

**SRI SATHYA SAI INSTITUTE OF HIGHER LEARNING**

(Deemed to be University)



**UCSH-606**

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**Data Visualization Using Microsoft POWER BI**

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194204

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## CERTIFICATE

This is to certify that this Project titled **Data Visualizations Using Microsoft POWER BI** was submitted by **Akula. Venkata Satya Sai Gopinadh, 194204**, Department of Mathematics and Computer Science, Muddenahalli Campus is a bonafide record of the original work done under my supervision as a Course requirement for the Degree of **Bachelor of Science(Hons.) in Computer Science**.

.....  
Sri V Bhaskaran,  
Project Supervisor.

Place: Muddenahalli

Date: 25 April 2022.



# Sri Sathya Sai Institute of Higher Learning

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## DECLARATION

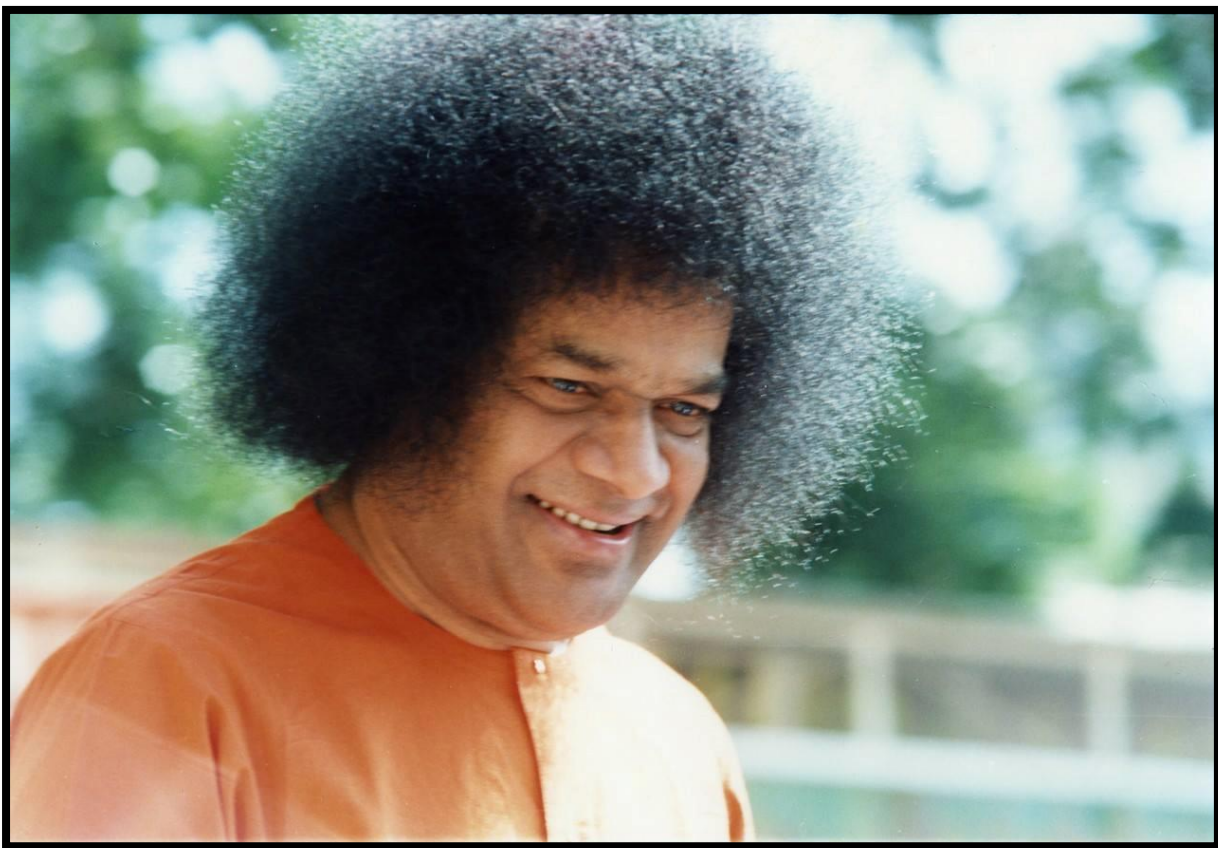
The Project titled **Data Visualization using Microsoft POWER BI** was carried out by me under the supervision of **Sri V Bhaskaran sir**, Department of Mathematics and Computer Science, Muddenahalli Campus as a course requirement for the Degree of **Bachelor of Science (Hons) in Computer Science** and has not formed the basis for the award of any degree, diploma or any other such title by this or any other University.

.....  
Akula Venkata Satya Sai Gopinadh

194204

Place: Muddenahalli

Date: 25 April 2022



Dedicated to Bhagawan Sri Sathya Sai  
Baba varu

## ACKNOWLEDGEMENT

I express my gratitude from the bottom of my heart to **Bhagawan Sri Sathya Sai Baba** varu who blessed and guided me all along with endeavor. And with utmost Love and gratitude, I thank him for selecting us to do his work.

My heartfelt gratitude to my parents for supporting me throughout this journey.

I greatly thank my project mentor and supervisor **Sri V. Bhaskaran sir & Sri G V Subbarao sir** for providing and supporting with requirements, ideas, and thoughts that led to the success of this project. If not for him the project wouldn't have been completed.

It was their encouragement that helped us gain deeper knowledge and complete this project successfully.

Furthermore, we are grateful to them, for guiding us throughout the project with a full amount of patience and care. Without that, nothing of this sort could have occurred. We are whole-heartedly thanking everyone who helped us in every step of this project.

I sincerely thank all the teachers for supporting me in developing this project.

I thank all my friends for supporting and encouraging me in completing this project and also my seniors for answering my queries and providing valuable input.

## ABSTRACT

In this fast-moving world, it's very tough to handle the amount of data that is getting accumulated in every place. There is an abundant amount of data available that needs processing and classification. In this world of 3.2 billion population.

The amount of data created by them is much more than we can ever imagine. To handle this we got a separate field where people analyze and visualize data.

As an initiative to this, the project is related to data visualization. The data set that we used in our project is directly from a hospital, so we can understand how data visualization can help to understand the abundant amount of data available. Also, doing this gives one a clear image of what is going on and how things are currently working in one's organization.

Using Microsoft Power BI, we created some relevant chart that gives information on the patients of the hospital their visit detail, Is and what are the tests they are undergoing for a kind of disease.

It also provides the hospital with overviolent the no of patients about the gender, year-wise classification of patients, clinic-wise classification, and much more.

Finally, using power bi the live data changes will be directly reflected in charts and in can be exported to any format according to the requirement.

"WE ARE DROWNING IN DATA, BUT STARVING FOR  
KNOWLEDGE"





## Chapter 1: Introduction to Data Visualization

Information perception is the graphical portrayal of information for understanding and correspondence. This includes two essential classes of perception:

**Data Visualization** - Visualization of information. This can either be:

**Exploratory:** You are attempting to investigate and grasp examples and patterns inside your information.

**Informative:** There is something in your information you might want to impart to users.

**Logical Visualization** - Scientific representation includes the perception of information with an inborn spatial part. This can be the representation of scalar, vector, and tensor fields. Normal areas of logical representation incorporate computational liquid elements, clinical imaging, and investigation and climate information examination.

We can reason and think more effectively about our data when we use good data visualizations. It permits us to offload internal cognition to the perceptual system by displaying information graphically. We might be able to detect a trend in numerical data in a table, but it will take a lot of effort on our behalf to recognize and perceive that trend. The trend becomes immediately apparent to our minds via our perceptual system by visualizing the data.

Arranging a data visualization ought to continuously start with a progression of inquiries intended to more readily comprehend your crowd, what you are attempting to convey, and how you plan to do such with visualization.

Who is your main interest group?

It is critical to comprehend what your crowd information and skill level are. A data visualization for distribution in your field will be not quite the same as one for a general lay crowd.

What are you attempting to show?

What message would you say you are attempting to speak with your data? What factors in your data would you say you are attempting to show? What connection between those factors is significant? This may be a connection between factors, rankings of factors, conveyances of factors, and so forth. The Understanding Your Data segment of this guide can assist you with a better comprehension of parts of your data and how those can best be addressed outwardly.

How would you expect to show it?

What is the fitting visualization type for your data and what you are attempting to impart? The Choosing an Appropriate Visualization Type part of this guide can assist with pointing you towards the right visualization for your data.

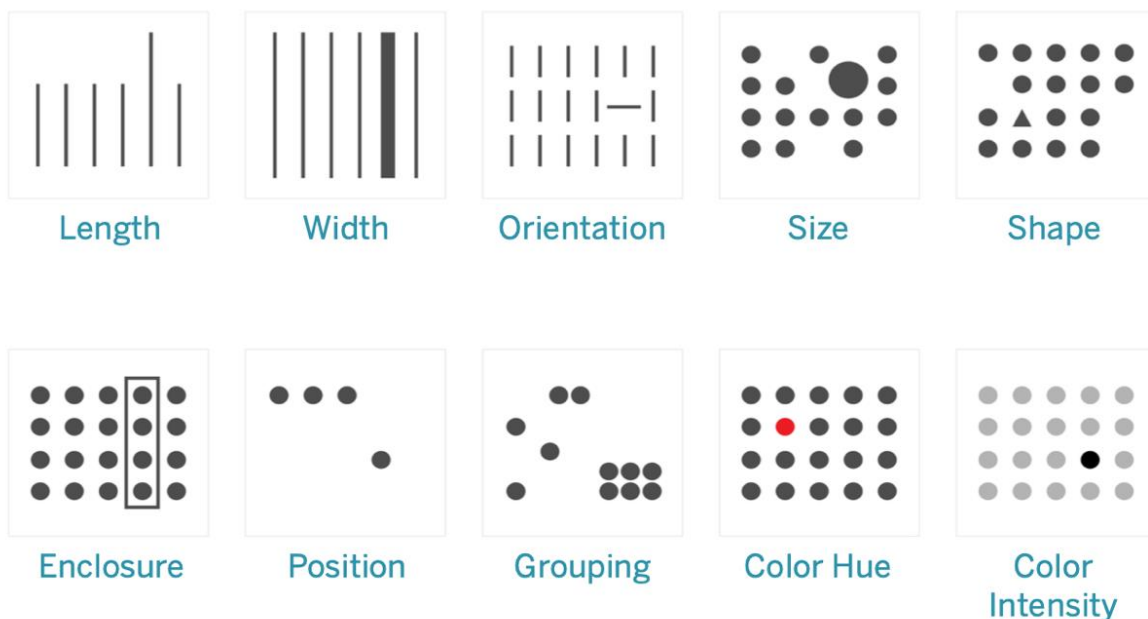
The more the data is visualized into graphs and pictorial representation it is understood faster than normal data seen.

Data visualization relies on **communication through perception**. A good data visualization can exploit the natural tendency of the human visual system to recognize structure and patterns.

**The brain can process information faster and more efficiently when it is in a visual format.**

The key to achieving this is the choice of visual encodings for your data that correspond to **pre-attentive attributes**. Pre-attentive attributes are visual attributes, including size, color, shape, and position that are processed at a high speed by the visual system.

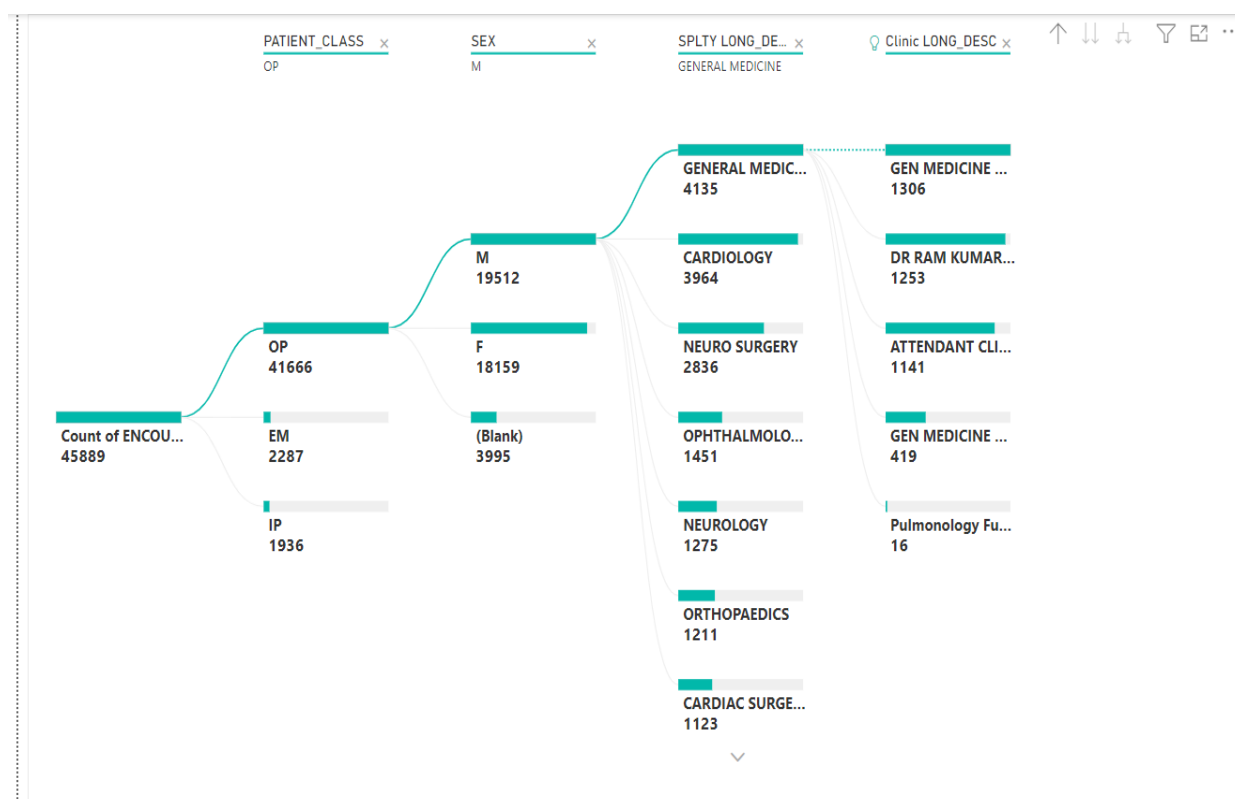
Consider the images below, what stands out to you in each image? Was the red dot in the color hue figure immediately apparent? That is pre-attentive processing at work.



For example, let's see the same data in two different formats:

| ENCOUNTER_ID    | PATIENT_ID | PATIENT_CLASS | VISIT_ADM_DATE_TIME | VISIT_ADM_TYPE | SEX | ASSIGN_CARE_LOCN_CODE | SERVICE_CODE | SPECIALTY_CODE | VISIT_STATUS | DISCHARGE_DATE_TIME | DISPOSIT |
|-----------------|------------|---------------|---------------------|----------------|-----|-----------------------|--------------|----------------|--------------|---------------------|----------|
| 29,61,00,50,010 | WSJDHEIHC  | OP            | 27-12-2021 00:00:00 | RF             | F   | OBG                   | OBOP         | OBG            | 09           | 27-12-2021 00:00:00 | AC       |
| 25,26,12,70,028 | WSJFIBBBI  | OP            | 27-12-2021 00:00:00 | RF             | F   | OBG                   | OBOP         | OBG            | 09           | 27-12-2021 00:00:00 | AC       |
| 29,70,63,20,004 | WSJDHBBCG  | OP            | 27-12-2021 00:00:00 | RF             | F   | OBG                   | OBOP         | OBG            | 09           | 27-12-2021 00:00:00 | AC       |
| 27,44,71,70,022 | WSJJEHJFE  | OP            | 27-12-2021 00:00:00 | RF             | F   | OBG                   | OBOP         | OBG            | 09           | 27-12-2021 00:00:00 | AC       |
| 29,81,43,50,003 | WSJDIBBEH  | OP            | 29-12-2021 00:00:00 | RF             | F   | OBG                   | OBOP         | OBG            | 09           | 29-12-2021 00:00:00 | AC       |
| 26,31,54,00,019 | WSJFDHGCFC | OP            | 22-12-2021 00:00:00 | RF             | F   | OBG                   | OBOP         | OBG            | 09           | 22-12-2021 00:00:00 | AC       |
| 29,65,40,10,009 | WSJDHDCBI  | OP            | 23-12-2021 00:00:00 | RF             | F   | OBG                   | OBOP         | OBG            | 09           | 23-12-2021 00:00:00 | AC       |
| 28,01,05,10,026 | WSJEFAGAE  | OP            | 22-12-2021 00:00:00 | RF             | F   | OBG                   | OBOP         | OBG            | 09           | 22-12-2021 00:00:00 | AC       |
| 29,68,70,30,013 | WSJDHBUC   | OP            | 22-12-2021 00:00:00 | RF             | F   | OBG                   | OBOP         | OBG            | 09           | 22-12-2021 00:00:00 | AC       |
| 29,92,09,90,004 | WSJGBBIEB  | OP            | 23-12-2021 00:00:00 | RF             | F   | OBG                   | OBOP         | OBG            | 09           | 23-12-2021 00:00:00 | AC       |
| 27,50,31,10,027 | WSJJEHGCCB | OP            | 23-12-2021 00:00:00 | RF             | F   | OBG                   | OBOP         | OBG            | 09           | 23-12-2021 00:00:00 | AC       |
| 29,74,53,70,008 | WSJDGJFGJ  | OP            | 23-12-2021 00:00:00 | RF             | F   | OBG                   | OBOP         | OBG            | 09           | 23-12-2021 00:00:00 | AC       |
| 29,73,42,90,005 | WSJDHAACD  | OP            | 03-01-2022 00:00:00 | RF             | F   | OBG                   | OBOP         | OBG            | 09           | 03-01-2022 00:00:00 | AC       |
| 29,65,05,00,008 | WSJDHDEED  | OP            | 03-01-2022 00:00:00 | RF             | F   | OBG                   | OBOP         | OBG            | 09           | 03-01-2022 00:00:00 | AC       |
| 29,68,39,60,010 | WSJDHCABC  | OP            | 03-01-2022 00:00:00 | RF             | F   | OBG                   | OBOP         | OBG            | 09           | 03-01-2022 00:00:00 | AC       |
| 29,06,42,90,015 | WSJDHIBGD  | OP            | 03-01-2022 00:00:00 | RF             | F   | OBG                   | OBOP         | OBG            | 09           | 03-01-2022 00:00:00 | AC       |
| 29,61,00,50,011 | WSJDHEIHC  | OP            | 28-12-2021 00:00:00 | RF             | F   | OBG                   | OBOP         | OBG            | 09           | 28-12-2021 00:00:00 | AC       |
| 28,85,94,00,009 | WSJEAHHGB  | OP            | 28-12-2021 00:00:00 | RF             | F   | OBG                   | OBOP         | OBG            | 09           | 28-12-2021 00:00:00 | AC       |
| 28,74,25,50,014 | WSJEBDDFI  | OP            | 29-12-2021 00:00:00 | RF             | F   | OBG                   | OBOP         | OBG            | 09           | 29-12-2021 00:00:00 | AC       |
| 29,65,79,90,005 | WSJDHDAEH  | OP            | 02-11-2021 00:00:00 | RF             | F   | OBG                   | OBOP         | OBG            | 09           | 02-11-2021 00:00:00 | AC       |
| 27,98,82,80,005 | WSJEFBGIF  | OP            | 02-11-2021 00:00:00 | RF             | F   | OBG                   | OBOP         | OBG            | 09           | 02-11-2021 00:00:00 | AC       |
| 29,61,01,30,007 | WSJEEEGGA  | OP            | 05-11-2021 00:00:00 | RF             | F   | OBG                   | OBOP         | OBG            | 09           | 05-11-2021 00:00:00 | AC       |
| 29,48,75,90,004 | WSJDIABFD  | OP            | 05-11-2021 00:00:00 | RF             | F   | OBG                   | OBOP         | OBG            | 09           | 05-11-2021 00:00:00 | AC       |
| 29,63,56,30,007 | WSJDIHDIJ  | OP            | 08-11-2021 00:00:00 | RF             | F   | OBG                   | OBOP         | OBG            | 09           | 08-11-2021 00:00:00 | AC       |
| 29,81,51,20,004 | WSJEFJUCF  | OP            | 02-11-2021 00:00:00 | RF             | F   | OBG                   | OBOP         | OBG            | 09           | 02-11-2021 00:00:00 | AC       |
| 29,57,78,50,008 | WSJDHGABF  | OP            | 02-11-2021 00:00:00 | RF             | F   | OBG                   | OBOP         | OBG            | 09           | 02-11-2021 00:00:00 | AC       |

The visualized format will be like this:



## Chapter 2: Introduction to Power BI:

Power BI is a tool used for data visualization. We can import data from any (nearly types of data sources) and create models using some basic database management knowledge and create relationships among tables' columns as per our needs and add them to the visuals' fields and create the visual. We can later publish them online for our group members on the online Power BI services site and edit them as per other suggestions if given.

We can also clean data, add columns measures and combine master sheets if required, so that any naïve person, who may not know the terminology of the displayed visuals, can understand.

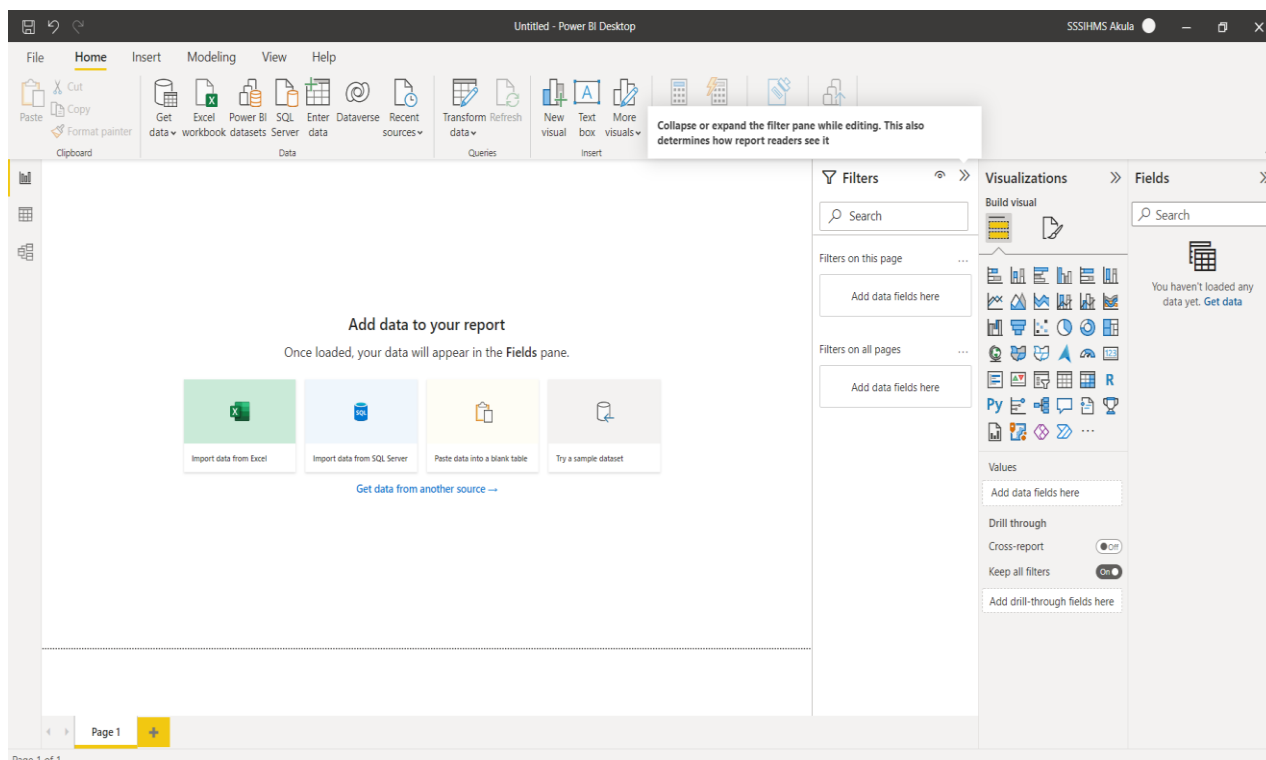
We can bring multiple data sources together in one place nearly 100+ even if they are from different sources altogether say one from a basic spreadsheet we can also bring in data from different other sources like SQL, Access database, Outlook, and even a webpage (customs example).

We can bring data that may be structured unstructured and do data clean-up in the data view pane, shaping it with visuals from the visualization pane or visuals that we import from outside, and modeling them in the model view using DAX measures and relationships (one to one, one to many, etc), and also color them format them and even animate them. Create visualizations and reports and make personalized dashboards featuring live, streaming data.

Unify data and intelligently transform it into eye-catching data visualizations. Nearly 36 Visuals are available for use offline in the beginning without any accounting requirement. We can have nearly 200+ more visuals to express our concerns as our position demands in the company. Basic charts like bars and pies to complex charts like radar can also be used to describe our data and make the culture among the group data-centric. So that we can present the visuals and learn insights from them and securely share your data and turn those insights into action. Use real-time data to improve collaboration and connect to your data anywhere.

Even we know how colors can affect the appearance, feel/vibe, and thinking to the listener of what we are trying to convey.

## 2.1 Features of Power BI:

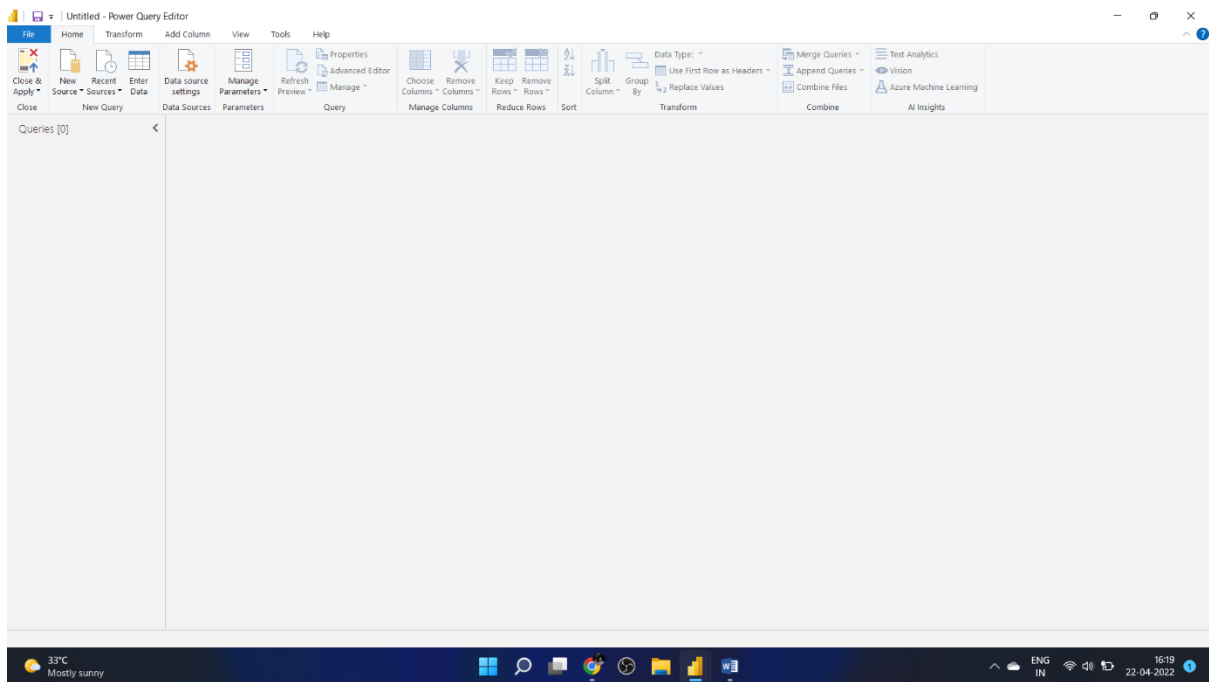


We first have to import data from what so ever source we want using the get data option on top of menubar's home pane's get data option.

Then on the left side 2<sup>nd</sup> view i.e. data/table view to clean data and also to power query editor as well to clean and organize or structure the unstructured data.

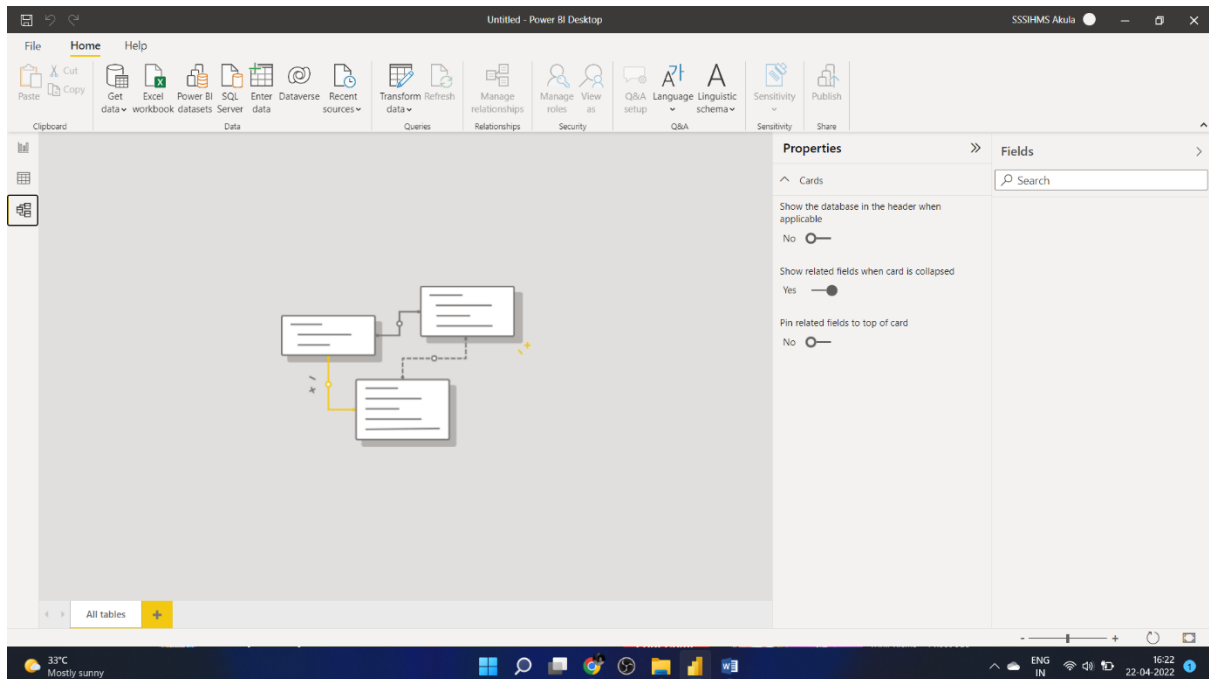
The screenshot shows the Microsoft Power BI Desktop application window with the 'Table tools' tab active. The table is named 'Orders' and contains 9,994 rows. The table has the following columns: Row ID, Order ID, Order Date, Ship Date, Ship Mode, Customer ID, Customer Name, Segment, Country/Region, City, State, Postal Code, Region, Product ID, Category, and Subcategory. The data is sorted by Order ID. The 'Fields' pane on the right shows the 'Orders' table selected. The status bar at the bottom indicates 'Table: Orders (9,994 rows)'.

| Row ID | Order ID       | Order Date        | Ship Date         | Ship Mode      | Customer ID | Customer Name    | Segment     | Country/Region | City        | State      | Postal Code | Region | Product ID | Category | Subcategory |
|--------|----------------|-------------------|-------------------|----------------|-------------|------------------|-------------|----------------|-------------|------------|-------------|--------|------------|----------|-------------|
| 42     | CA-2018-101343 | 17 July 2018      | 22 July 2018      | Standard Class | RA-19885    | Ruben Ausman     | Corporate   | United States  | Los Angeles | California | 90049       | West   |            |          |             |
| 514    | CA-2019-169405 | 21 December 2019  | 25 December 2019  | Standard Class | BN-11515    | Bradley Nguyen   | Consumer    | United States  | Los Angeles | California | 90049       | West   |            |          |             |
| 515    | CA-2019-169405 | 21 December 2019  | 25 December 2019  | Standard Class | BN-11515    | Bradley Nguyen   | Consumer    | United States  | Los Angeles | California | 90049       | West   |            |          |             |
| 1606   | US-2018-115819 | 19 April 2018     | 24 April 2018     | Second Class   | JO-15280    | Jas O'Carroll    | Consumer    | United States  | Los Angeles | California | 90049       | West   |            |          |             |
| 1607   | US-2018-115819 | 19 April 2018     | 24 April 2018     | Second Class   | JO-15280    | Jas O'Carroll    | Consumer    | United States  | Los Angeles | California | 90049       | West   |            |          |             |
| 1609   | US-2018-115819 | 19 April 2018     | 24 April 2018     | Second Class   | JO-15280    | Jas O'Carroll    | Consumer    | United States  | Los Angeles | California | 90049       | West   |            |          |             |
| 1807   | US-2018-116729 | 25 December 2018  | 28 December 2018  | First Class    | GK-14620    | Grace Kelly      | Corporate   | United States  | Los Angeles | California | 90049       | West   |            |          |             |
| 2060   | CA-2016-106439 | 31 October 2016   | 04 November 2016  | Standard Class | GG-14650    | Greg Guthrie     | Corporate   | United States  | Los Angeles | California | 90049       | West   |            |          |             |
| 2061   | CA-2016-106439 | 31 October 2016   | 04 November 2016  | Standard Class | GG-14650    | Greg Guthrie     | Corporate   | United States  | Los Angeles | California | 90049       | West   |            |          |             |
| 2063   | CA-2016-106439 | 31 October 2016   | 04 November 2016  | Standard Class | GG-14650    | Greg Guthrie     | Corporate   | United States  | Los Angeles | California | 90049       | West   |            |          |             |
| 2065   | CA-2016-106439 | 31 October 2016   | 04 November 2016  | Standard Class | GG-14650    | Greg Guthrie     | Corporate   | United States  | Los Angeles | California | 90049       | West   |            |          |             |
| 2068   | CA-2016-106439 | 31 October 2016   | 04 November 2016  | Standard Class | GG-14650    | Greg Guthrie     | Corporate   | United States  | Los Angeles | California | 90049       | West   |            |          |             |
| 2191   | CA-2018-118913 | 25 June 2018      | 29 June 2018      | Standard Class | AS-10240    | Alan Shonely     | Consumer    | United States  | Los Angeles | California | 90049       | West   |            |          |             |
| 2492   | CA-2016-113579 | 13 December 2016  | 15 December 2016  | Second Class   | KD-16345    | Katherine Ducich | Consumer    | United States  | Los Angeles | California | 90049       | West   |            |          |             |
| 2944   | CA-2019-126242 | 19 November 2019  | 24 November 2019  | Standard Class | MC-18100    | Mick Crebaggia   | Consumer    | United States  | Los Angeles | California | 90049       | West   |            |          |             |
| 3534   | CA-2016-110849 | 18 April 2016     | 23 April 2016     | Standard Class | JL-15835    | John Lee         | Consumer    | United States  | Los Angeles | California | 90049       | West   |            |          |             |
| 3535   | CA-2016-110849 | 18 April 2016     | 23 April 2016     | Standard Class | JL-15835    | John Lee         | Consumer    | United States  | Los Angeles | California | 90049       | West   |            |          |             |
| 3536   | CA-2016-110849 | 18 April 2016     | 23 April 2016     | Standard Class | JL-15835    | John Lee         | Consumer    | United States  | Los Angeles | California | 90049       | West   |            |          |             |
| 3563   | CA-2018-130029 | 03 July 2018      | 06 July 2018      | First Class    | GT-14755    | Guy Thornton     | Consumer    | United States  | Los Angeles | California | 90049       | West   |            |          |             |
| 3566   | CA-2018-130029 | 03 July 2018      | 06 July 2018      | First Class    | GT-14755    | Guy Thornton     | Consumer    | United States  | Los Angeles | California | 90049       | West   |            |          |             |
| 3759   | CA-2017-167745 | 18 September 2017 | 23 September 2017 | Standard Class | GB-14530    | George Bell      | Corporate   | United States  | Los Angeles | California | 90049       | West   |            |          |             |
| 3760   | CA-2017-167745 | 18 September 2017 | 23 September 2017 | Standard Class | GB-14530    | George Bell      | Corporate   | United States  | Los Angeles | California | 90049       | West   |            |          |             |
| 3844   | CA-2016-101931 | 28 October 2016   | 31 October 2016   | First Class    | TS-21370    | Todd Sumrall     | Corporate   | United States  | Los Angeles | California | 90049       | West   |            |          |             |
| 3845   | CA-2016-101931 | 28 October 2016   | 31 October 2016   | First Class    | TS-21370    | Todd Sumrall     | Corporate   | United States  | Los Angeles | California | 90049       | West   |            |          |             |
| 3847   | CA-2016-101931 | 28 October 2016   | 31 October 2016   | First Class    | TS-21370    | Todd Sumrall     | Corporate   | United States  | Los Angeles | California | 90049       | West   |            |          |             |
| 4229   | CA-2017-125234 | 27 November 2017  | 01 December 2017  | Standard Class | SN-20710    | Sven Nguyen      | Home Office | United States  | Los Angeles | California | 90049       | West   |            |          |             |
| 4481   | CA-2018-102365 | 03 November 2018  | 08 November 2018  | Standard Class | XP-21865    | Xylona Price     | Consumer    | United States  | Los Angeles | California | 90049       | West   |            |          |             |



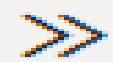
Above is the view of the power query editor.

Then we can create and manage the relationships between columns of the required tables.

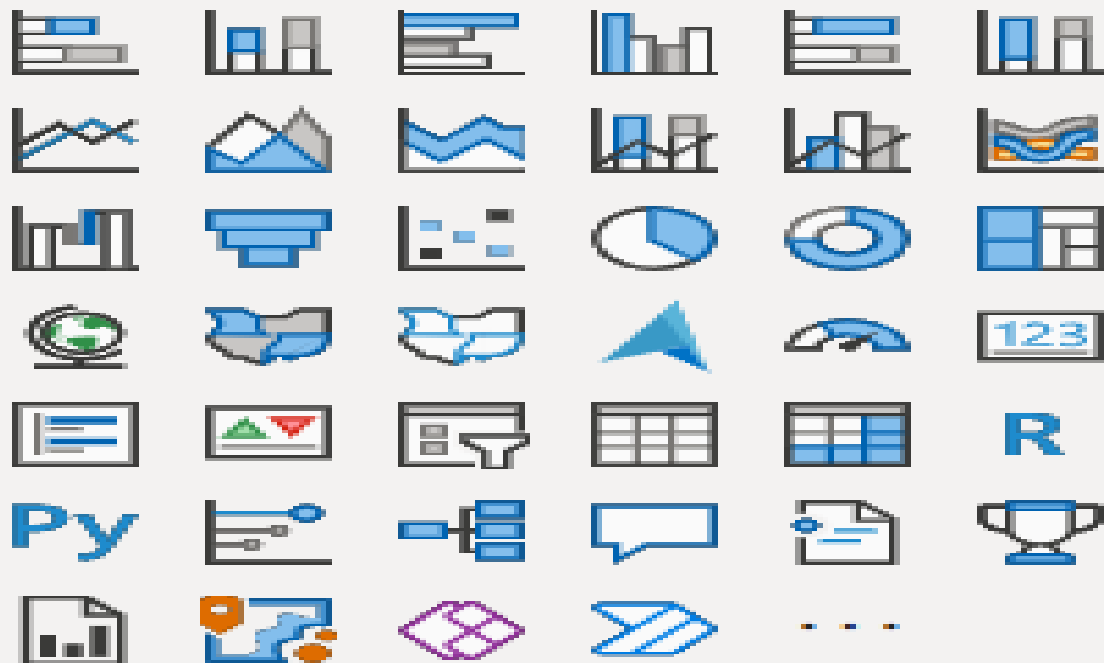
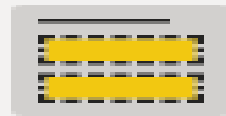


Then we can see the tables and their columns in the right side Fields pane and use the one left to it i.e. the visualizations pane and create visuals of all types that best fit our requirements as well as data.

# Visualizations



## Build visual



## Values

Add data fields here

## Drill through

Cross-report



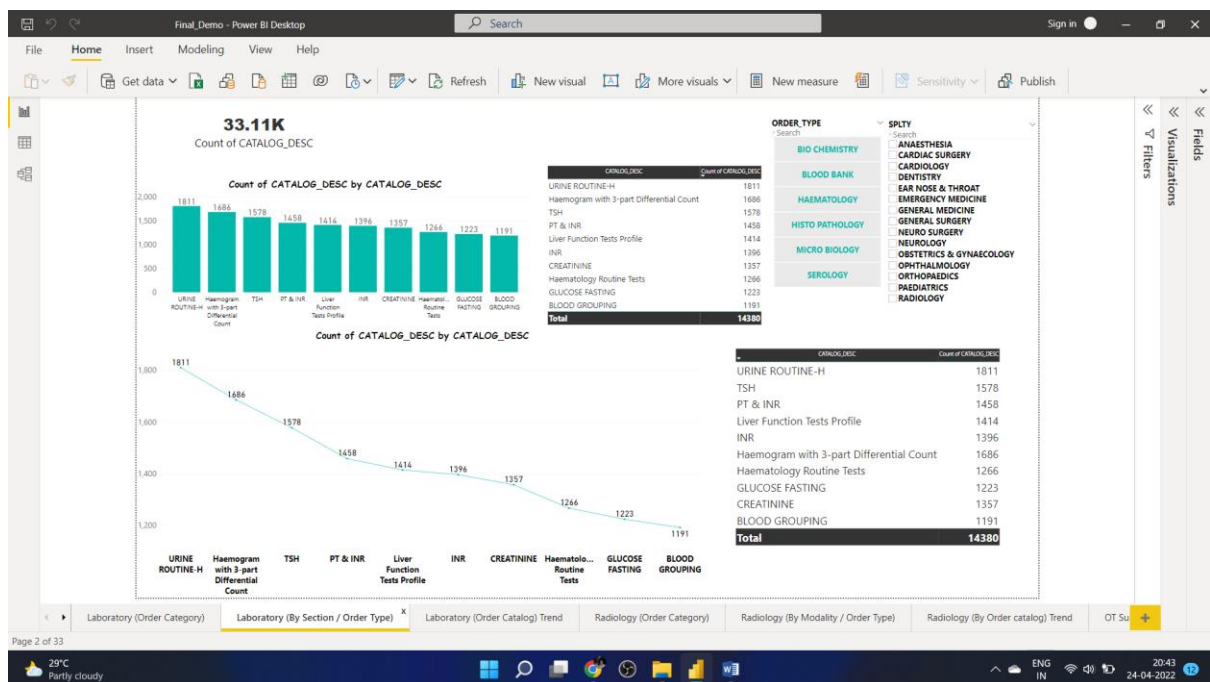
Keep all filters



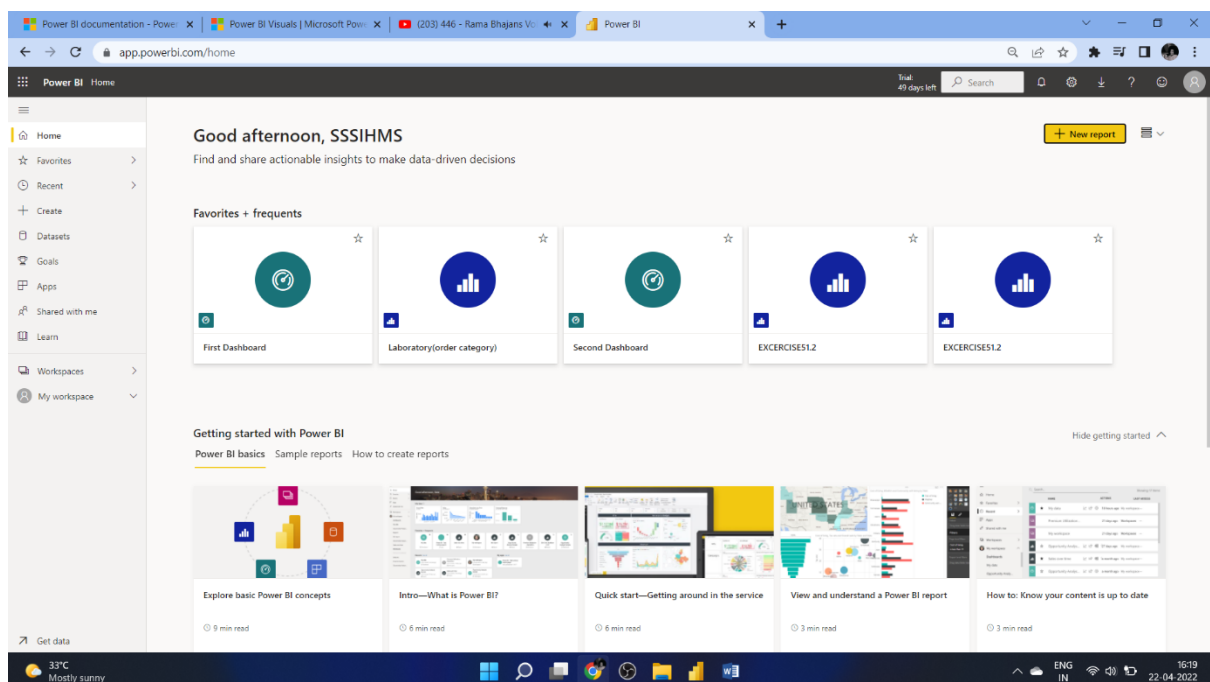
Add drill-through fields here



Once we are done the page of the report can be as simple and insightful at the same time. We can format it more and make it look more appealing.



After this, we can publish these reports on the Power BI services site to share and collaborate with our group members so that we can discuss and have improvements.



## Chapter 3: Exclusive charts/visualizations in Power BI:

### 3.1 Slicer

Power BI slicers are visuals acting as filters. They are very useful to switch between years, months, or other similar data.

Add a slicer by selecting the **Slicer** icon in the **Visualizations** pane. Then simply select values for filtering from your **Fields** pane. This creates a **simple slicer that filters displayed data by year**.

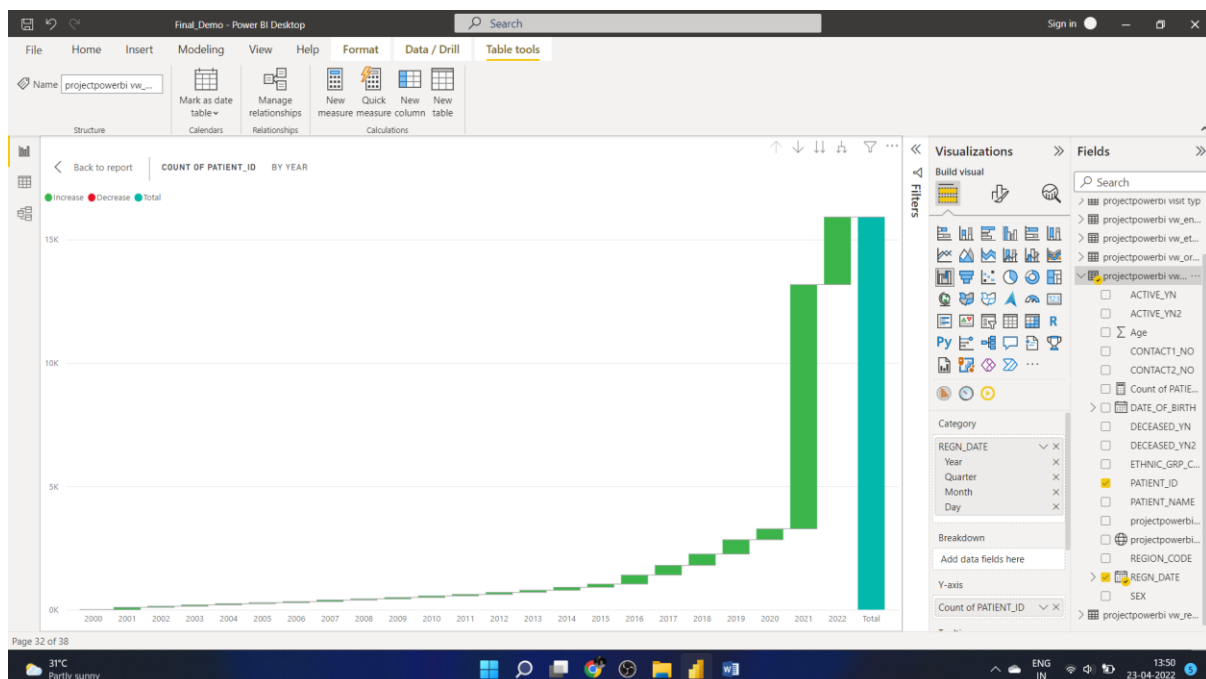
### 3.2 Waterfall chart

They provide a great way to **visualize a starting value, any positive and negative contributions to that value, and the result**.

Some examples of when you should use waterfall charts:

- Visualizing profit and loss statements
- Comparing product earnings
- Showing product value over some time

Below is a simple waterfall chart

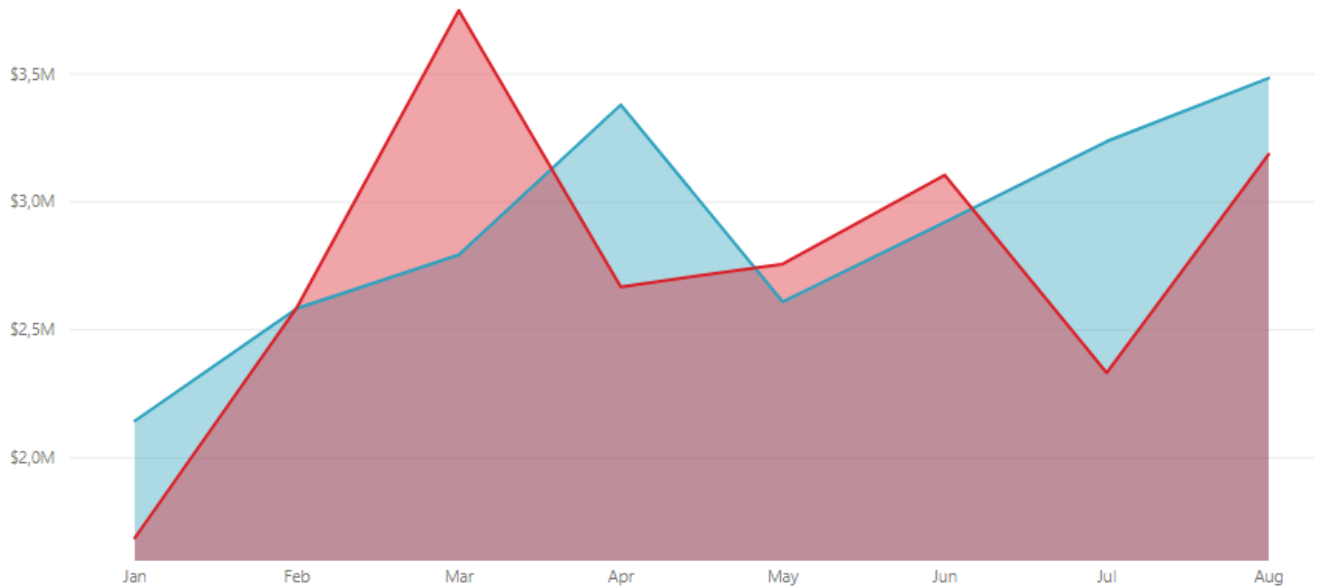


### 3.3 Area chart

Area charts are a **variant of the line chart** where the area between the axis and the line has filled to show volume.

Last Year Sales and This Year Sales by FiscalMonth

● Last Year Sales ● This Year Sales

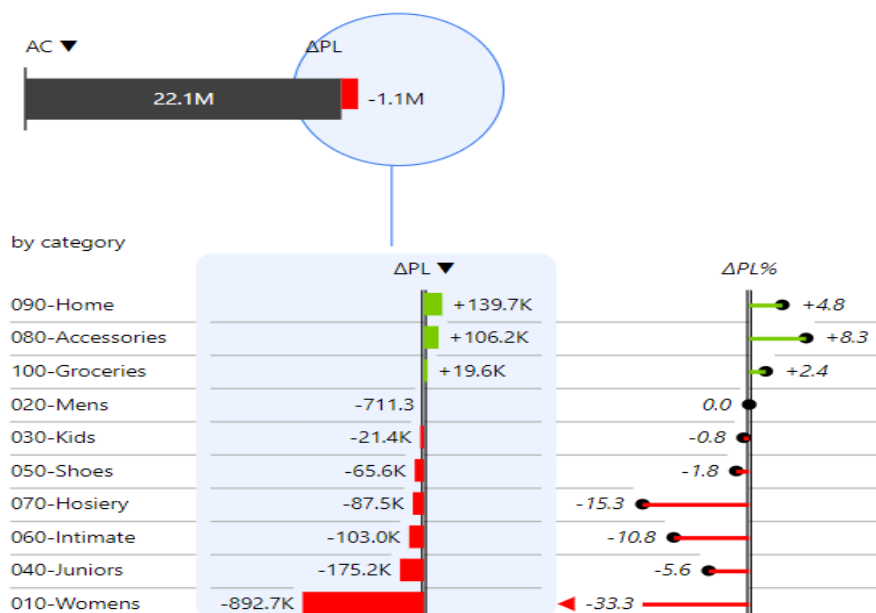


When displaying two measures like here, the real focus is on the area between the two charts.

When you work with a **large number of data points**, use an area chart that also shows **actual values as well as deviations** in the form of an **area between the two values**. This is something where Zebra BI shines with its focus on variances.

### 3.4 Zebra BI visuals

A list of custom visuals for Power BI would not be complete without our own **Zebra BI for Power BI**. These extremely advanced visuals enable you to create convincing financial reports that make a point and reveal hidden insights.



### 3.5 Decomposition Tree:

The decomposition tree visual in Power BI allows you to envision information across different aspects. It naturally totals information and empowers diving into your aspects in any request.



The visualization requires two types of input:

- **Analyse** – the metric you would like to analyse. This has to be a measure or an aggregate.
- **Explain By** – one or more dimensions you would like to drill down into.

Once you drag your measure into the field well, the visual updates showcase the aggregated measure. The next step is to bring in one or more dimensions you would like to drill down into. Add these fields to the **Explain by** the bucket.

#### Other custom Power BI visuals:

- Card with States
- Gantt Chart
- Text Filter
- Map box Visual for Power BI
- Hierarchy Slicer

## Chapter 4: Learning Process:

- Referred to the videos present on the internet.
- Using some sample data sets from the internet, charts were created so that useful data can be visualized.
- Went through all the basic charts available in power bi and implemented them one by one using the available sample data set.
- Covered further on slicers and filters available in Power BI
- Learned about filtering in Power BI.
- Explored power bi services, workspaces, and also creating online interactive dashboards which would be helpful to share the data
- The data sent can be shared in 2 different ways:
  - Importable mode and Non-Importable.
  - Users can comprehend the data by observing the graphs, and by using the filters one can alter the data within the available dashboard. But the creator is not restricted by these filters.
- Query option where one can clean the data and do a lot more.
- Power bi is not just limited to just creating charts and visuals. Power bi gives more usability via power apps and power automation, one can create a powerful web/mobile application to come to use and get it published in no time
- Excel formulae, sorting in Excel data handling, etc. along with this learned about importing excel data into MySQL.
  - The simple way to import excel data into SQL was by saving the excel sheet to CSV format utf-8 coding which is the default in MySQL workbench
- It can be exported as a new table into SQL workbench or it can be imported into an existing table
  - The data relations between the tables are directly handled in power bi using the data model relation handler available in power bi. Thus, the relations are shown by using something which resembles ER DIAGRAMS.

## Chapter 5: Data Description:

### 5.1 Patient Table:

This table has the information of each patient. It contains the patient ID, contact number, date of birth, date of registering in the hospital, gender, name, age, region code(state), ethnic group code(language), deceased/ active, and added long descriptions for codes like region and ethnicity.

### 5.2 Encounter table:

This table has details of the encounter (the visit of the patient each time). It has encounter ID, patient ID, patient class (outpatient, inpatient emergency), visits admission date, visit admission type, gender, assigned care location code(clinic), service code, specialty code (cardiology, ophthalmology, neurology, etc.), visit status, discharge date, disposition type, attended practitioner's ID, facility ID, ADT status, and long descriptions of the code columns.

### 5.3 Order line table:

This table has the details of the test ordered by each patient during his check-up. It has encounter ID, patient ID, order category (laboratory, radiology, OT surgery) under which order type (biochemistry, Histopathology (for laboratory category), etc.) shall lie under that comes order ID, patient class, source type, source code, order date, ordering practitioner's ID, and specialty code. It also has a long description of the specialty code and the test names as well.

### 5.4 Master tables:

Other tables like region, visit type, unit, clinic, enc, and ethnic group are the masters for the codes of the table columns.

The region table has the code full-form (long description or short description) of the region codes and country codes as well. For example, KA is for Karnataka in the state code. NP as Nepal as per country code and its description

The ethnic group table has descriptions of the ethnicity (Language) of the patient. For example, ASM for Assamese.

The clinic table talks about the clinic code of encounter table its short description along with its corresponding specialty and maximum walking for the day.

While the master tables ENC talks about specialty codes and their descriptions. Like CARD for cardiology and OPHT for ophthalmology, etc.

The table, visit\_typ talks about its code and its descriptions. This table informs us whether the patient is for a referral visit, follow-up visit, surgery, etc.

The unit table provides us the information about the nursing unit codes and their descriptions. These are the nursing units under each specialty. For example, CWA-CWI is the 9 wards of CTVS specialty.

### 6.1 SQL stored procedures:

A procedure (or stored procedure, depending on the context) is a collection of pre-compiled SQL statements that are stored in a database. In a standard computing language, this is referred to as a subroutine or subprogram. Always include a name, a list of parameters, and SQL statements in a procedure. Triggers, other procedures, and Java, Python, and PHP applications can all be used to invoke the procedures. MySQL 5 was the first release to include it. Almost all relational database systems currently support it.

If we examine the enterprise program, notice that certain database operations, such as database cleanup and payroll processing, must be performed regularly. Numerous SQL statements are used to complete each task. It may be simpler if we group these responsibilities into a procedure.

It's straightforward to alter: modify the code contained within the stored procedure without restarting or deploying the program. If, for example, the T-SQL queries are written in the application and we need to change the logic, we must change the code and re-deploy the application. SQL Server Stored Procedures resolve these issues by storing the code in the database. Thus, all we need to do is use the ALTER PROCEDURE statement to update the logic within the process.

When stored procedures are used instead of writing T-SQL queries at the application level, only the procedure name is transmitted over the network, not the entire T-SQL code.

Stored procedures are reusable because they can be reused by multiple users or client applications without requiring the code to be rewritten.

By obviating direct access to the tables, stored procedures mitigate the threat. Additionally, stored procedures can be encrypted as they are created, rendering the source code contained within the invisible. Utilize third-party software such as ApexSQL Decrypt to decrypt encrypted stored procedures.

When a SQL Server stored procedure is invoked for the first time, it generates a plan and stores it in the buffer pool so that it can be reused the next time the procedure is invoked.

#### 6.1.1 Our SQL stored procedures:

##### **FOR ENCOUNTER TABLE:**

```
CREATE DEFINER=`root`@`localhost` PROCEDURE `encounter_sp` (in fromdate  
DATETIME,in enddate DATETIME)  
  
BEGIN
```

```

select
vw_encounter.ENCOUNTER_ID,vw_encounter.PATIENT_ID,vw_encounter.PATIENT_C
LASS,vw_encounter.VISIT_ADM_DATE_TIME

,vw_encounter.VISIT_ADM_TYPE,vw_patient.SEX,vw_encounter.ASSIGN_CARE_LOCN
_CODE,vw_encounter.SERVICE_CODE,

vw_encounter.SPECIALTY_CODE,vw_encounter.VISIT_STATUS,vw_encounter.DISCHA
RGE_DATE_TIME,vw_encounter.DISPOSITION_TYPE,

vw_encounter.ATTEND_PRACTITIONER_ID,vw_encounter.FACILITY_ID,vw_encounte
r.ADT_STATUS

FROM vw_encounter

LEFT JOIN vw_patient ON vw_encounter.PATIENT_ID = vw_patient.PATIENT_ID

WHERE VISIT_ADM_DATE_TIME >= fromdate AND VISIT_ADM_DATE_TIME <=
enddate

order by REGN_DATE ;

END

```

#### **FOR PATIENT TABLE:**

```

CREATE DEFINER=`root`@`localhost` PROCEDURE `patient_sp` (in fromdate
DATETIME,in enddate DATETIME)

BEGIN

select
PATIENT_ID,REGN_DATE,PATIENT_NAME,DATE_OF_BIRTH,DATE_FORMAT(F
ROM_DAYS(DATEDIFF(now(),DATE_OF_BIRTH)), '%Y')+0 AS
Age,SEX,CONTACT1_NO,CONTACT2_NO,REGION_CODE,DECEASED_YN,ACTIV
E_YN,

DECEASED_YN,ACTIVE_YN,ETHNIC_GRP_CODE from vw_patient

where REGN_DATE >= fromdate and REGN_DATE <= enddate

order by PATIENT_ID; END

```

#### **FOR ORDER TABLE:**

```

CREATE DEFINER=`root`@`localhost` PROCEDURE `orderline_sp` (in fromdate
DATETIME,in enddate DATETIME)

BEGIN

select * from vw_order_line where ORD_DATE_TIME >= fromdate and
ORD_DATE_TIME <= enddate order by PATIENT_ID;

END

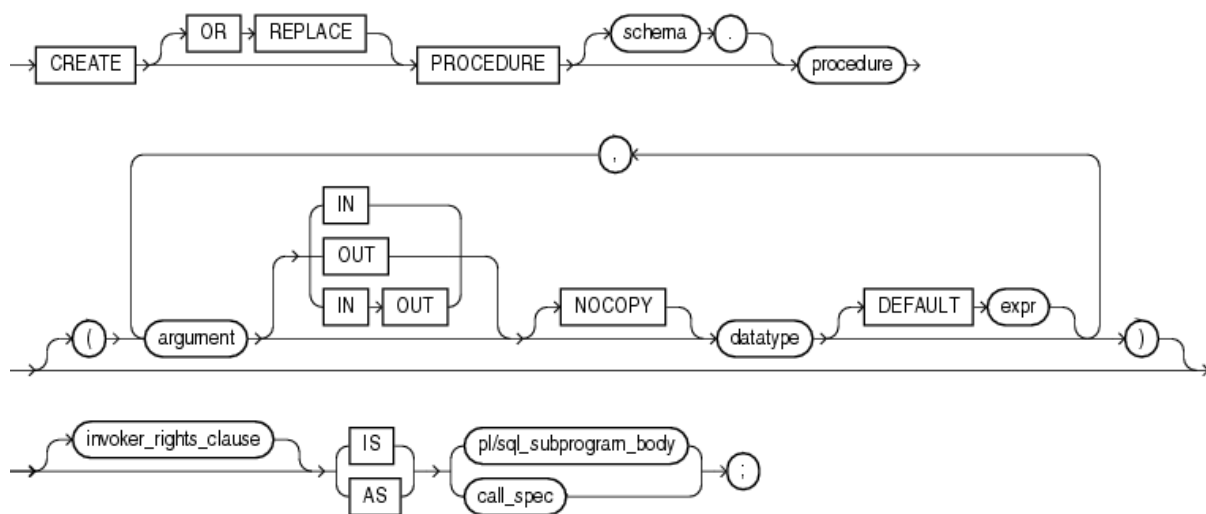
```



## 6.2 ORACLE Stored Procedures:

You already know how to use SQL to interface with a database, but that knowledge is insufficient for developing corporate apps. ORACLE is a third-generation language containing procedural and namespace constructs, as well as close integration with SQL, allowing for the creation of complex and powerful applications. You can incorporate SQL statements into your code without needing to establish a separate connection because ORACLE is executed in the database.

Standalone procedures and functions, as well as packages, are the most common forms of program units that may be created with ORACLE and stored in the database. These ORACLE components, generally known as stored procedures, can be utilized as building blocks for a variety of applications once they've been saved in the database.



The SQL statements for creating procedures and functions are **CREATE PROCEDURE** and **CREATE FUNCTION**, respectively. In practice, it is best to use a **CREATE OR REPLACE** statement. The general form of these statements follows.

```
CREATE OR REPLACE procedure_name(arg1 data_type, ...) AS
```

```
BEGIN
```

```
....
```

```
END procedure_name;
```

```
CREATE OR REPLACE procedure_name(arg1 data_type, ...) AS
```

```
BEGIN
```

```
....
```

```
END procedure_name;
```

### 6.2.1 Our oracle stored procedures:

```
SELECT PATIENT_ID, PATIENT_NAME,  
TRUNC(MONTHS_BETWEEN(SYSDATE,DATE_OF_BIRTH)/12) AGE, SEX,  
    NVL(M.CONTACT2_NO, M.CONTACT1_NO) CONTACT_NO,  
    NVL(UPPER(R.LONG_DESC),'NA') LANG, NVL(H.LONG_DESC,'NA') STATE  
FROM VW_PATIENT M, VW_ETHNIC_GROUP R, VW_REGION H  
WHERE M.ETHNIC_GRP_CODE = R.ETHNIC_GROUP_CODE(+)  
    AND M.REGION_CODE = H.REGION_CODE(+)  
    AND TRUNC(M.REGN_DATE) BETWEEN TO_DATE(:ARG_FROM_DATE,'DD-MON-  
YYYY') AND TO_DATE(:ARG_TO_DATE,'DD-MON-YYYY');
```

```
CREATE or replace PROCEDURE PR_GET_PATIENT_LIST(ARG_FROM_DATE VARCHAR2,  
ARG_TO_DATE VARCHAR2, L_CURSOR OUT SYS_REFCURSOR) AS  
BEGIN  
  
OPEN L_CURSOR FOR  
  
SELECT PATIENT_ID, PATIENT_NAME,  
TRUNC(MONTHS_BETWEEN(SYSDATE,DATE_OF_BIRTH)/12) AGE, SEX,  
    NVL(M.CONTACT2_NO, M.CONTACT1_NO) CONTACT_NO,  
    NVL(UPPER(R.LONG_DESC),'NA') LANG, NVL(H.LONG_DESC,'NA') STATE  
FROM VW_PATIENT M, VW_ETHNIC_GROUP R, VW_REGION H  
WHERE M.ETHNIC_GRP_CODE = R.ETHNIC_GROUP_CODE(+)  
    AND M.REGION_CODE = H.REGION_CODE(+)  
    AND TRUNC(M.REGN_DATE) BETWEEN TO_DATE(ARG_FROM_DATE,'DD-MON-  
YYYY') AND TO_DATE(ARG_TO_DATE,'DD-MON-YYYY');
```

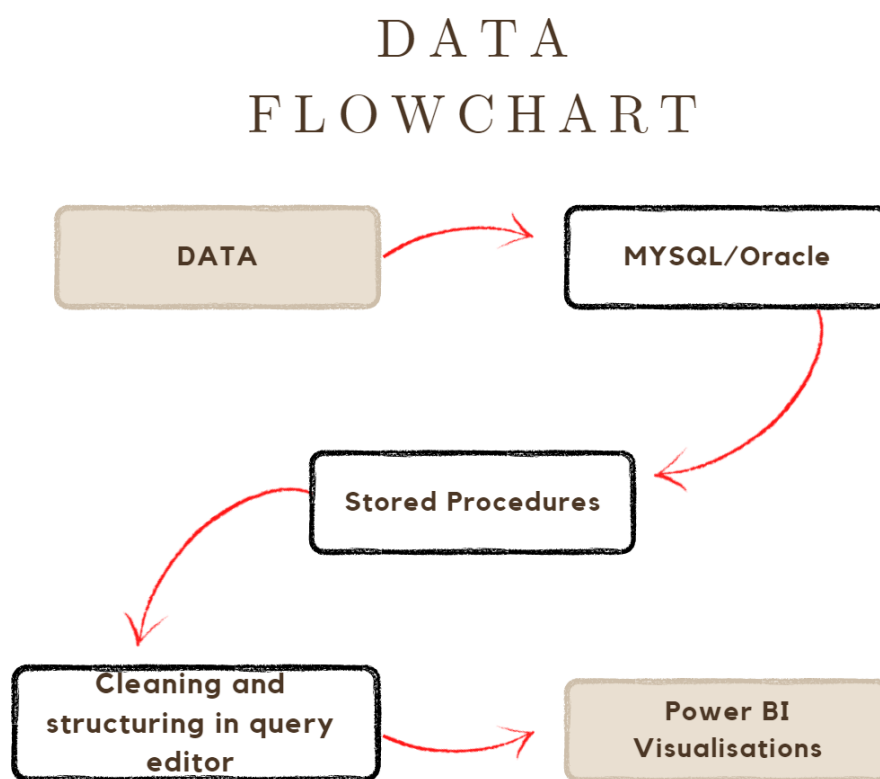
```
END PR_GET_PATIENT_LIST;
```

## Chapter 7: Flow Chart of Data Movement:

We get our data in different ways. Then we store them in places like MYSQL, Oracle, etc. for our use and create relationships there if we want to and manage them there.

Then as per our requirements, we do stored procedures (A stored procedure is a set of Structured Query Language (SQL) statements with an assigned name, which is stored in a relational database management system (RDBMS) as a group, so it can be reused and shared by multiple programs.)

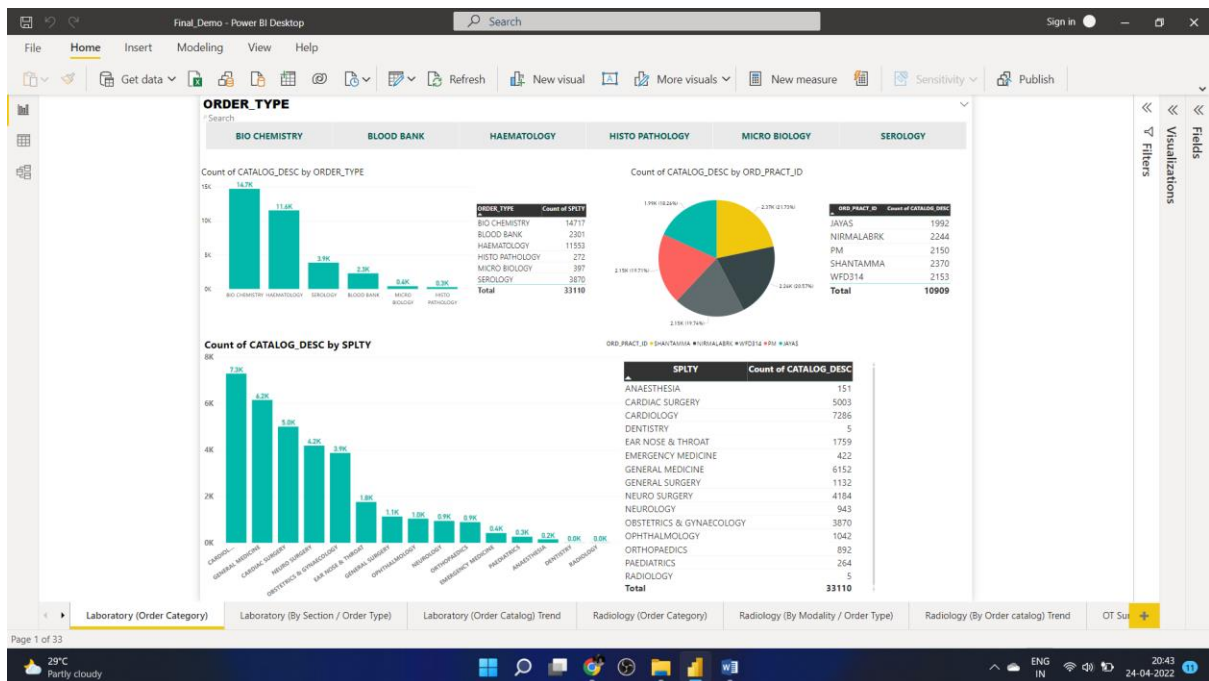
A stored procedure is a subroutine available to applications that access a relational database management system. Such procedures are stored in the database data dictionary. Uses for stored procedures include data validation or access-control mechanisms.



We also clean the data and structure it if necessary. Now, this can be done before importing it into power BI or after importing and doing it in the power query editor. This cleaning can be basic like filling the null cells with random/estimated data.

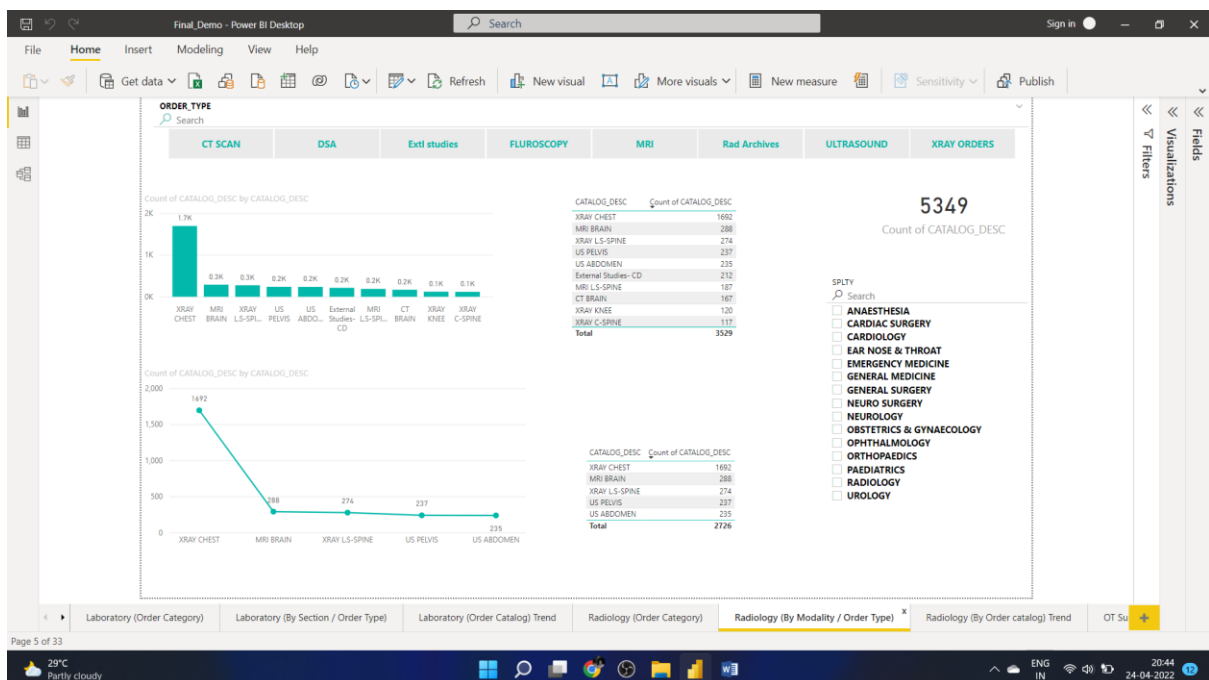
Now that we have imported the data we can use the visualization pane and import visuals and add fields to them to get the graphs/visualizations we want from the data.

## Chapter 8: Work Screenshots:



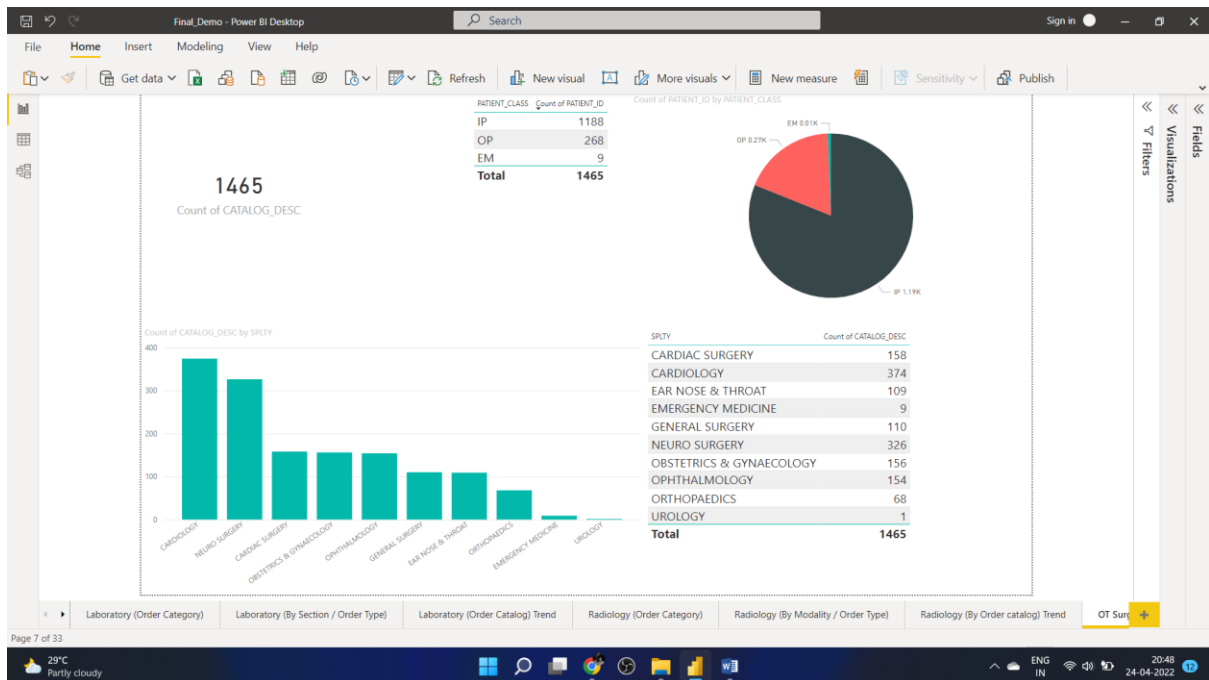
Firstly, this report is only for the order category LABORATORY. (This whole page is having Laboratory as the filter, so only laboratory data is displayed here.

The Top one is the Slicer where the Order Type can be selected, which affects the change of each other graph on that page. And Top left is the Count of Tests by order type. Besides that, it is the pie chart where the Top five practitioners by the count of patients they treated. The bottom is the Stack Column chart, where the count of tests is shown for each specialty.

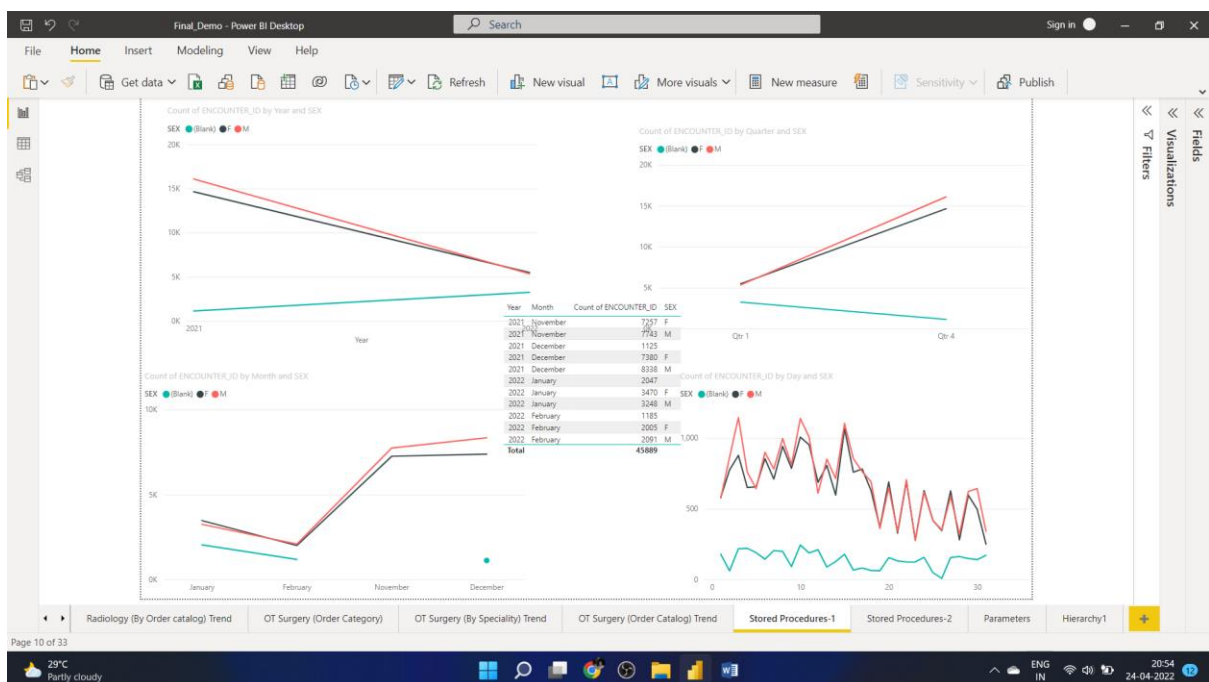


Firstly, this report is only for the order category RADIOLOGY. (This whole page is

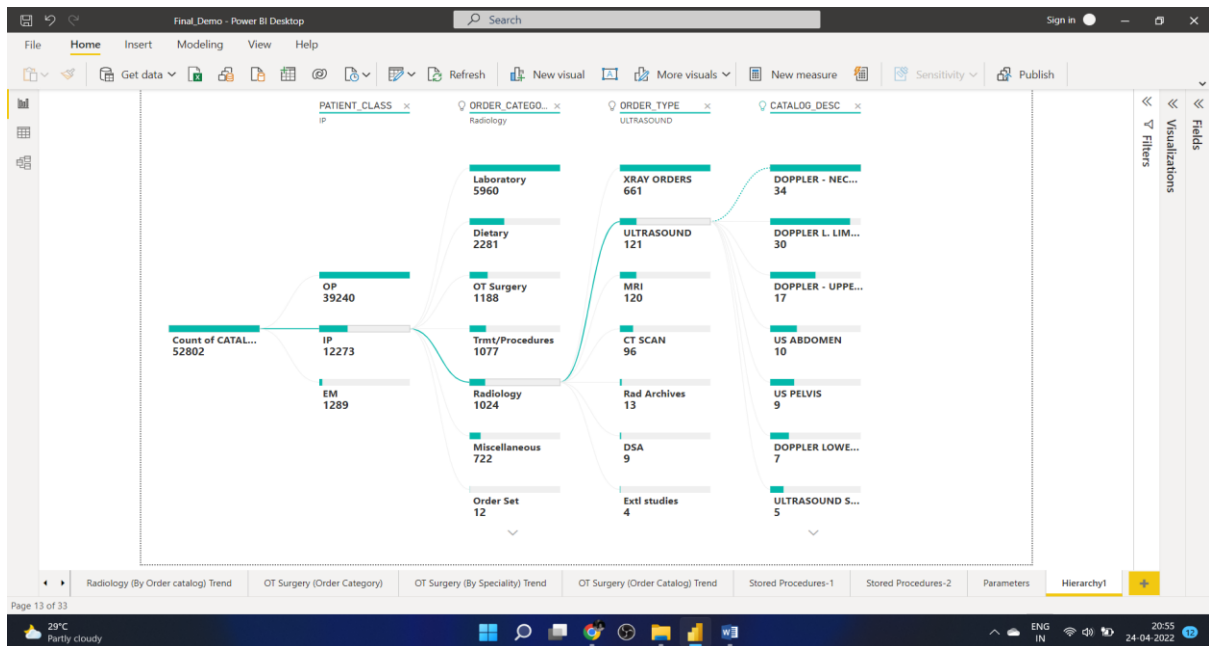
having Radiology as the filter, So only Radiology data is displayed here. The above is having a slicer for order type. And it shows the Top 10 tests, Top 5 tests by the count.



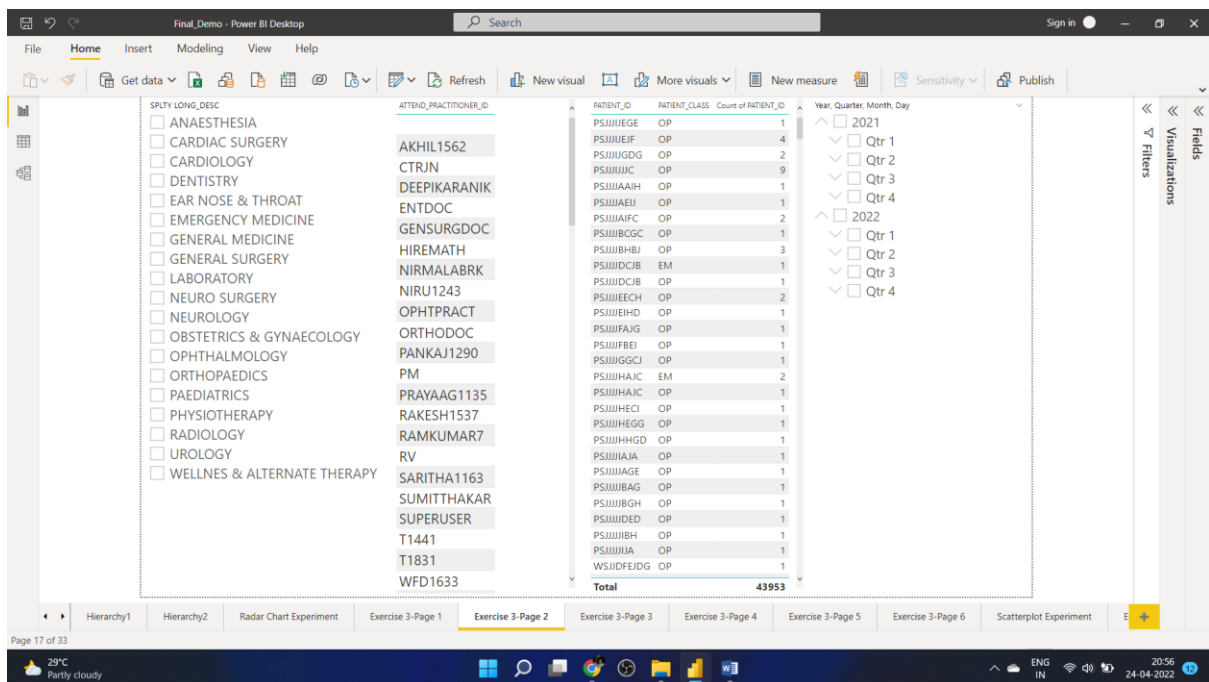
The above report depicts the count of patients by their class in the form of a Pie chart, Total count of patients. The above page is having OT SURGERY as the page filter, so only that data will be displayed here. And the Stacked column chart gives the data of the count of tests by each specialty.



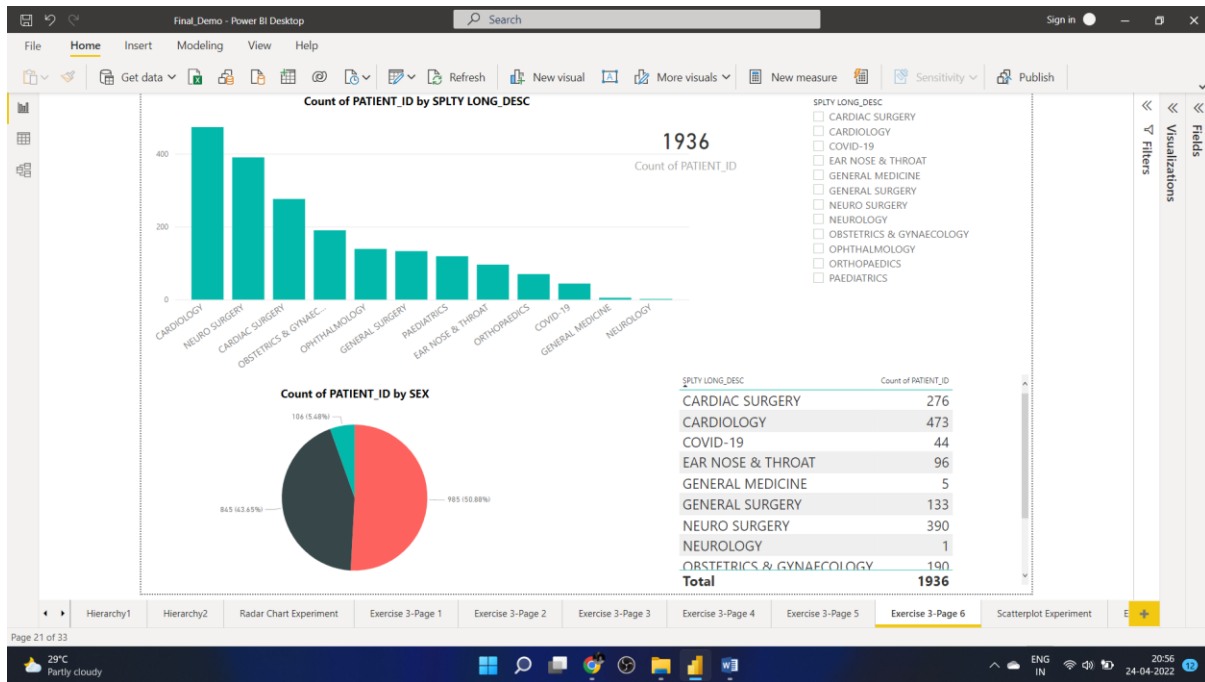
The above is from a stored procedure, where we got the gender column from another table. All the four-line charts are according to the hierarchy i.e. by year, by month, by quarter, and by day. That table gives the detailed count of encounters by year, month, and gender



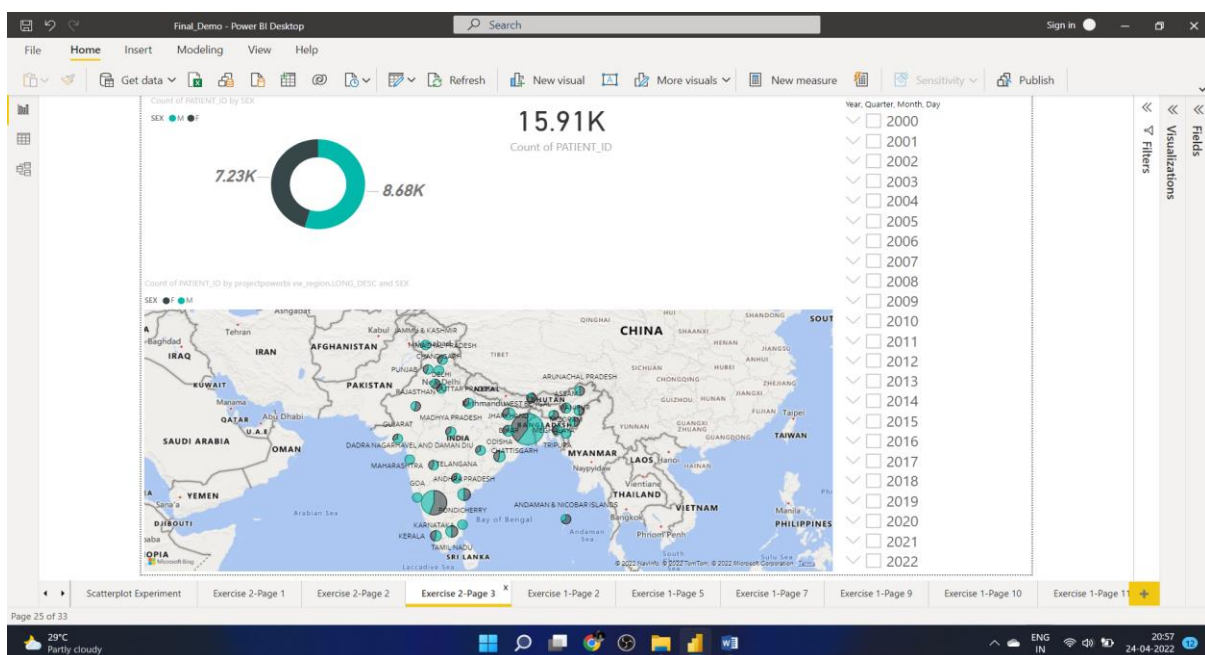
The above is called the HIERARCHY graph, also called the decomposition tree. It shows the count of tests in that patient class, in that order category, order type, and type of test.



The above is just a report where we have a slicer for Date Hierarchy, another slicer for specialty, tables for showing practitioners, and a table for showing a table of patient details like name, class, and number of times he/she visited.



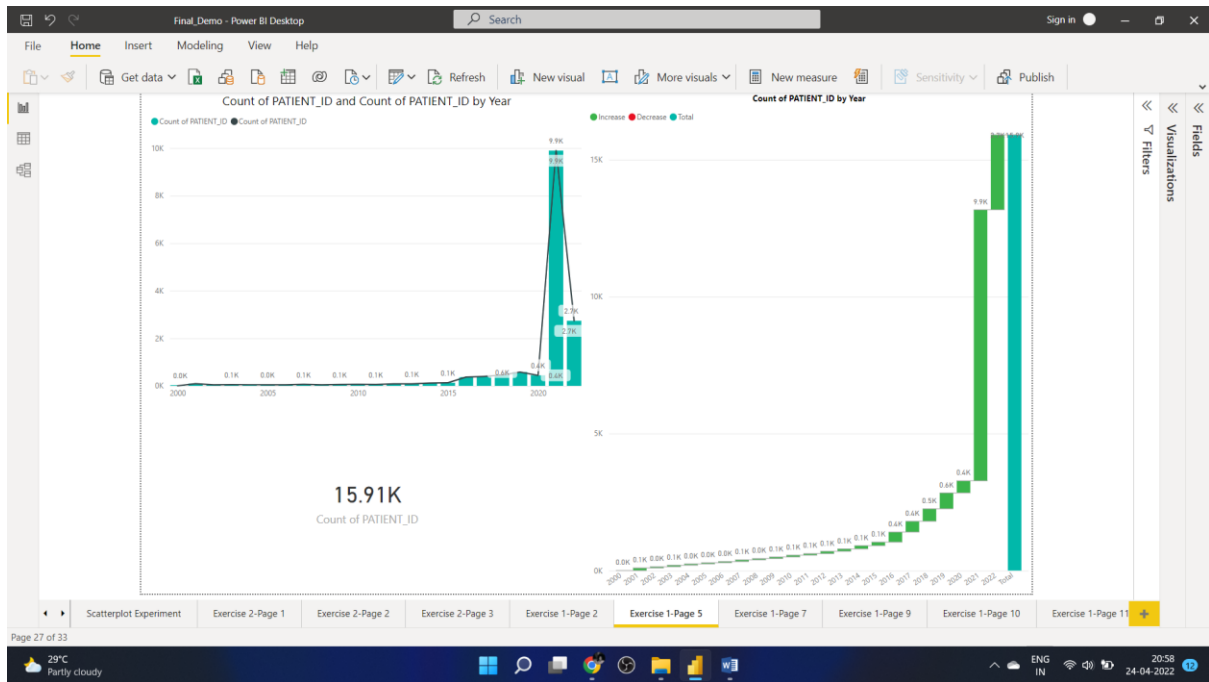
The above report is only for the PATIENT\_CLASS IP, the top left is the stacked column chart which shows the count of IP patients (INPATIENT = IP) per each specialty. And the bottom Pie chart depicts the Count of patients based on gender. We also have a number card, which shows the total count of patients. And a slicer of specialty.



The above report shows, the total count of patients on a number card. A Slicer for Registration date as a hierarchy (Year, Quarter, Month & Day). A Pie chart that shows the Count of Patients by Gender.

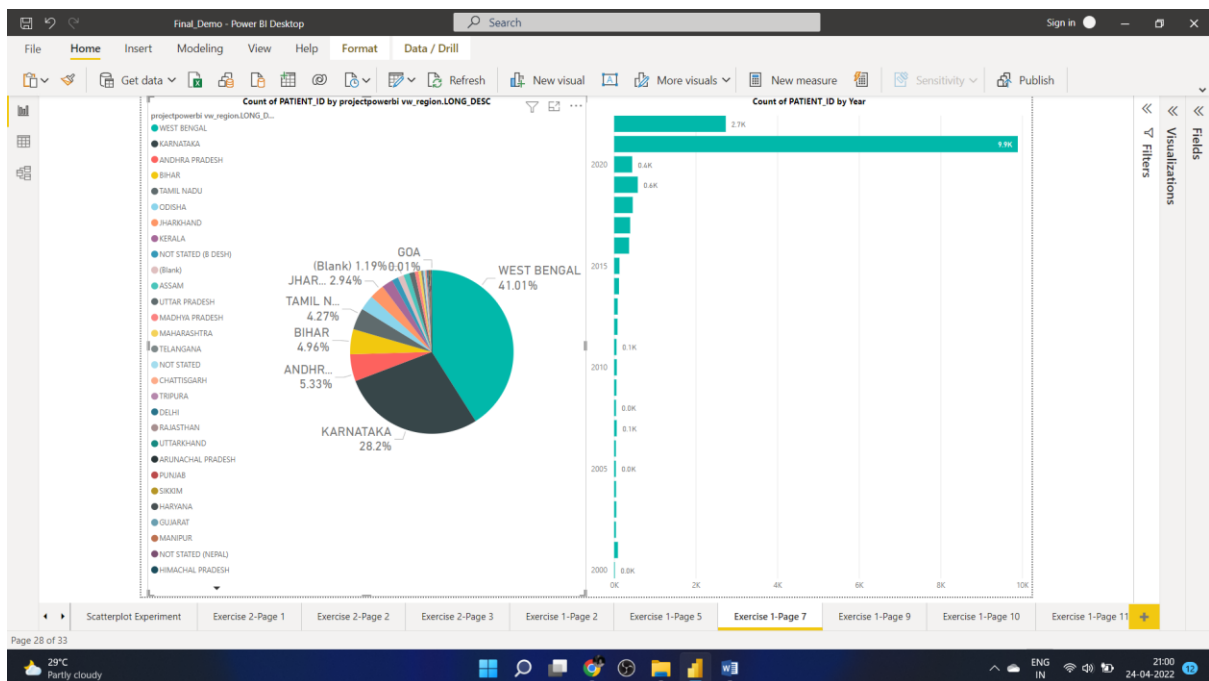
And the bottom Map shows the Patients from which region and the size of the Pie chart depend on the count of patients from that region. And that Pie chart on the map also shows the distribution of males and females.





The left top line chart shows the trend of the count of patients by year. And the bottom number card shows the total count of patients.

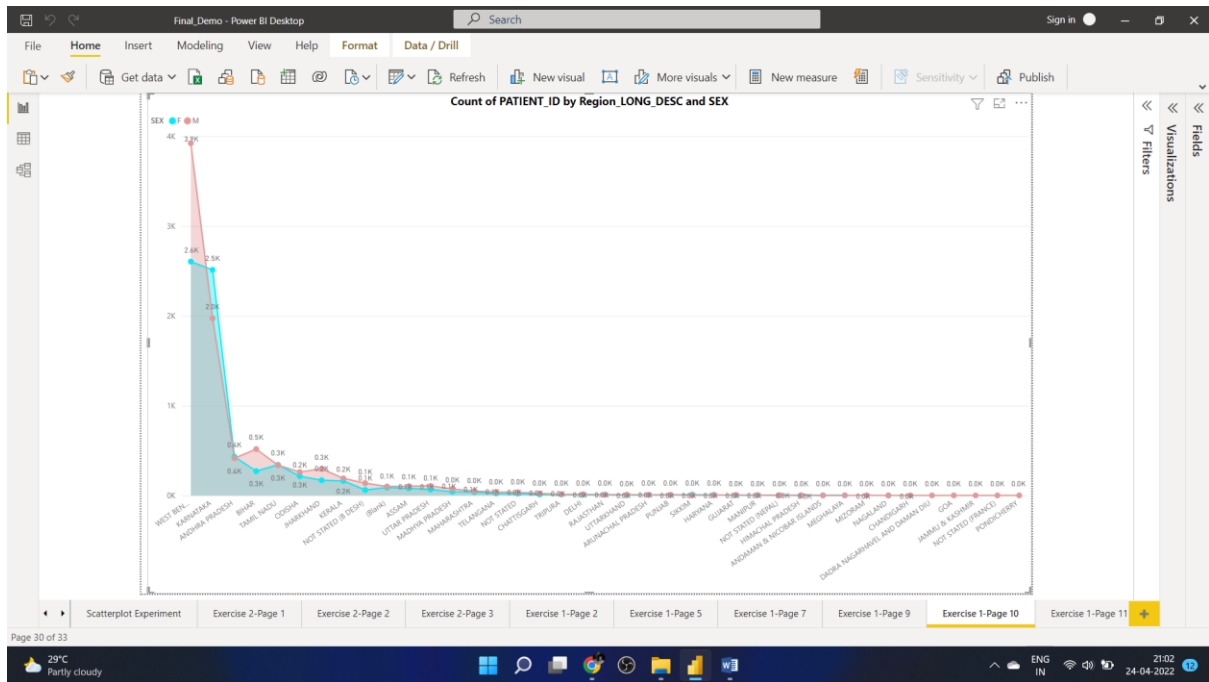
And the right graph is called the Waterfall graph. In that, it shows the count of patients by each year. And we can easily understand that 2021 is having more patients.



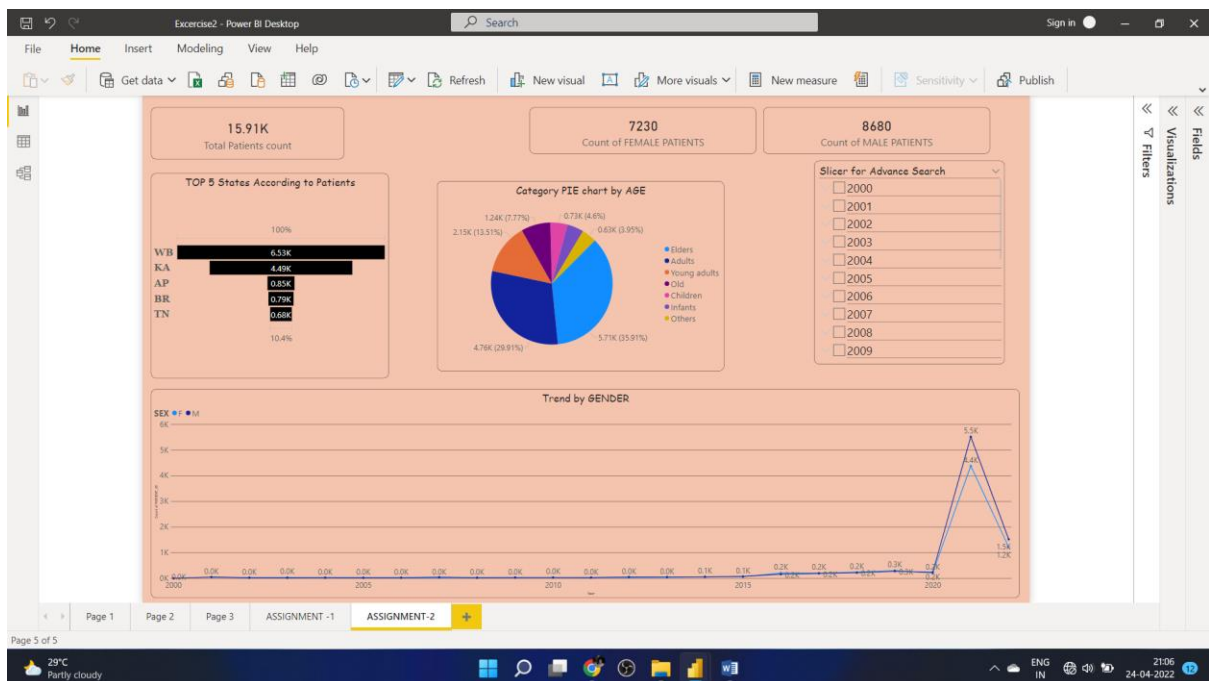
The above left pie chart shows the count of patients from each region, i.e. State. From that pie chart, we can say Patients are more from West Bengal.

And the right chart is called the Stack bar chart, which shows the count of the patients by each year.





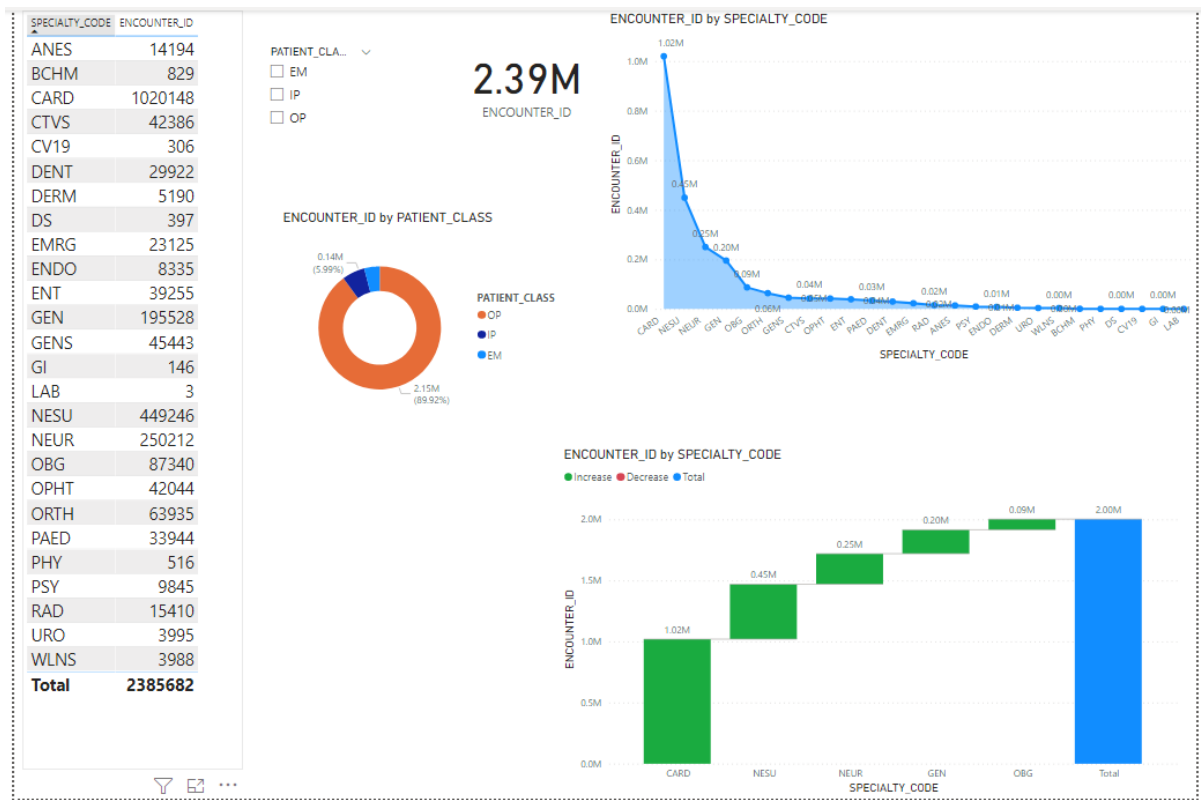
The above line graph depicts the count of the patient from each region i.e.; States, by Gender as the parameter.



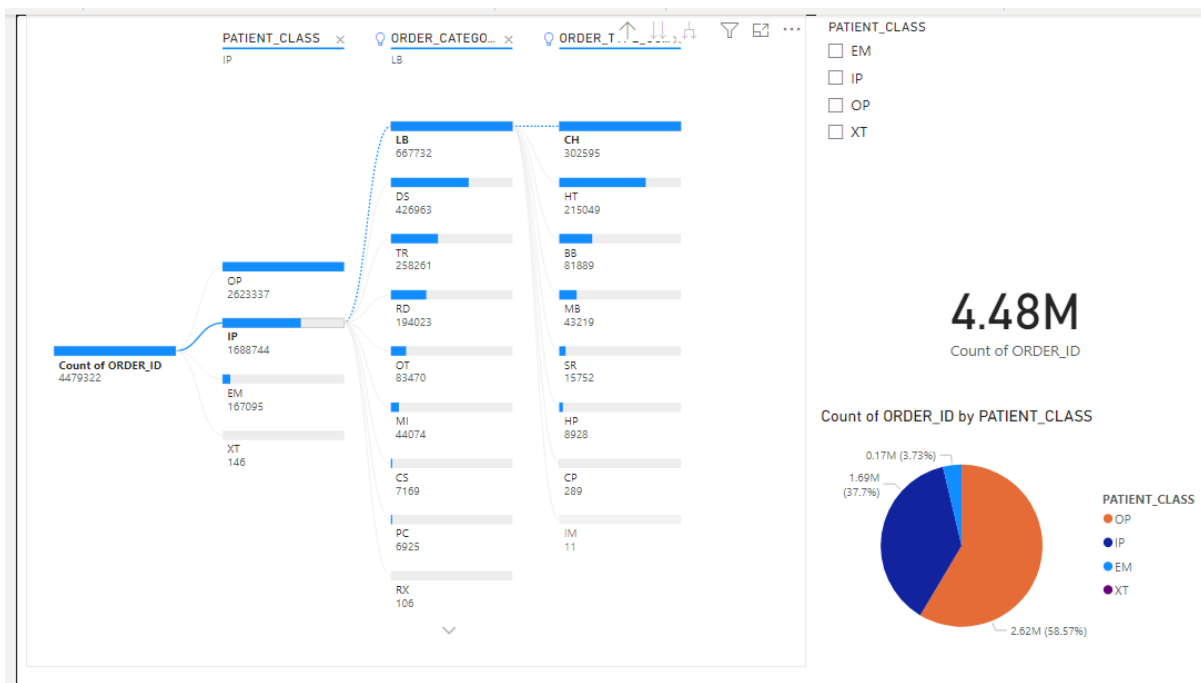
The above is the Trend of Demographics by Month and year. It shows the top 5 states by the count of patients from that state. And it has a number card that shows the count of patients and two more number cards, which show the count of patients by gender.

That pie chart in the middle depicts the count by age group (Example: Infants, Children, Young Adults, Adults, Elders, and Old. And the line chart is the trend of patients by gender.

## Chapter 9: Live Data Work Screenshots:



In the above report, there is a table on the left side that shows the Count of Encounter ids for each Specialty. And then a Slicer for Patient class. The number card shows the total count of the Encounters, the Area graph shows the Count of Encounters for each specialty. And in the middle, we have a Donut chart that shows the distribution of Encounter ids in the patient class. The bottom Waterfall chart shows the Top 5 Specialities by the Count of Encounters.



Above we have a Decomposition tree that shows the distribution of Order\_ID and then patient class Order Category and Order type. A Slicer for patient class. The number card depicts the total count of Order ids. Bottom we have a Pie Chart which shows the distribution of the Count of orders by patient class.

## Chapter 10: Learning Outcomes:

Learning outcomes after completing this project are as follows:

- Power of using power bi and creating visualizations.
- Power bi can directly integrate with live data using direct query usage.
- To see, the given data in many different ways through the process.
- Gain a new perspective on how to handle excel, like sorting, using
- Some formulae, applying column-wise, and much more.
- Configuration of MYSQL through my.ini file in MYSQL, which gives more accessibility in MySQL Workbench
- Import any given data simply by converting it to Excel and saving it as CSV.
- Insights and implementation of SQL stored procedures.
- Basics of Oracle and implemented Oracle stored procedures in the live data.
- ODAC-oracle data access components and client handling in oracle.
- Learnt a new application that is widely used in the market now for data visualizations and learned many things about charts and which charts to implement in which place.

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