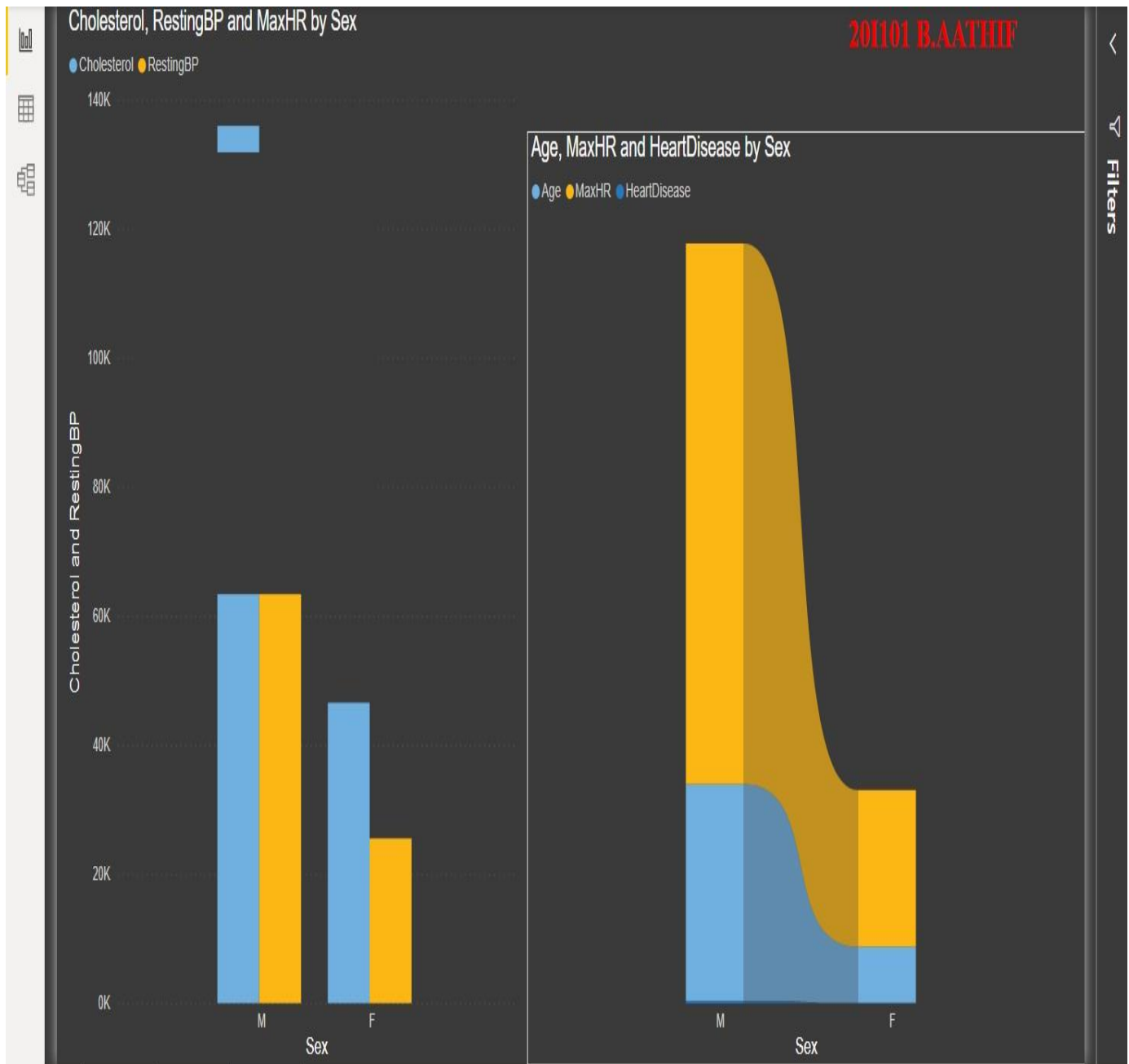
#### Output of Dashboard - 1



#### Output of Dashboard - 2



Output of Dashboard - 3



## CHAPTER 4

## CONCLUSION

### 4.1 Following are the reasons why Power BI is so popular and needed in the BI domain:

#### 1. Access to Volumes of Data from Multiple Sources

Power BI can access vast volumes of data from multiple sources. It allows you to view, analyze, and visualize vast quantities of data that cannot be opened in Excel. Some of the important data sources available for Power BI are Excel, CSV, XML, JSON, pdf, etc. Power BI uses powerful compression algorithms to import and cache the data within the PBIX file.

## 2. Interactive UI/UX Features

Power BI makes things visually appealing. It has an easy drag and drops functionality, with features that allow you to copy all formatting across similar visualizations.

## 3. Exceptional Excel Integration

Power BI helps to gather, analyze, publish, and share Excel business data. Anyone familiar with Office 365 can easily connect Excel queries, data models, and reports to Power BI Dashboards.

## 4. Accelerate Big Data Preparation with Azure

Using Power BI with Azure allows you to analyze and share massive volumes of data. An azure data lake can reduce the time it takes to get insights and increase collaboration between business analysts, data engineers, and data scientists.

## 5. Turn Insights into Action

Power BI allows you to gain insights from data and turn those insights into actions to make data-driven business decisions.

## 6. Real-time Stream Analytics

Power BI will enable you to perform real-time stream analytics. It helps you fetch data from multiple sensors and social media sources to get access to real-time analytics, so you are always ready to make business decisions.





## REFERENCES

- <https://www.simplilearn.com/tutorials/power-bi-tutorial/what-is-power-bi>
- <https://app.powerbi.com/embed?dashboardId=>
- <https://www.edureka.co/blog/what-is-power-bi>
- <https://www.microsoft.com/en-in/p/power-bi-desktop/9ntxr16hnw1t>
- [https://www.tutorialspoint.com/power\\_bi/power\\_bi\\_introduction.htm](https://www.tutorialspoint.com/power_bi/power_bi_introduction.htm)

- <https://docs.microsoft.com/en-us/dax/dax-function-reference>

