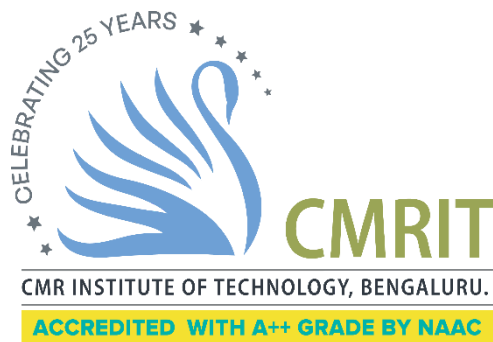


CMR INSTITUTE OF TECHNOLOGY

Affiliated to Visvesvaraya Technological University (VTU)

Sri Nivasa Reddy Layout, AECS Layout, Marathahalli,

Bengaluru, Karnataka 560037



Department of Information Science and Engineering

LAB MANUAL

DATA VISUALIZATION LAB (BAIL504)



Semester-V

Scheme-2022

Syllabus -Data Visualization Lab

DATA VISUALIZATION LAB		Semester	V
Course Code		CIE Marks	50
Teaching Hours/Week (L:T:P: S)		SEE Marks	50
Credits		Exam Hours	100
Examination type (SEE)			

Course objectives: - Understand the Importance of Data Visualization for business intelligence and decision making. - Learn different approaches to understand the importance of visual perception. - Learn different data visualization techniques and tools. - Gain knowledge of effective data visuals to solve workplace problems.	
Sl.NO	Experiments
1	Getting Started - Tableau Workspace, Tableau terminologies, basic functionalities.
2	Connecting to Data Source – Connecting to Database, Different types of Tableau Joins.
3	Creating a View - formatting charts, adding filters, creating calculated fields and defining parameters.
4	Dashboard Design and Storytelling – Components of Dashboard, Understanding how to place worksheets in Containers, Action filters and its types.
5	Introducing Power BI –Components and the flow of work. Power BI Desktop Interface-The Report has five main areas.
6	Querying Data from CSV - Query Editor, Connecting the data from the Excel Source, Clean, Transform the data.
7	Creating Reports & Visualizations - Different types of charts, Formatting charts with Title, Colors.
8	Dashboards - Filters in Power BI, Formatting dashboards.
9	Analysis of revenue in sales dataset: i) Create a choropleth map (fill the map) to spot the special trends to show the state which has the highest revenue. ii) Create a line chart to show the revenue based on the month of the year. iii) Create a bin of size 10 for the age measure to create a new dimension to show the revenue. iv) Create a donut chart view to show the percentage of revenue per region by creating zero access in the calculated field. v) Create a butterfly chart by reversing the bar chart to compare female & male revenue based on product category. vi) Create a calculated field to show the average revenue per state & display profitable & non-profitable state. vii) Build a dashboard.
10	Analysis of GDP dataset: i) Visualize the countries data given in the dataset with respect to latitude and longitude along with country name using symbol maps. ii) Create a bar graph to compare GDP of Belgium between 2006 – 2026. iii) Using pie chart, visualize the GDP of India, Nepal, Romania, South Asia, Singapore by the year 2010. iv) Visualize the countries Bhutan & Costa Rica competing in terms of GDP. v) Create a scatter plot or circle views of GDP of Mexico, Algeria, Fiji, Estonia from 2004 to 2006. vi) Build an interactive dashboard
11	Analysis of HR Dataset: i) Create KPI to show employee count, attrition count, attrition rate, active employees, and average age. ii) Create a Lollipop Chart to show the attrition rate based on gender category. iii) Create a pie chart to show the attrition percentage based on Department Category- Drag department into colours and change automatic to pie. Entire view, Drag attrition count to angle. Label attrition count, change to percent, add total also, edit label. iv) Create a bar chart to display the number of employees by Age group, v) Create a highlight table to show the Job Satisfaction Rating for each job role based on employee count. vi) Create a horizontal bar chart to show the attrition count for each Education field Education field wise attrition – drag education field to rows, sum attrition count to col, vii) Create multiple donut chart to show the Attrition Rate by Gender for different Age group.

12	Analysis of Amazon Prime Dataset: i) Create a Donut chart to show the percentage of movie and tv shows ii) Create a area chart to shows by release year and type iii) Create a horizontal bar chart to show Top 10 genre iv) Create a map to display total shows by country v) Create a text sheet to show the description of any movie/movies. vi) Build an interactive Dashboard.
Course outcomes (Course Skill Set): At the end of the course the student will be able to: 1. Design the experiment to create basic charts and graphs using Tableau and Power BI. 2. Develop the solution for the given real world problem. 3. Analyze the results and produce substantial written documentation.	

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation (CIE):

CIE marks for the practical course are **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- ❑ Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session.
- ❑ Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- ❑ Total marks scored by the students are scaled down to **30 marks** (60% of maximum marks).
- ❑ Weightage to be given for neatness and submission of record/write-up on time.
- ❑ Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.
- ❑ In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- ❑ The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- ❑ The marks scored shall be scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

- ❑ SEE marks for the practical course are 50 Marks.
- ❑ SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the Head of the Institute.
- ❑ The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedule mentioned in the academic calendar of the University.
- ❑ All laboratory experiments are to be included for practical examination.
- ❑ (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- ❑ Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.
- ❑ Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.

General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in - 60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero. The minimum duration of SEE is 02 hours

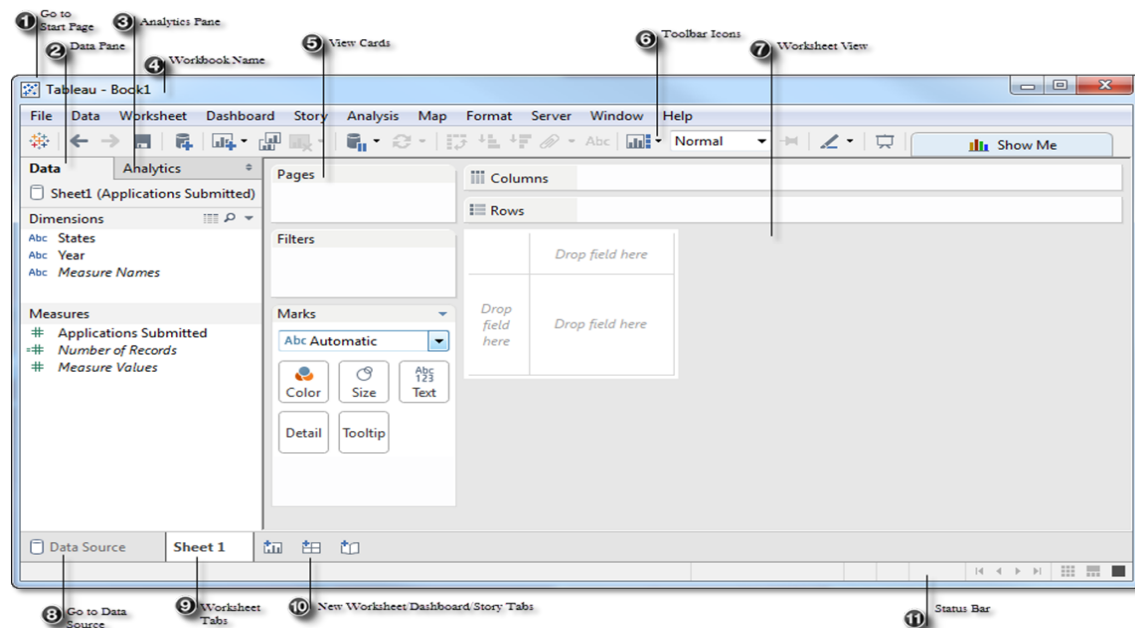
Suggested Learning Resources:

Microsoft Power BI Dashboards Step by Step by Errin O'Connor, 2019 by Pearson Education, Inc
Information Dashboard Design: Displaying Data for At-a-glance Monitoring" by Stephen Few
<https://help.tableau.com/current/guides/get-started-tutorial/en-us/get-started-tutorial-home.htm>
<https://www.tutorialspoint.com/tableau/index.htm>
<https://www.simplilearn.com/tutorials/power-bi-tutorial/power-bi-vs-tableau>

Program 1: Getting Started - Tableau Workspace, Tableau terminologies, Basic functionalities.

Working with Tableau that focuses on understanding the Tableau Workspace, Tableau terminologies, and basic functionalities.

Dataset used: vgsales.csv



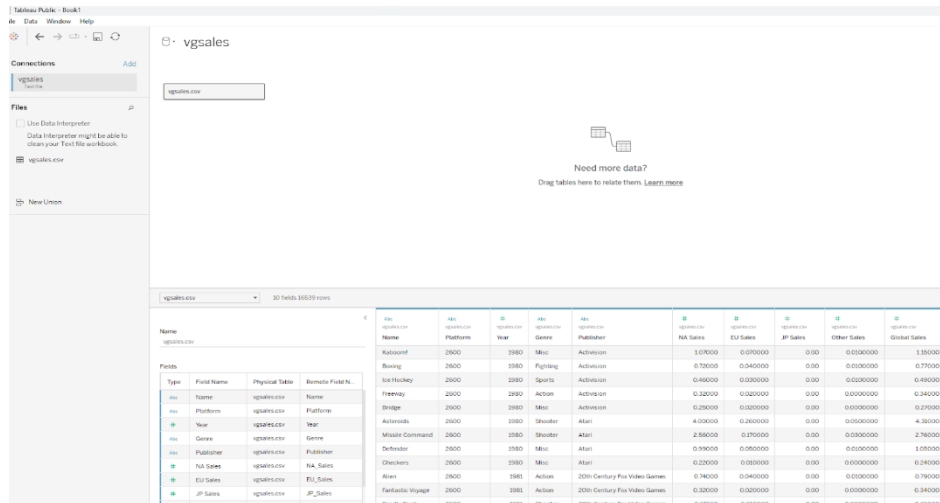
1. Go to Start Page: Toggle between the active sheet and the Desktop Start Page.
2. Data Pane: Includes dimensions and measures, populated from your selected data source. May also include calculated fields, parameters, or sets.
3. Analytics Pane: Includes options you can use to apply reference lines, forecasts, trend lines, to add totals to crosstabs, and to build boxplots.
4. Workbook Name: The file name of our workbook.
5. View Cards: Used for modifying the worksheet.
6. Toolbar Icons: Icons are available for quick access to popular features.
7. Worksheet/View: Workspace for building your visualizations.
8. Go to Data Source: Returns you to the data source specification page.
9. Worksheet Tabs: Click to view a specific worksheet, dashboard, or story
10. New Worksheet, Dashboard, and Story Tabs: Click to create a new Worksheet, Dashboard, or Story.
11. Status Bar: Displays data about the fields and marks included in the view.

Steps:

1. Tableau Workspace Setup:

- **Connect to Data:**
- Open Tableau, and on the "Start Page," select Connect -> To a File -> Text File.
- Browse to the location of vgsales.csv and open it.
- **Data Preview:**

- After loading, Tableau will show a preview of the data. You can rename columns if necessary.
- Click on the "Sheet 1" tab at the bottom to go to your first worksheet.



Name	Platform	Year	Genre	Publisher	Global Sales	NA Sales	EU Sales	JP Sales	Other Sales
Katamari Damacy	Wii	2006	Platform	Nintendo	1.070000	0.070000	0.00	0.000000	1.000000
Bowling	Wii	2006	Fighting	Nintendo	0.730000	0.040000	0.00	0.000000	0.770000
Ice Hockey	Wii	2006	Sports	Nintendo	0.460000	0.000000	0.00	0.000000	0.460000
Freemove	Wii	2006	Action	Nintendo	0.320000	0.020000	0.00	0.000000	0.340000
Shogun	Wii	2006	Misc	Nintendo	0.280000	0.020000	0.00	0.000000	0.270000
ActRaiders	Wii	2006	Shooter	Atari	4.000000	0.000000	0.00	0.000000	4.000000
Atari Anniversary	Wii	2006	Shooter	Atari	2.560000	0.070000	0.00	0.000000	2.760000
Defender	Wii	2006	Misc	Atari	0.980000	0.050000	0.00	0.000000	1.050000
Checkered	Wii	2006	Misc	Atari	0.220000	0.000000	0.00	0.000000	0.240000
Atari	Wii	2006	Action	20th Century Fox Video Games	0.740000	0.040000	0.00	0.000000	0.780000
FarCry: Vengeance	Wii	2006	Action	20th Century Fox Video Games	0.300000	0.020000	0.00	0.000000	0.340000
Definitely, Definitely	Wii	2006	Shooter	20th Century Fox Video Games	0.180000	0.000000	0.00	0.000000	0.200000

2. Tableau Terminologies:

- **Dimensions:** These are qualitative fields. In vgsales.csv, examples include Platform, Genre, and Publisher.
- **Measures:** These are quantitative fields used for calculations. Examples are Global_Sales, NA_Sales, and Year.
- **Rows and Columns Shelf:** Drag dimensions and measures to the Rows or Columns shelves to build the structure of your visualization.
- **Marks:** Controls the appearance of the data. You can set marks to be circles, bars, or other shapes and control size, color, and label.
- **Filters:** Used to limit the data displayed in the view.
- **Pages Shelf:** Used for creating animations or segmenting your view by categories.

3. Basic Functionalities:

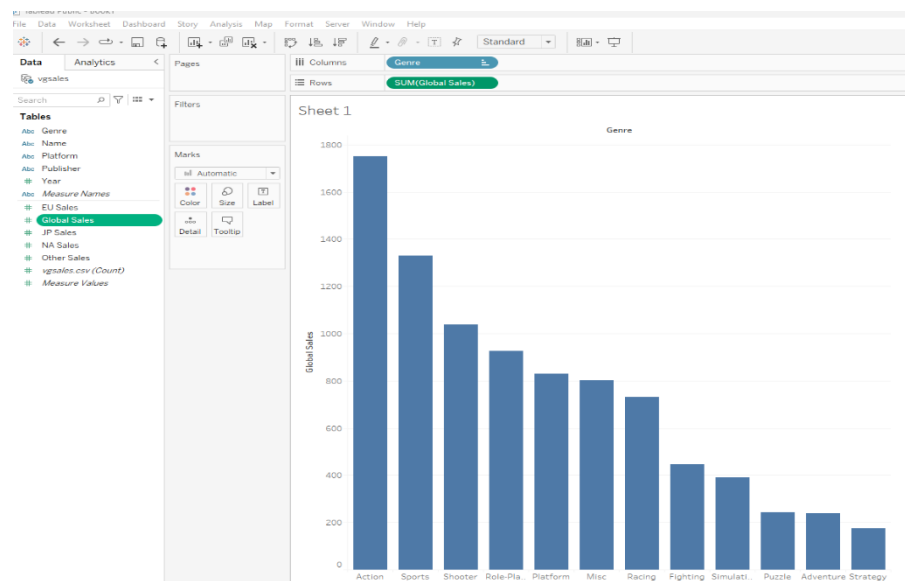
a. Basic Visualization (Bar Chart of Global Sales by Genre):

- In your worksheet, drag Genre to the Columns shelf.
- Drag Global_Sales to the Rows shelf.
- You should see a bar chart. If the data isn't aggregating correctly, check if the aggregation is set to SUM by right-clicking Global_Sales -> Measure -> Sum.

b. Sorting:

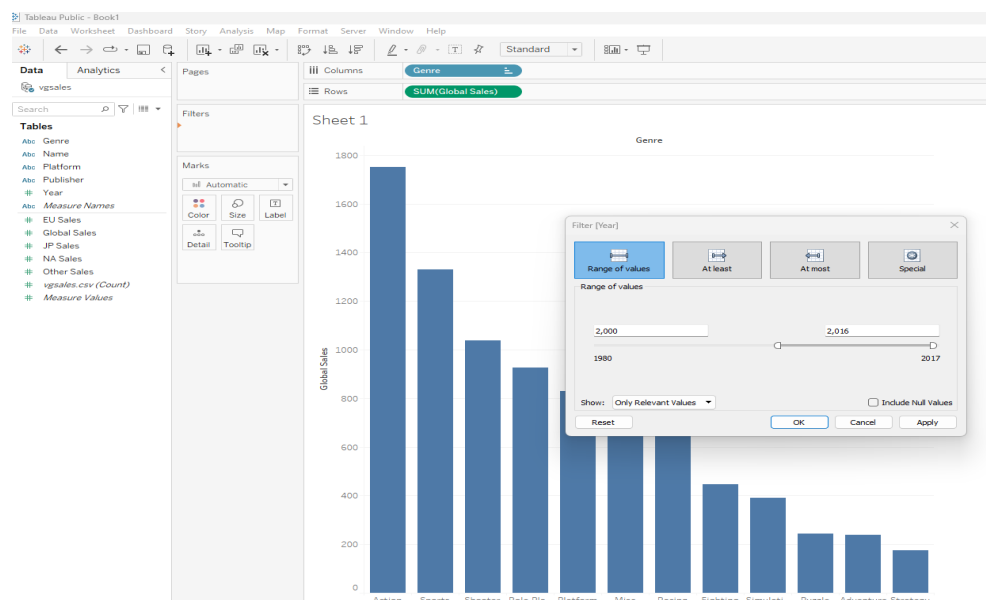
- Click on the Global_Sales axis and sort descending to show the genres with the most sales first.

Data Visualization Lab (BAIL504)



c. Filtering:

- Drag Year to the Filters shelf.
- Choose the range of years you want to display (e.g., 2000-2016).
- Add Year to the Pages shelf to create a dynamic view of how sales changed over time.



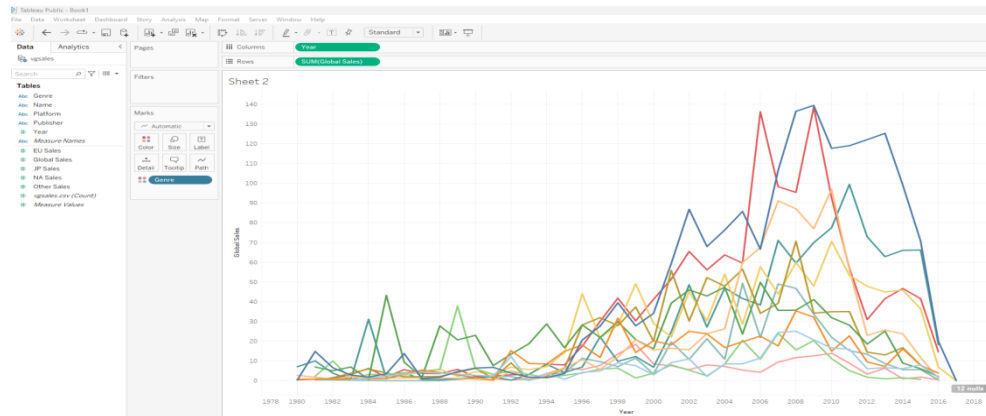
4. Additional Functionalities:

Dashboards: Combine different sheets to create a comprehensive dashboard. Go to the Dashboard tab, drag your created sheets to the layout, and arrange them accordingly.

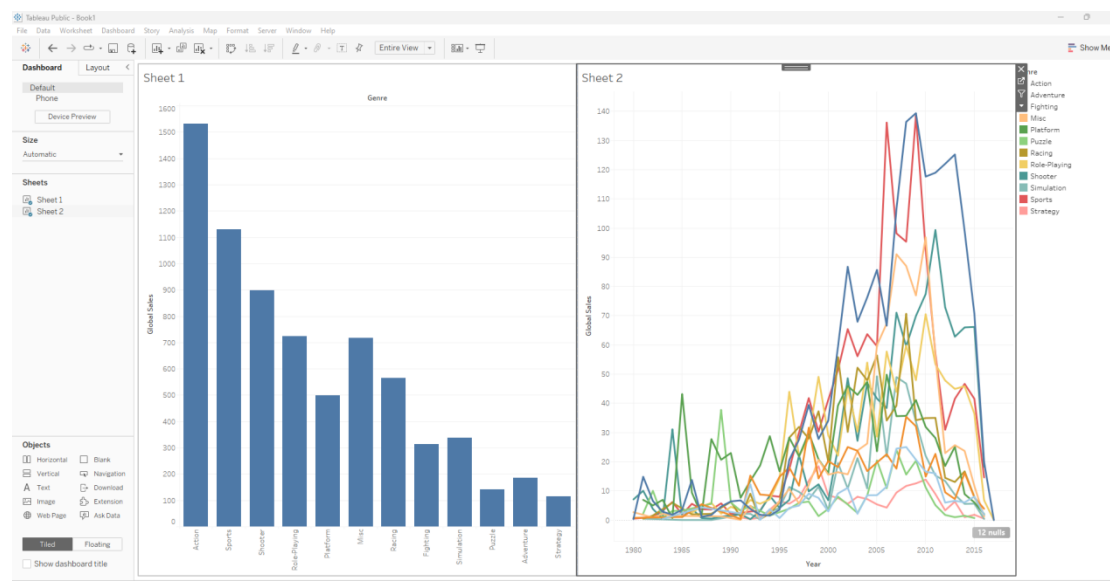
a. Add one more worksheet - Global Sales Trend by Year

- Drag Year to the Columns.
- Drag Global Sales to the Rows.
- Create a line chart to show how global sales have trended over time.

- Add Genre to the Marks
- Apply colour to Genre



- Go to the Dashboard tab in Tableau.
- Add multiple visualizations to a single dashboard. (To increase dashboard size - select size-Automatic)
- Arrange charts (e.g., a line chart for yearly sales, a bar chart for top genres, etc.).



Reference Video Link -

<https://www.youtube.com/watch?v=6xv1KvCMF1Q&list=PLUaB-1hjhk8GwbqoVmo5zuhOa0Tcl3xC&index=3>

Program 2: Connecting to Data Source – Connecting to Database, Different types of Tableau Joins.

Dataset used: Tableau Joins File: Contains 3 sheets: Demographics, Salary, Job Title

1. Connecting to Excel Files in Tableau:

- Open Tableau and click on **Connect** in the left pane.

- Under **To a File**, choose **Microsoft Excel**.
- Browse and select your Excel file (Tableau Joins File.xlsx).
- Tableau will display the sheets from the Excel file in the Data Source tab.
- Drag the relevant sheets to the workspace.

2. Tableau Joins File.xlsx Dataset: has three Excel sheets

- **Demographics:**

- EmployeeID
- NameofEmployee
- EmployeeAge
- EmployeeGender

- **Salary:**

- EmployeeID
- EmployeeSalary

These sheets have a relationship based on the EmployeeID, and you can join them using this field.

Drag and drop Demographics table- Right click-select open- that allows you to do following types of joins.

Now Drag and drop Salary table - That allows you to do join of your choice.

3. Types of Joins in Tableau:

Once both tables are in the Data Source tab, Tableau automatically suggests an inner join, but you can modify the type of join depending on the scenario.

a. Inner Join:

- **Description:** Returns only records where there is a match in both tables.
- **How to Create in Tableau:**
 - Drag Demographics and Salary sheets into the canvas.
 - Tableau automatically detects the common field (EmployeeID). If not, manually select it.
 - Choose **Inner Join** in the **Join Type** options.
 - Result: You will see only employees whose employee id matches in both Demographics and Salary table.

Data Visualization Lab (BAIL504)

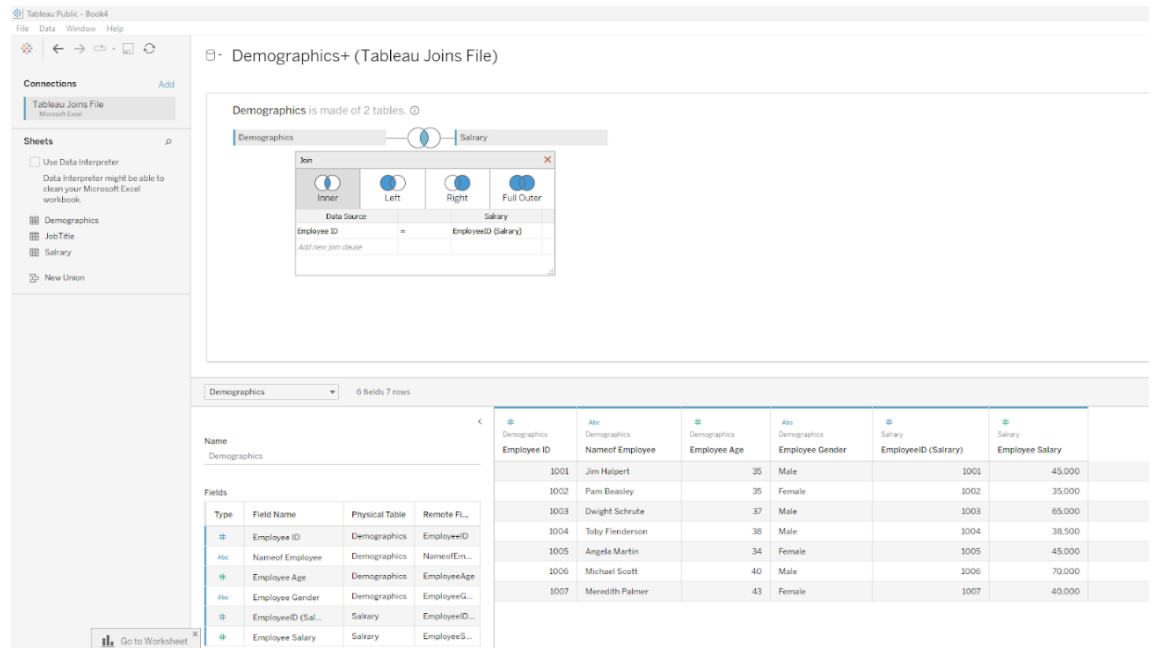


Tableau Public - Book4

File Data Window Help

Connections: Add
Tableau Joins File
Microsoft Excel

Sheets: p
☐ Use Data Interpreter
Data Interpreter might be able to clean your Microsoft Excel workbook.
Demographics
JobTitle
Salary
New Union

Demographics+ (Tableau Joins File)

Demographics is made of 2 tables. @

Join

Demographics Salary

Inner Left Right Full Outer

Data Source Salary

Employee ID = EmployeeID (Salary)

Add new join clause

Demographics 6 fields 7 rows

Name	Demographics	Demographics	Demographics	Demographics	Salary	Salary
	Employee ID	Name of Employee	Employee Age	Employee Gender	EmployeeID (Salary)	Employee Salary
	1001	Jim Halpert	35	Male	1001	45,000
	1002	Pam Beasley	35	Female	1002	35,000
	1003	Dwight Schrute	37	Male	1003	65,000
	1004	Toby Flenderson	38	Male	1004	38,500
	1005	Angela Martin	34	Female	1005	45,000
	1006	Michael Scott	40	Male	1006	70,000
	1007	Meredith Palmer	43	Female	1007	40,000

Fields

Type	Field Name	Physical Table	Remote FL...
#	Employee ID	Demographics	EmployeeID
Alt	Name of Employee	Demographics	Name of Em...
#	Employee Age	Demographics	EmployeeAge
Alt	Employee Gender	Demographics	EmployeeG...
#	EmployeeID (Sal...	Salary	EmployeeID...
#	Employee Salary	Salary	EmployeeS...

Go to Worksheet

• b. Left Join:

- **Description:** Returns all records from the left table (Demographics), and matched records from the right table (salary). If there's no match, NULL values are returned for fields from the right table.
- **How to Create in Tableau:**
- In the join settings, select **Left Join**.
- **Result:** All employees will be returned, even if data missing in Salary. Salary information will be NULL for those without a match.

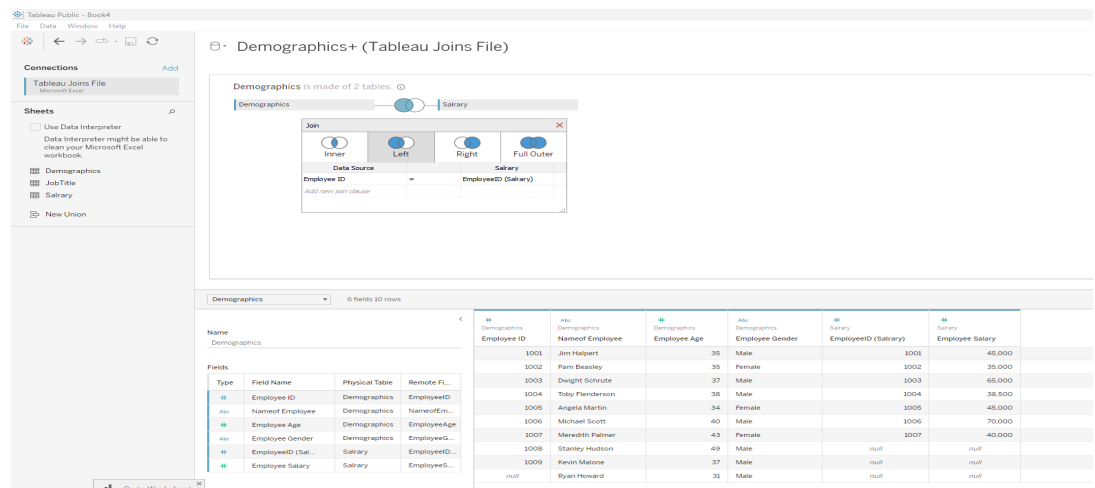


Tableau Public - Book4

File Data Window Help

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Microsoft Excel

Sheets: p
☐ Use Data Interpreter
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Demographics
JobTitle
Salary
New Union

Demographics+ (Tableau Joins File)

Demographics is made of 2 tables. @

Join

Demographics Salary

Inner Left Right Full Outer

Data Source Salary

Employee ID = EmployeeID (Salary)

Add new join clause

Demographics 6 fields 10 rows

Name	Demographics	Demographics	Demographics	Demographics	Salary	Salary
	Employee ID	Name of Employee	Employee Age	Employee Gender	EmployeeID (Salary)	Employee Salary
	1001	Jim Halpert	35	Male	1001	45,000
	1002	Pam Beasley	35	Female	1002	35,000
	1003	Dwight Schrute	37	Male	1003	65,000
	1004	Toby Flenderson	38	Male	1004	38,500
	1005	Angela Martin	34	Female	1005	45,000
	1006	Michael Scott	40	Male	1006	70,000
	1007	Meredith Palmer	43	Female	1007	40,000
	1008	Stanley Hudson	49	Male	null	null
	1009	Kevin Malone	37	Male	null	null
	null	Ryan Howard	31	Male	null	null

Fields

Type	Field Name	Physical Table	Remote FL...
#	Employee ID	Demographics	EmployeeID
Alt	Name of Employee	Demographics	Name of Em...
#	Employee Age	Demographics	EmployeeAge
Alt	Employee Gender	Demographics	EmployeeG...
#	EmployeeID (Sal...	Salary	EmployeeID...
#	Employee Salary	Salary	EmployeeS...

Go to Worksheet

c. Right Join:

- **Description:** Returns all records from the right table (Salary), and matched records from the left table (Demographics). If there's no match, NULL values are returned for fields from the left table.
- **How to Create in Tableau:**
- Select **Right Join**.

Data Visualization Lab (BAIL504)

- **Result:** You will see all salary, even if they don't have employee id. Employee information will be NULL for those salary with no matching employee id.

Demographics+ (Tableau Joins File)

Demographics is made of 2 tables. ☒ Demographics ☐ Salary

Join: ☒ Inner ☐ Left ☐ Right ☒ Full Outer

Data Source: Employee ID = EmployeeID (Salary)

6 fields 8 rows

Name	Demographics	Demographics	Demographics	Demographics	Salary	Salary
Fields	Employee ID	Name of Employee	Employee Age	Employee Gender	EmployeeID (Salary)	Employee Salary
Employee ID	1001	Jim Halpert	35	Male	1001	45,000
Name of Employee	1002	Pam Beasley	35	Female	1002	35,000
Employee Age	1003	Dwight Schrute	37	Male	1003	65,000
Employee Gender	1004	Toby Flenderson	38	Male	1004	38,500
EmployeeID (Salary)	1005	Angela Martin	34	Female	1005	45,000
Employee Salary	1006	Michael Scott	40	Male	1006	70,000
	1007	Meredith Palmer	43	Female	1007	40,000
	null	null	null	null	1010	25,000

d. Full Outer Join:

- **Description:** Returns all records when there is a match in either the left (Demographics) or right (Job Title) table. If there's no match, NULL values are returned for the missing side.
- **How to Create in Tableau:**
 - Select **Full Outer Join**.
 - **Result:** You will see all employees and all salary, even if they don't have a match in the other table. NULL values will appear where there's no corresponding record.

Demographics+ (Tableau Joins File)

Demographics is made of 2 tables. ☒ Demographics ☐ Salary

Join: ☐ Inner ☐ Left ☐ Right ☒ Full Outer

Data Source: Employee ID = EmployeeID (Salary)

6 fields 11 rows

Name	Demographics	Demographics	Demographics	Demographics	Salary	Salary
Fields	Employee ID	Name of Employee	Employee Age	Employee Gender	EmployeeID (Salary)	Employee Salary
Employee ID	1001	Jim Halpert	35	Male	1001	45,000
Name of Employee	1002	Pam Beasley	35	Female	1002	35,000
Employee Age	1003	Dwight Schrute	37	Male	1003	65,000
Employee Gender	1004	Toby Flenderson	38	Male	1004	38,500
EmployeeID (Salary)	1005	Angela Martin	34	Female	1005	45,000
Employee Salary	1006	Michael Scott	40	Male	1006	70,000
	1007	Meredith Palmer	43	Female	1007	40,000
	1008	Stanley Hudson	49	Male	null	null
	1009	Kevin Malone	37	Male	null	null
	1010	Ryan Howard	31	Male	null	25,000

4. Creating a Visualization Based on Joins:

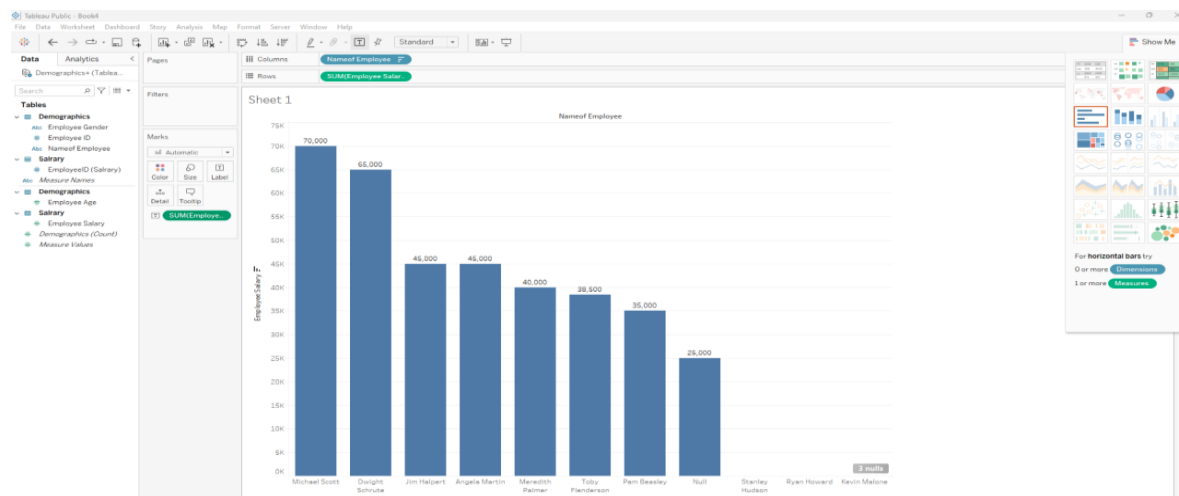
After performing the joins, you can build different visualizations.

Press on Sheet 1:

For example:

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- **Bar Chart:** Number of employees and their salary.
- Drag NameofEmployee to **Columns**.
- Drag EmployeeSalary to **Rows**.
- This chart will display the number of employees and their salary based on the type of join.
- Sort it in decending
- Drag EmployeeSalary to Marks - Select color Color, Label



Reference Video Link -

https://www.youtube.com/watch?v=A4SVUF-fTwc&list=PLUaB-1hjhk8GwbqoVmo_5zuhOa0Tcl3xC&index=4

Program 3. Creating a View - formatting charts, adding filters, creating calculated fields and defining parameters

- **Dataset Used: vgsales.csv**

Step 1: Connect to Data

1. **Open Tableau Desktop.**
2. **Connect to Your Data Source:**

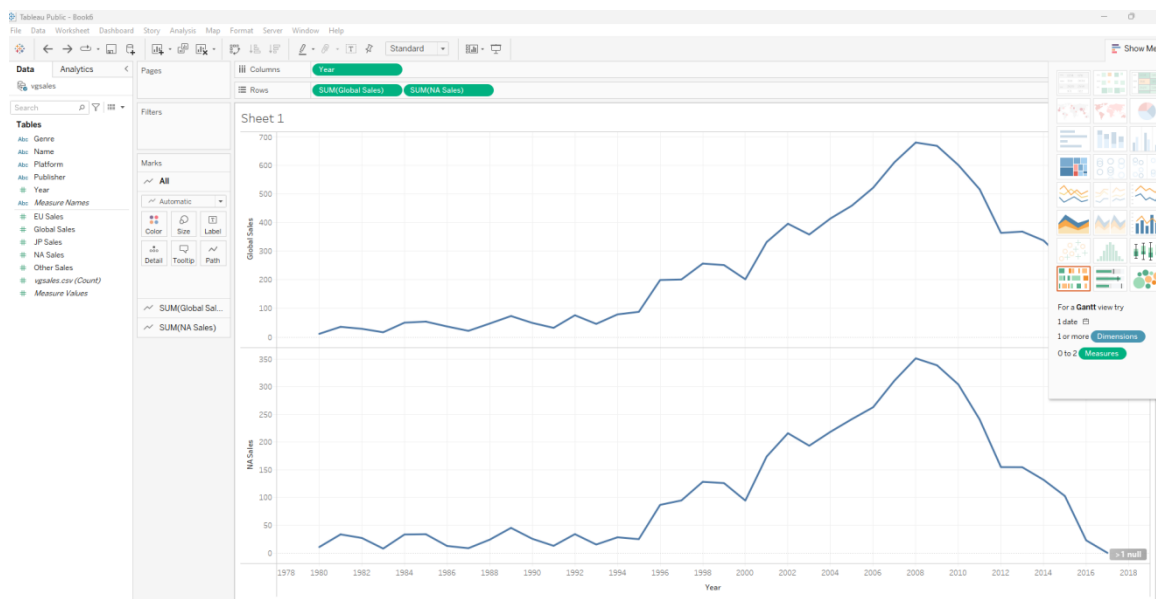
a) Click on Connect on the left sidebar.

b) Choose your data source by selecting text file and load your vgsales dataset into Tableau.

Step 2: Create a Basic Visualization

- **Create a New Worksheet:**
 - a) Click on the Sheet tab at the bottom of the screen.
- **Drag Fields to Shelves:**
 - a) Drag Year to the Columns shelf.
 - b) Drag Global Sales to the Rows shelf.
 - c) Drag EU Sales to the Rows shelf.

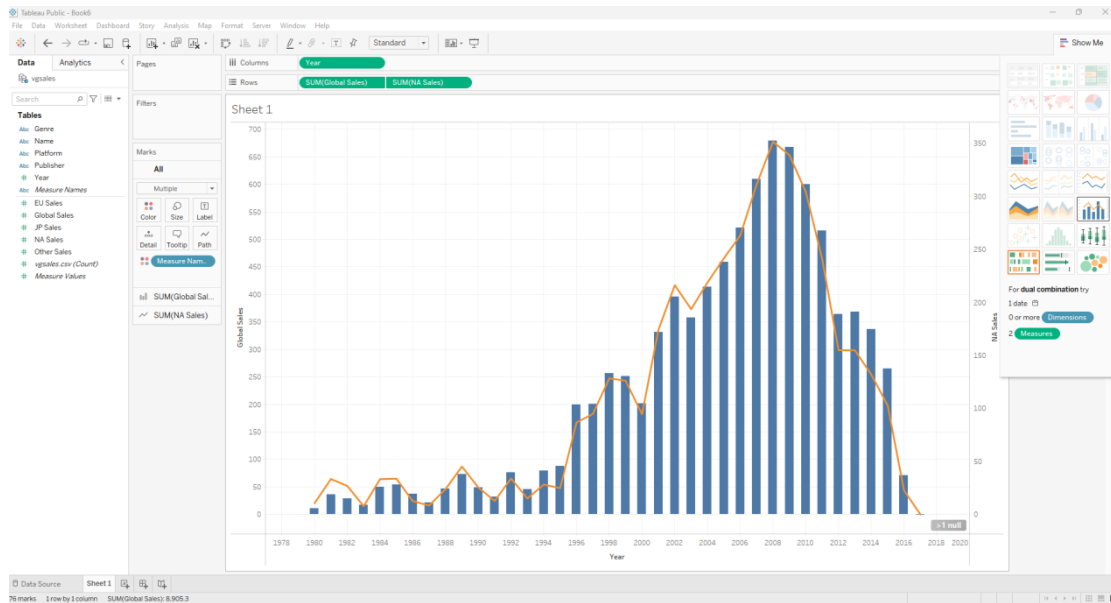
That gives the line graph visualization.



- **Change Visualization Type:**

In the Show Me panel on the right, select a bar chart or any other type that suits your needs.

Data Visualization Lab (BAIL504)



Step 3: Format the Chart

- **Format Axes:**

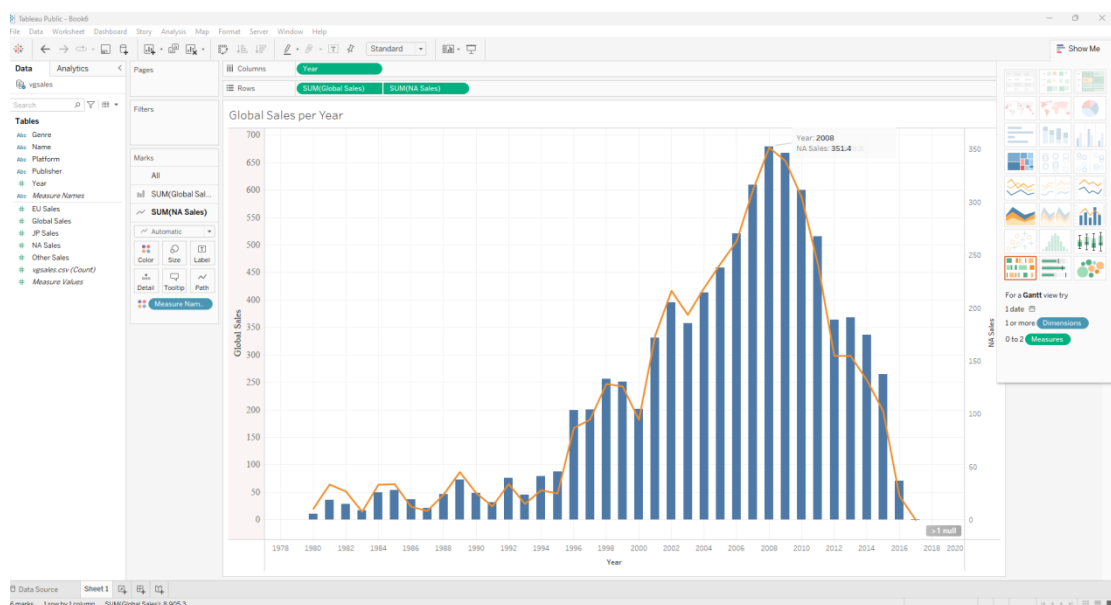
a) Right-click on the Global Sales axis and select Format.

b) In the Format pane, adjust the font style & size as needed.

- **Add Titles and Annotations:**

a) Click on the chart title area and enter a descriptive title - Global Sales by Year.

b) Add annotations if needed to highlight specific data points – Right click the on the chart which you want to highlight - Select Annotate - Select Mark - Press Ok



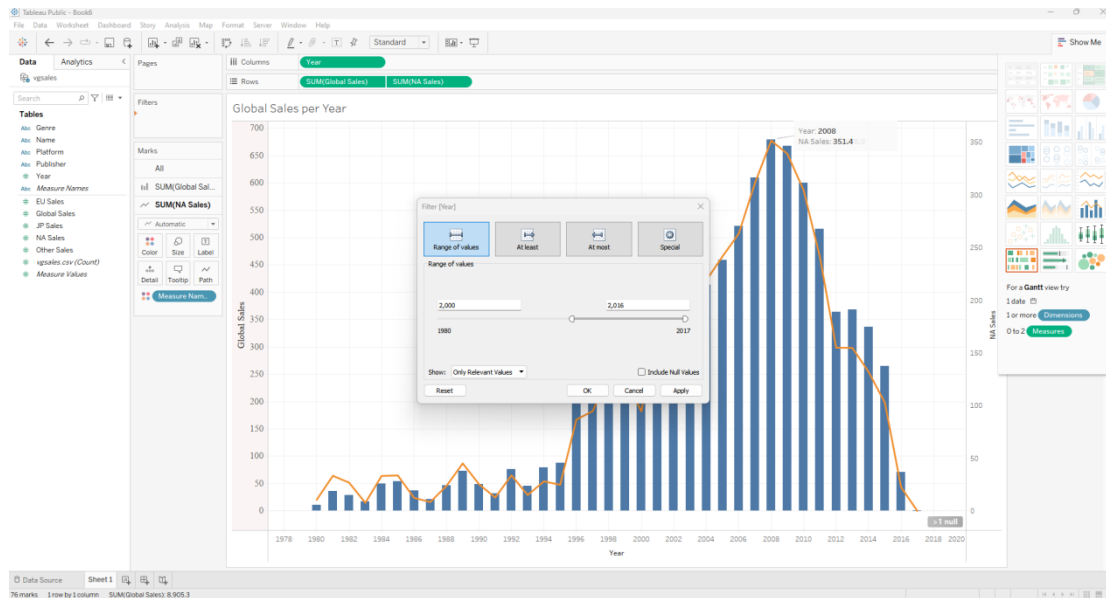
Step 4: Add Filters

Add a Filter for Year:

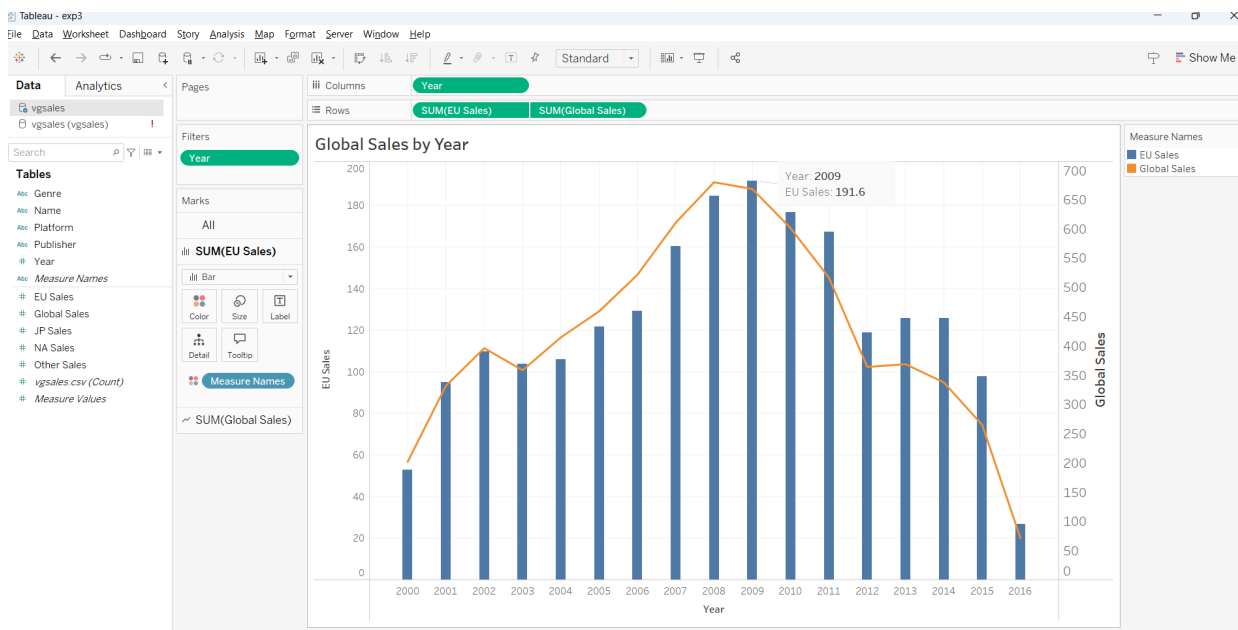
Drag Year to the Filters shelf.

Choose the range of years you want to display (e.g., 2000-2016).

Data Visualization Lab (BAIL504)



After applying filter,



Step 5: Create Calculated Fields

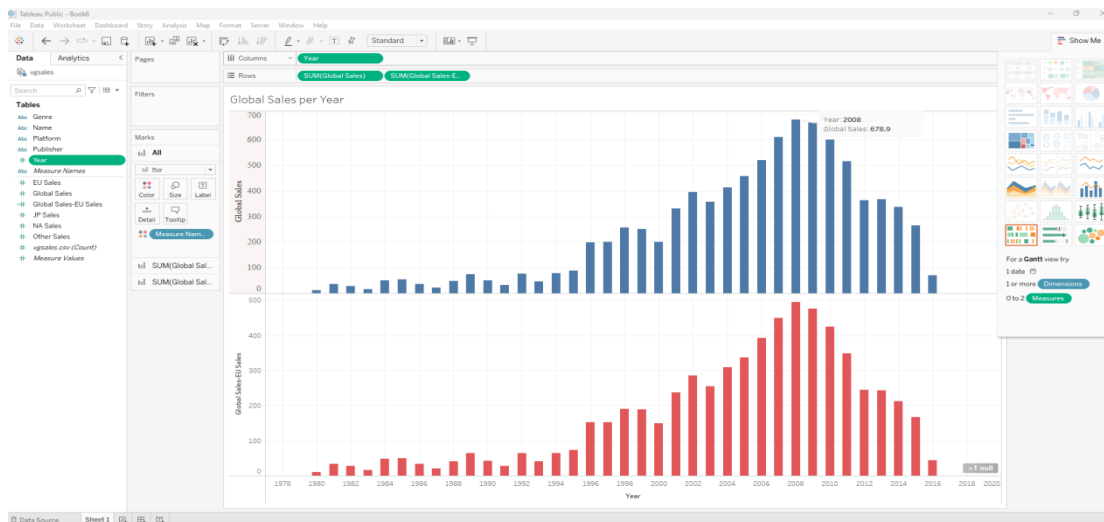
- **Create a Calculated Field for Sales Category:**

- Right-click on Global Sales - Select Create - Calculated Field.
- Give name to your calculations as Global Sales - EU Sales
- Do calculations as per your need - [Global Sales] - [EU Sales]
- Press Ok

Add Calculated Fields to Visualization:

- Drag Global Sales-EU Sales to the Rows shelf to show Global Sales over Year with Global Sales - EU Sales over Year.

Data Visualization Lab (BAIL504)



Step 6: Create a Parameter:

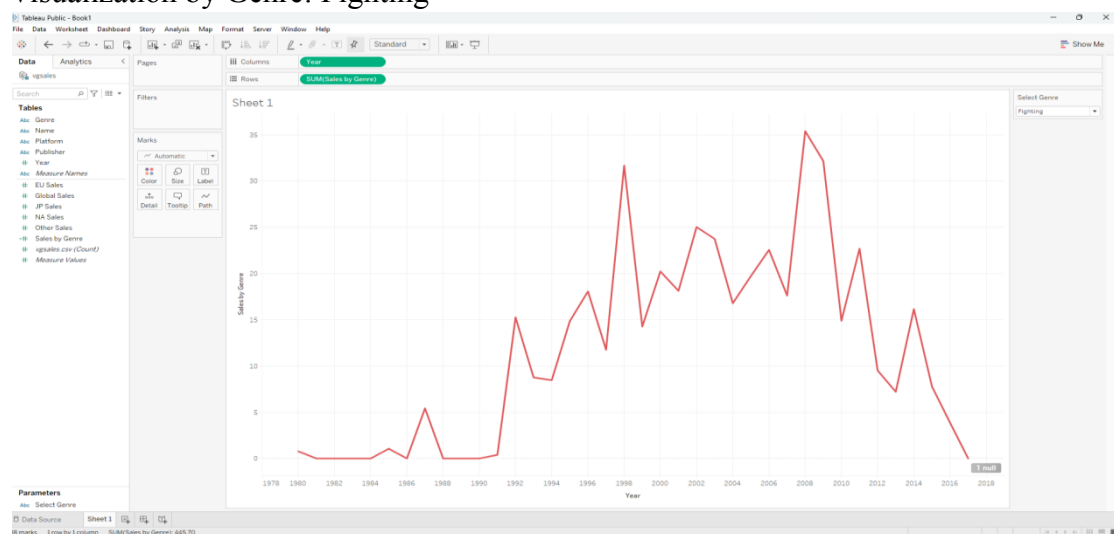
Name: "Select Genre"

- **Data Type:** String
- **Values:** List (e.g., "Action", "Adventure", "Shooter") or Add values from Genre.
- **Create a Calculated Field:**
- **Name:** "Sales by Genre"
- **Formula:**
- IF [Genre] = [Select Genre] THEN [Global Sales] ELSE 0 END

Build the Visualization:

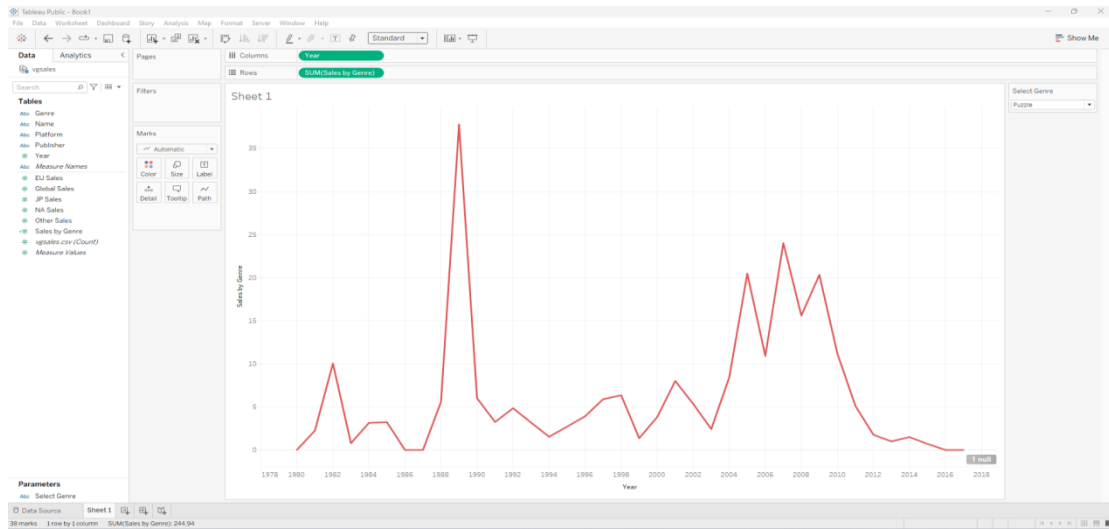
- **Columns:** Drag "Year".
- **Rows:** Drag "Sales by Genre".
- At the right side of your sheet you can select required Genre and can see different Visualization

Visualization by Genre: Fighting



Visualization by Genre: Puzzle

Data Visualization Lab (BAIL504)



Reference Video Link - https://www.youtube.com/watch?v=_n5SaTnxoeE

Program 4:

Dashboard Design and Storytelling – Components of Dashboard, understanding how to place worksheets in Containers, Action filters and its types.

Dashboard Design and Storytelling

Dashboards are powerful tools used to communicate data insights clearly and effectively. They combine multiple visualizations into a single, interactive interface to tell a meaningful story. Good dashboard design focuses on clarity, simplicity, and user experience, ensuring that stakeholders can make data-driven decisions quickly.

Components of a Dashboard

1. **Title and Header:** Clearly describe the purpose of the dashboard and the type of data being visualized.
2. **Filters and Parameters:** Allow users to customize the view, enabling them to focus on specific dimensions or metrics.
3. **Charts and Visualizations:** Graphs, maps, and tables that communicate trends, comparisons, and distributions.
4. **KPIs (Key Performance Indicators):** Highlight critical metrics in a prominent way for quick decision-making.
5. **Legends and Labels:** Help users interpret charts and visual elements accurately.
6. **Interactive Elements:** Buttons, dropdowns, and highlight actions to enhance user engagement.
7. **Navigation:** Tabs or links to switch between dashboard sections or stories.

Placing Worksheets in Containers

Containers in Tableau help organize multiple visualizations within a dashboard layout, ensuring a clean and responsive design.

- Horizontal Containers: Place worksheets side by side, aligning visualizations horizontally.
- Vertical Containers: Stack worksheets one above another for vertical organization.
- Nested Containers: Combine both horizontal and vertical containers for complex layouts.
- Floating Elements: Position visuals freely over the dashboard for flexible customization.

Filter Actions

A Filter Action in Tableau is a type of action that allows users to click on a specific data point (like a bar in a chart, a cell in a table, or a section of a pie chart) and filter other visualizations on the dashboard based on that selection. It is widely used to create interactive dashboards and facilitate data exploration without requiring complex navigation.

How it Works:

- When a user selects a data point in a visualization (called the source sheet), the selection acts as a filter.
- Other connected visualizations (called the target sheets) will display only data related to the selected value(s).
- This makes dashboards more dynamic and drill-down friendly, helping viewers focus only on relevant data.

Steps to Create a Filter Action in Tableau:

1. Open your dashboard.
2. Go to the Dashboard menu → Actions.
3. Select Add Action → Filter.
4. Choose the source sheet(s) and target sheet(s).
5. Decide when the action runs:
 - Hover: Filter happens when hovering over data.
 - Select: Filter happens when clicking.
 - Menu: Filter happens when selecting from a menu.
6. Click OK and test the interactivity.

CREATING A DASHBOARD WITH TABLEAU

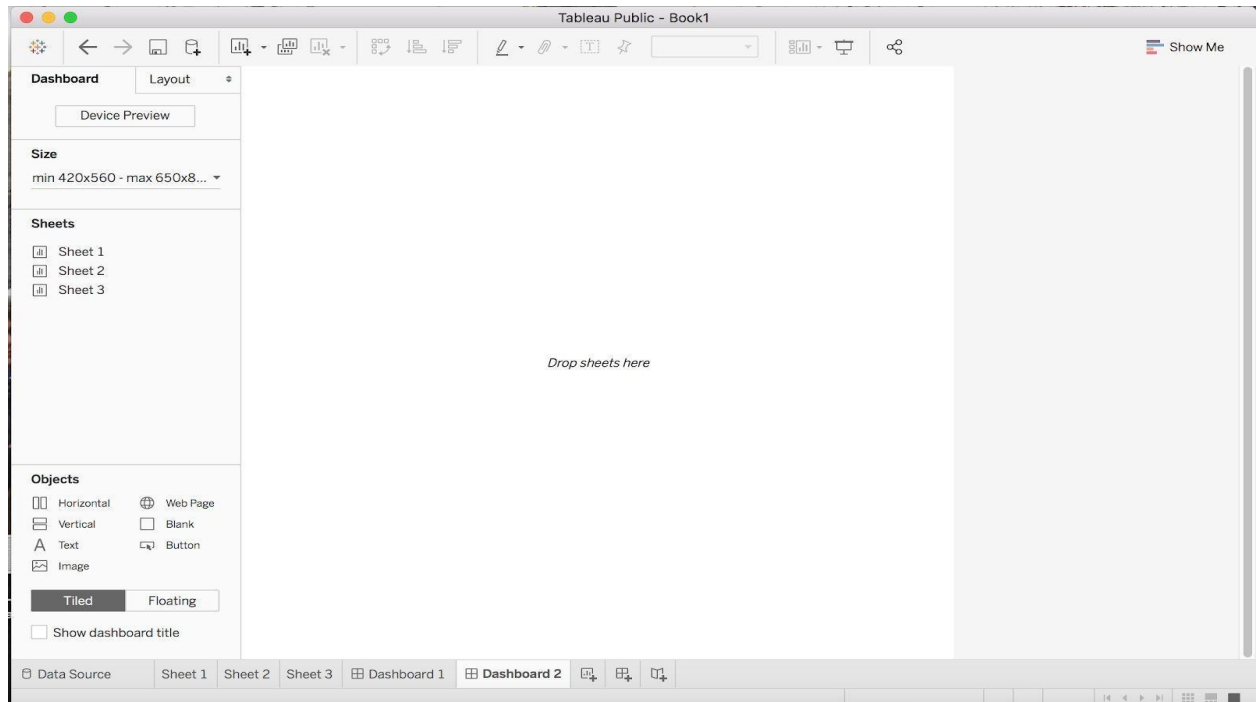
Dashboards are a great way to combine your data visualizations and have them interact with one another. A lot of businesses use dashboards to keep up-to-date in real time about key performance indicators at a glance. In this example, we will combine just two of our data visualizations, the map and the line graph from the first section of the tutorial, but in reality, it can be used to combine many visualizations at once.

The first step in creating your dashboard is to open up the Dashboard tab at the



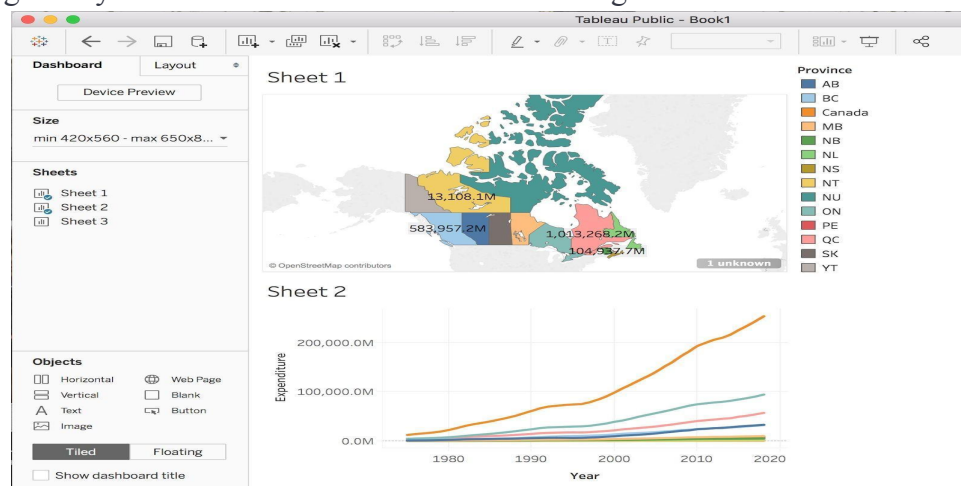
bottom of the screen:

After clicking this icon, your screen should open to this:

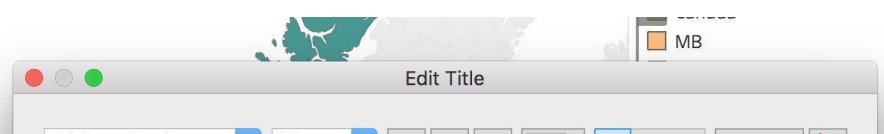


This is your Dashboard Sheet. On the left side you can see that there is a list of the sheets you have made from your current data source.

To build your dashboard, drag the sheet you want in to the center where it says *Drop sheets here*. For our purposes, we will need to drag Sheet 1 and Sheet 2 where the map and line graph are saved. When you drag, you will notice an area of your screen will shade over where your graph will drop when you put it down. Organize your dashboard to look like the following:



Now to add titles to the graphs that were chosen, double click on the automatic titles generated based on the sheet name, and a new window should appear, type in a title that describes the graph like so:



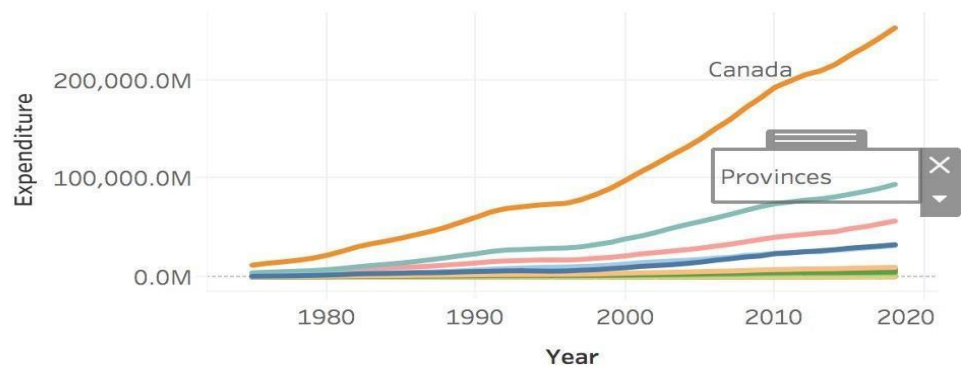
We can also add additional titles and objects to the dashboard by choosing an object from the Objects side panel and dragging it to the dashboard. We are going to add titles to the bottom-line graph to differentiate between the Canada

line and the provinces. To do this, drag **A Text** to the area near the orange line that corresponds to the sum of all province's expenditure throughout the years. Type in "Canada". Drag

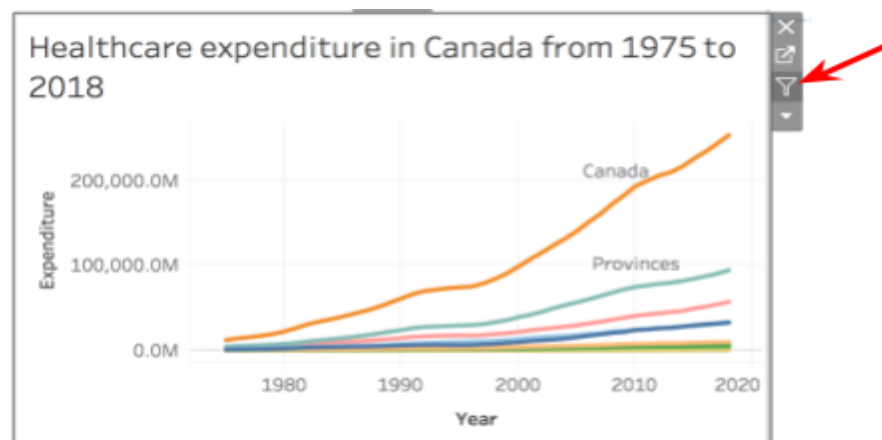
A Text

once more to label the remaining provinces. Your bottom graph should look like this:

Healthcare expenditure in Canada from 1975 to 2018



Now, to add an interactive layer between the graphs, we can choose a graph that can act as a filter to the other. We will choose the line graph to act as a filter to the map. To do this, click on the line graph and a grey sidebar should appear. From this bar, click the filter icon to use this graph as a filter:



Now, when you click a given line, it will be highlighted on the above map:



Congrats, now you have an interactive dashboard that is ready to be published or saved!

Program 5

Title: Introducing Power BI –Components and the flow of work. Power BI Desktop Interface-The Report has five main areas.

Solution:

Power BI includes the following components –

1. Power BI Desktop

- A Windows application for ingesting, transforming, modeling, and visualizing data. You build reports here using Power Query, Power Pivot, visuals, and DAX.

2. Power BI Service (Cloud)

- A SaaS platform (app.powerbi.com) where you publish, share, collaborate on, and schedule refreshes for reports and dashboards.

3. Power BI Mobile

- iOS, Android, and Windows apps for viewing and interacting with published content on the go.

4. Gateways (On-Premises Data Gateway)

- Bridges to refresh on-premises data in the cloud securely.

5. Power BI Report Server

- On-premises alternative to the cloud Service, hosting reports within your own infrastructure.

6. Power BI Embedded

- Azure service enabling integration of Power BI visuals into custom applications via APIs

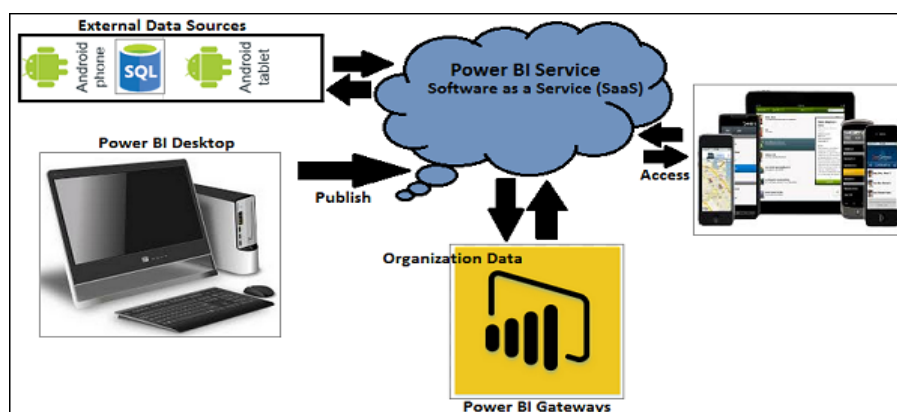
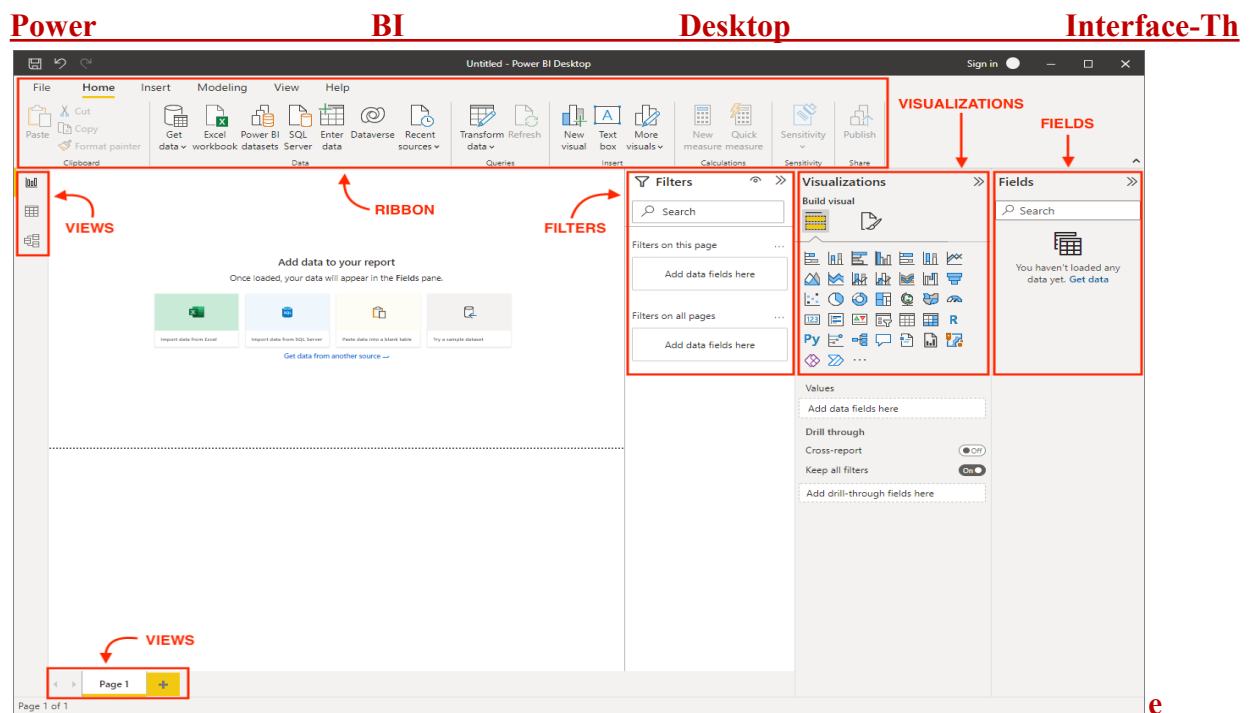


Fig 1 : The Components of Power BI

Flow of work

1. **Data Connection:** Connect to multiple data sources (Excel, SQL Server, Azure, Web APIs, etc.).
2. **Data Transformation (Power Query):** Clean, filter, and shape data to make it ready for analysis.
3. **Data Modeling:** Create relationships, calculated columns, and measures using DAX (Data Analysis Expressions).
4. **Visualization:** Build charts, KPIs, and interactive dashboards to display insights.
5. **Sharing:** Publish reports to the Power BI Service for collaboration and secure sharing.
6. **Access Anywhere:** View and interact with reports on desktops, tablets, and mobile devices.



Report has five main areas.

1. Ribbon

Located at the top, with tabs like Home, Insert, View, Model, and Format. It contains essential commands: Get Data, Transform Data, Publish, insert visuals, and navigate report pages.

2. Pages Tab (Page Selector)

Along the bottom, you can switch or add report pages—helpful for multi-page reports.

3. Report Canvas (Main Visual Area)

The central workspace where you drag and arrange visualizations—charts, maps, tables, etc.—to layout your report.

4. Visualizations Pane

Typically on the right: choose chart types, add fields, apply drill-through options, and switch to formatting.

5. Fields Pane

Also on the right, listing data tables and fields from your model. You drag fields into visuals or filters directly from here.



Additional Interface Elements

- **Filters Pane**

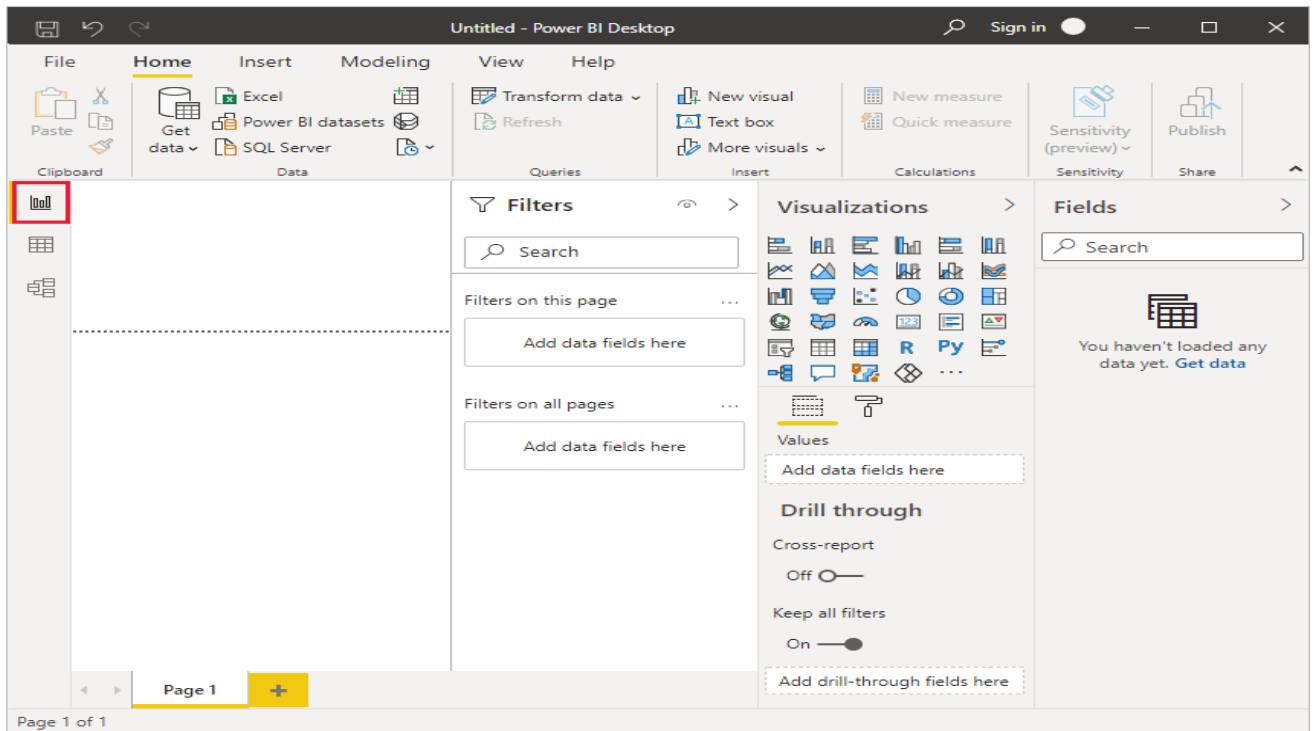
Adjacent to the Visualizations pane, you can apply filters at visual, page, or report level.

- **Views Pane (left side icons)**

Enables switching between Report, Data, and Model views.

Solution:

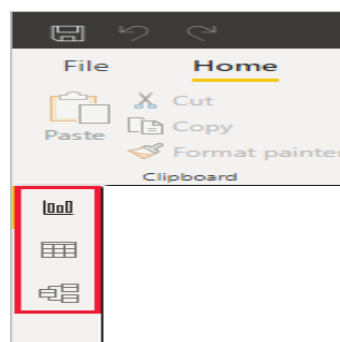
Power BI Desktop also includes the Power Query Editor, which opens in a separate window. In Power Query Editor, you can build queries and transform data, then load the refined data model into Power BI Desktop to create reports.



Along the left side of Power BI Desktop are icons for the three Power BI Desktop views:

Report, Data, and Model, from top to bottom. The current view is indicated by the yellow bar along the left, and you can change views by selecting any of the icons.

Report view is the default view.

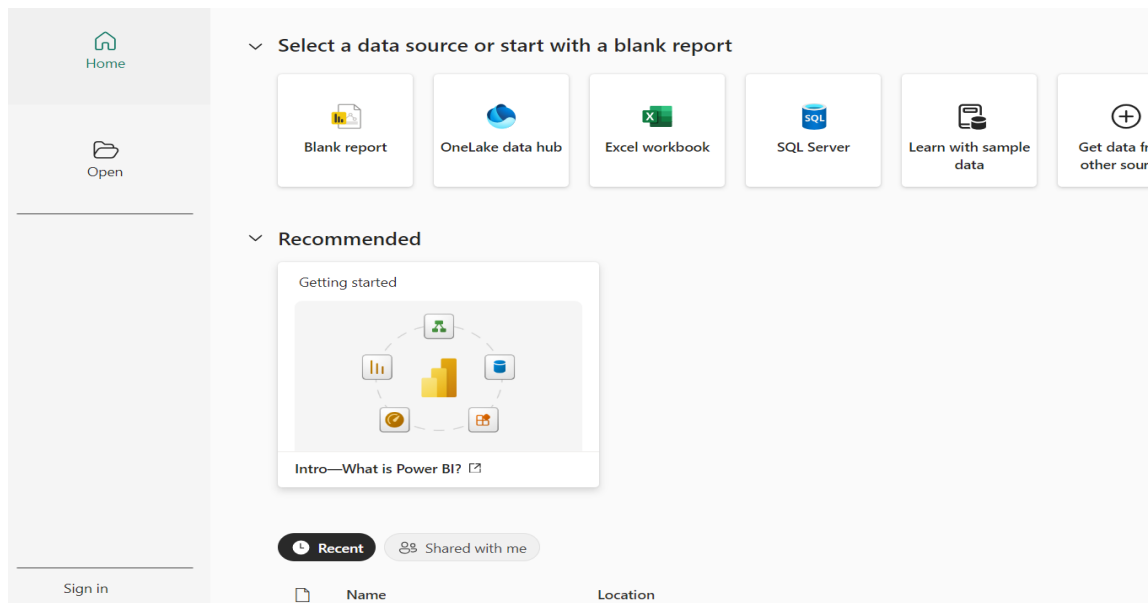


Connect to data(Get Data from different Sources)

With Power BI Desktop installed, we can connect to the world of data. To see the many types of data sources available,

Once Power BI screen is seen click on blank Report

Data Visualization Lab (BAIL504)

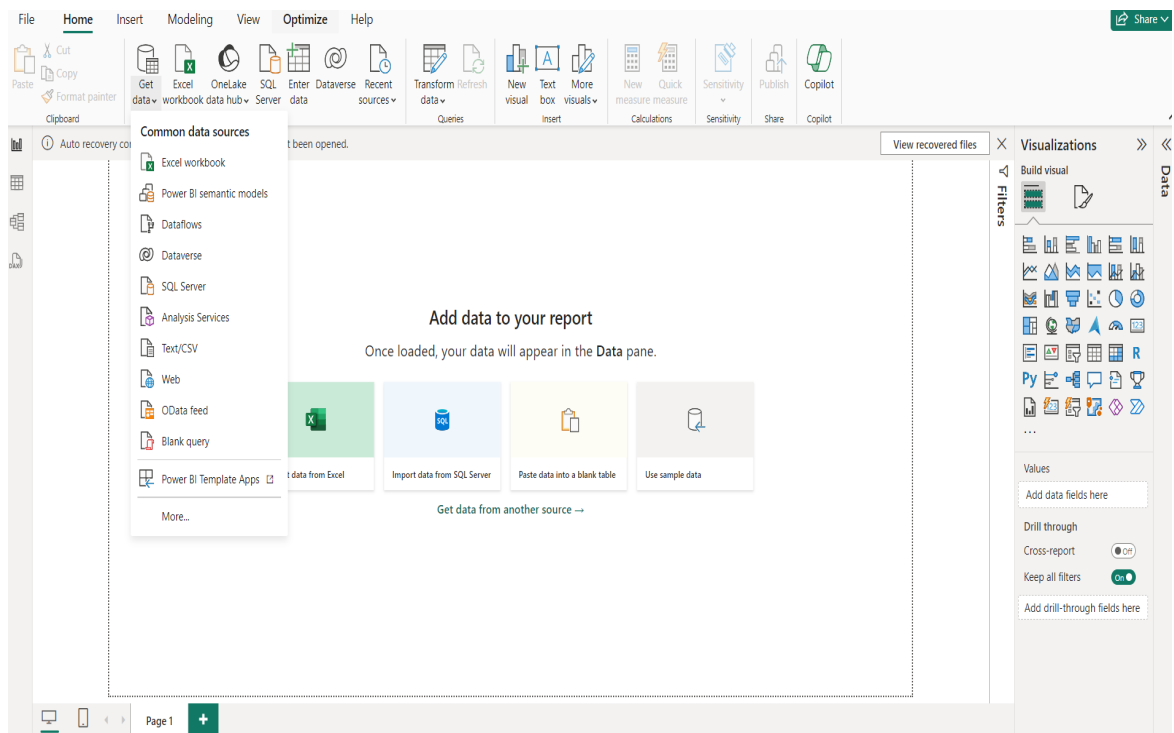


After clicking on blank Report, the below screen appears.

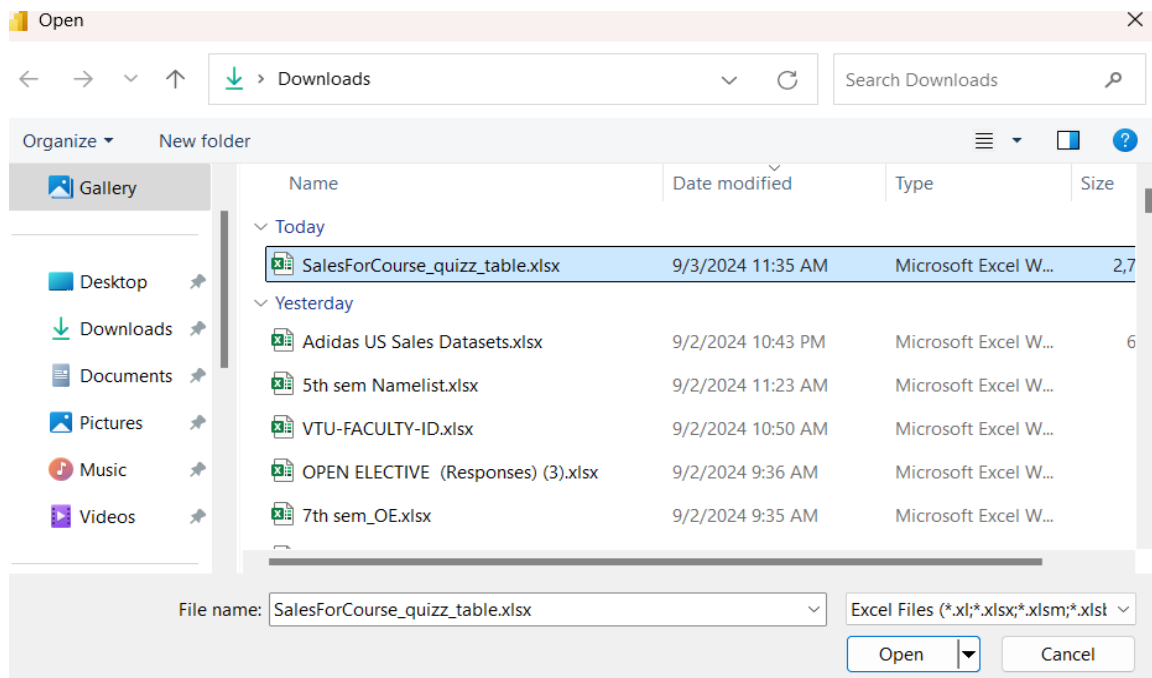
NOW TO GET DATA FROM DIFFERENT SOURCES -----The steps

Step 1: Select **Get Data** in the Power BI Desktop Home tab, and in the Get Data window, scroll through the list of All data sources. (like Excel, CSV, Oracle....)

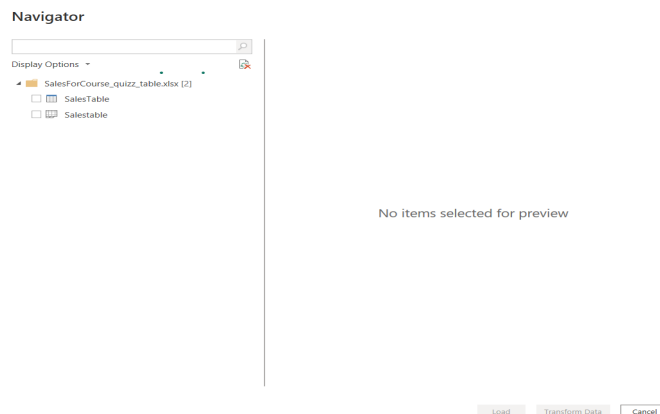
On the Power BI Desktop Home tab, select Get Data > Excel workbook



Data Visualization Lab (BAIL504)



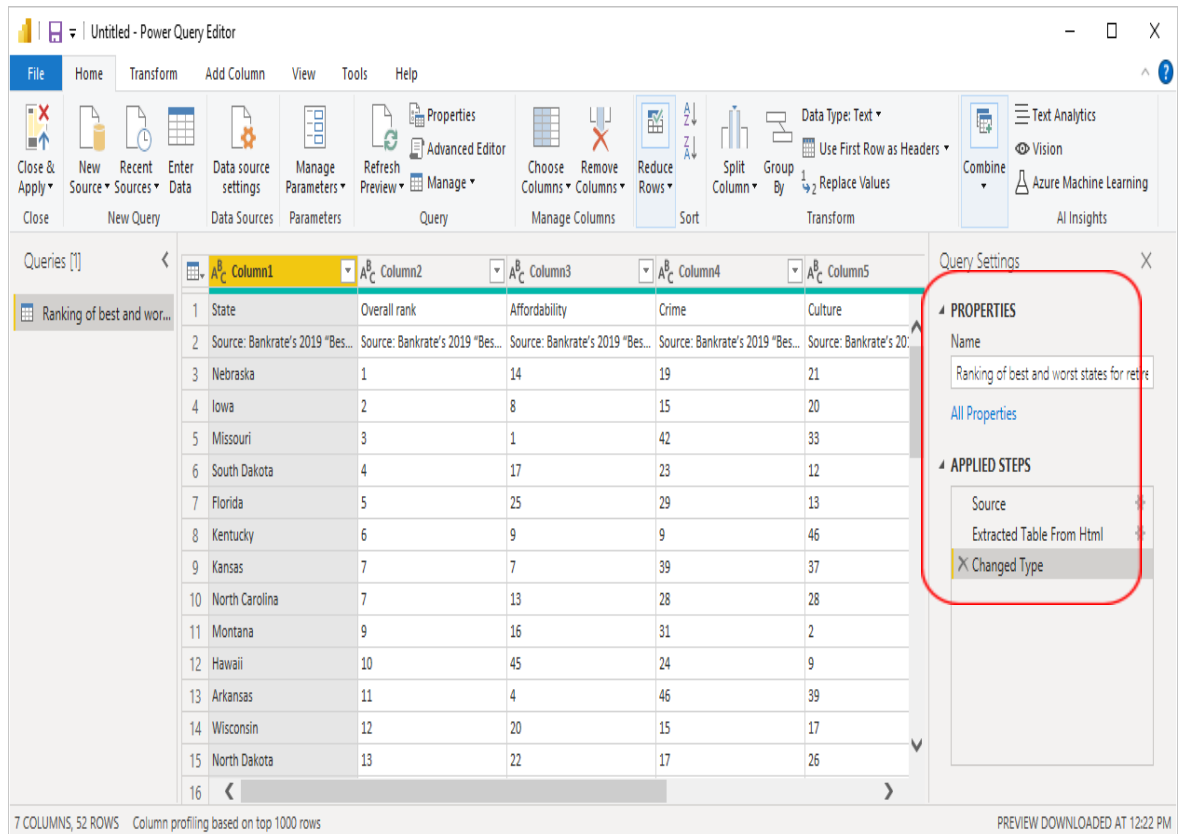
2. Click on the file you need and open the file, once you open the file below window with navigator appears, select the file (2nd option to see the contents of the file)



3. At this point you can select Load to load the table, or Transform data to make changes in the table before you load it.

4. When you select Transform data, Power Query Editor launches, with a representative view of the table. The Query Settings pane is on the right, or you can always show it by selecting Query Settings on the View tab of Power Query Editor.

Data Visualization Lab (BAIL504)



7 COLUMNS, 52 ROWS Column profiling based on top 1000 rows PREVIEW DOWNLOADED AT 12:22 PM

Transforming the data

Once connected to a data source, you can adjust the data to meet your needs.

To transform the data, you provide Power Query Editor with step-by-step instructions for adjusting the data while loading and presenting it. Transforming doesn't affect the original data source, only this particular view of the data.

Transforming the data, includes **renaming columns or tables, removing rows or columns, or changing data types.**

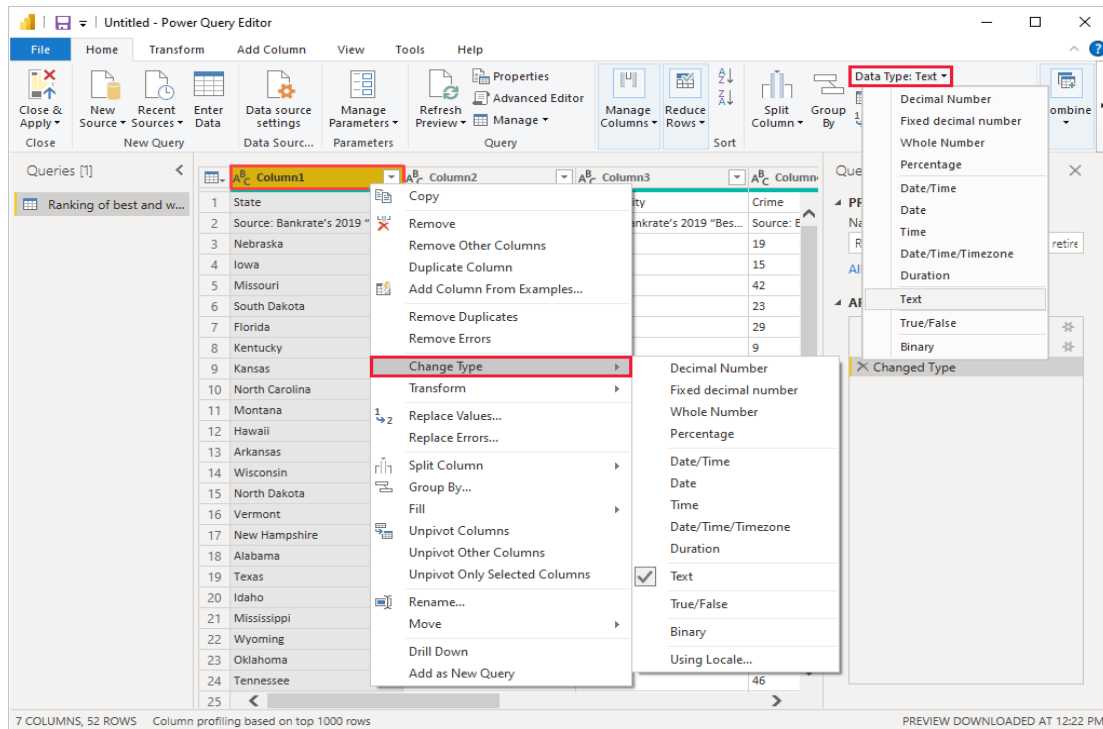
Power Query Editor captures these steps sequentially under Applied Steps in the Query Settings pane.

Notice that the Applied Steps in Query Settings already contain a few steps. You can select each step to see its effect in the Power Query Editor

To Change a data type

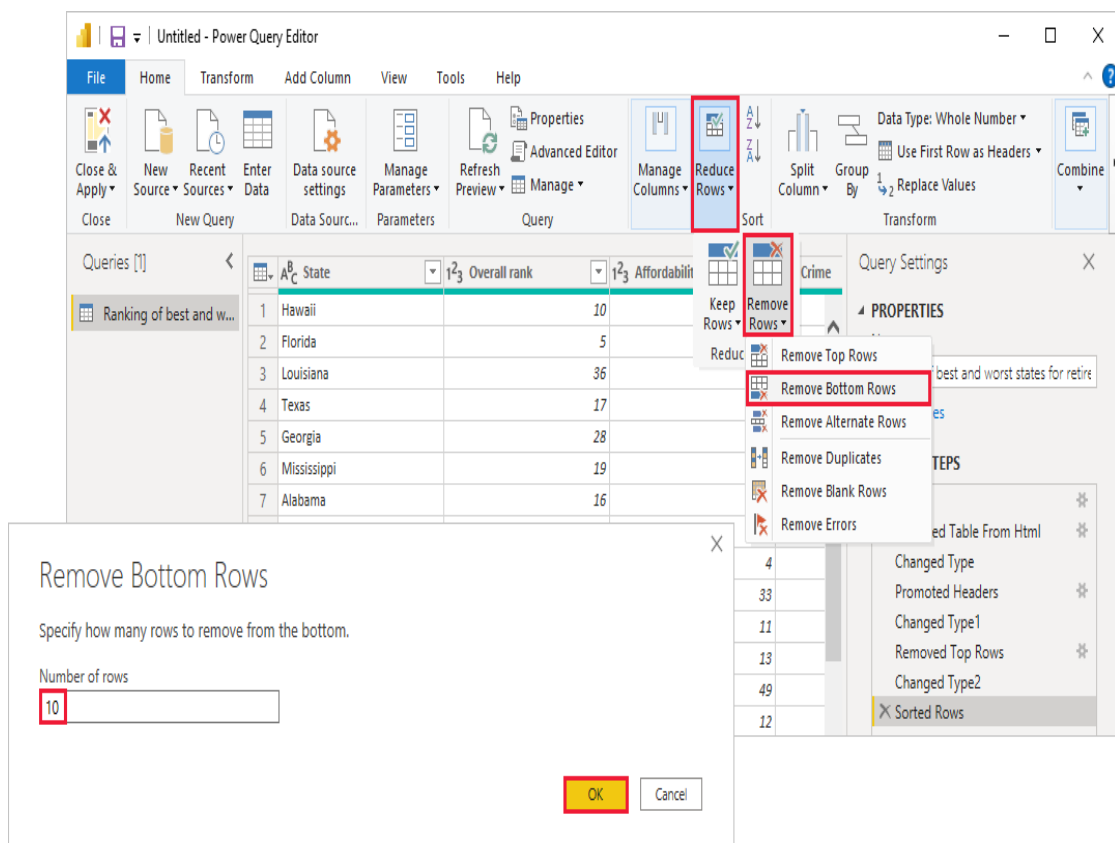
- Select the column or columns to change.
- Hold down the Shift key to select several adjacent columns, or Ctrl to select non-adjacent columns.
- Either right-click a column header, select Change Type,
- choose a new data type from the menu, or drop down the list next to Data Type in the Transform group of the Home tab,
- select a new data type.

Data Visualization Lab (BAIL504)



To Reduce/Delete the Rows

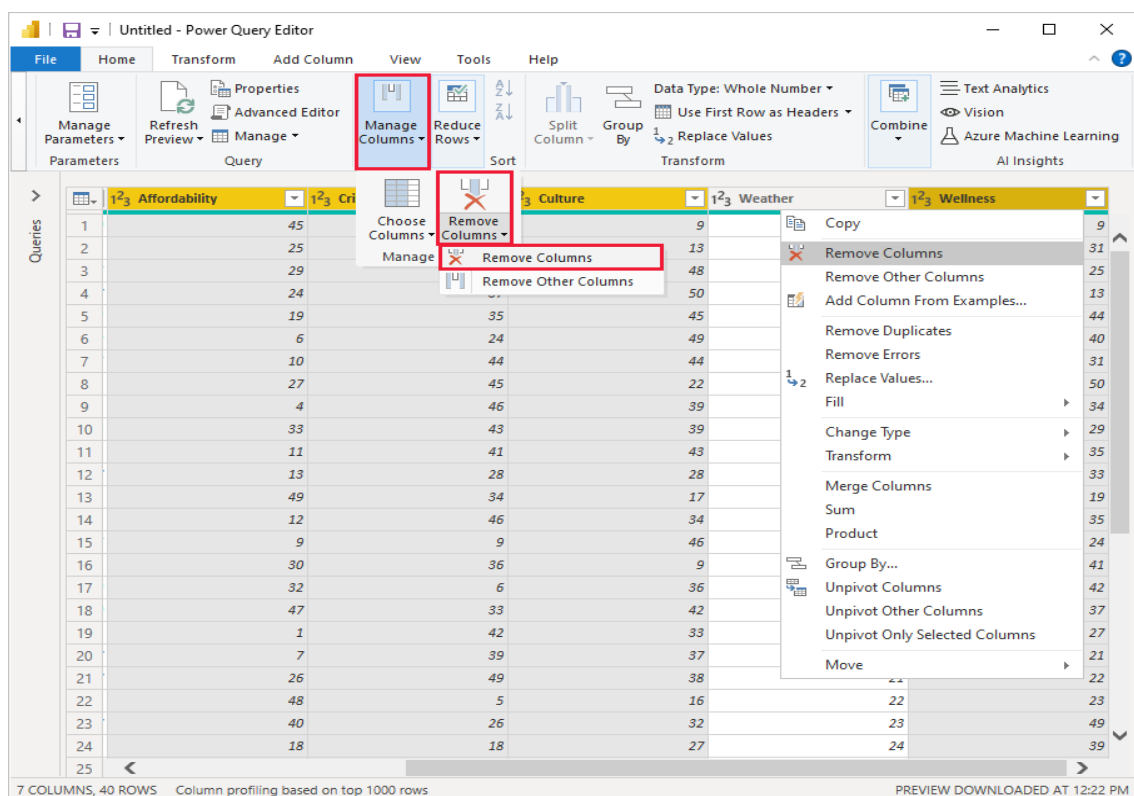
- From the Home tab select
- Reduce Rows > Remove Rows > Remove Bottom Rows.
- In the Remove Bottom Rows dialog box, enter 10, and then select OK.



The bottom 10 worst rows are removed from the table, and the step Removed Bottom Rows appears in Applied Steps.

To Remove columns

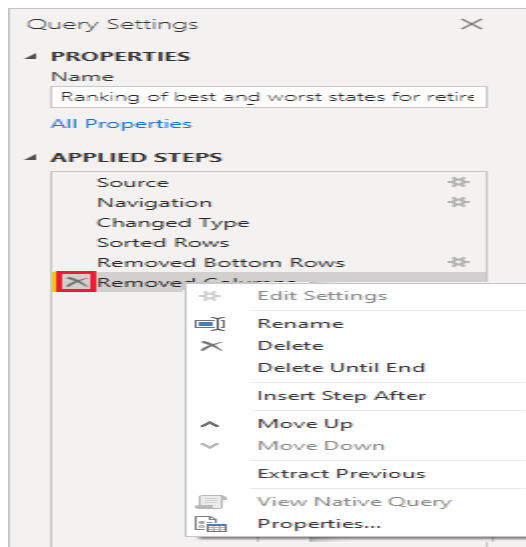
- From Home Tab Select Manage Columns group → select Remove Columns.
- You can also right-click one of the selected column headers and select Remove Columns from the menu.
- The selected columns are removed, and the step Removed Columns appears in Applied Steps.



Applied steps in the Query setting pane

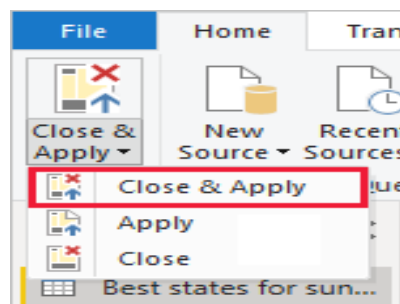
Right-click any step in the Applied Steps pane and choose to delete it, rename it, move it up or down in the sequence, or add or delete steps after it.

For intermediate steps, Power BI Desktop will warn you if the change could affect later steps and break your query.



Once all the required transformations are done the report should be created in the Power BI Desktop

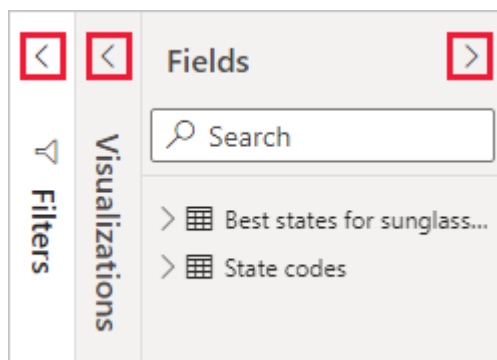
- Apply the changes in Power Query Editor and load them into Power BI Desktop
- Selecting **Close & Apply** from the Home tab of the ribbon.
- You can also select just **Apply** to keep the query open in Power Query Editor while you work in Power BI Desktop.



To reopen Power Query Editor from Power BI Desktop

Select **Transform Data** on the **Home** tab of the Power BI Desktop ribbon.

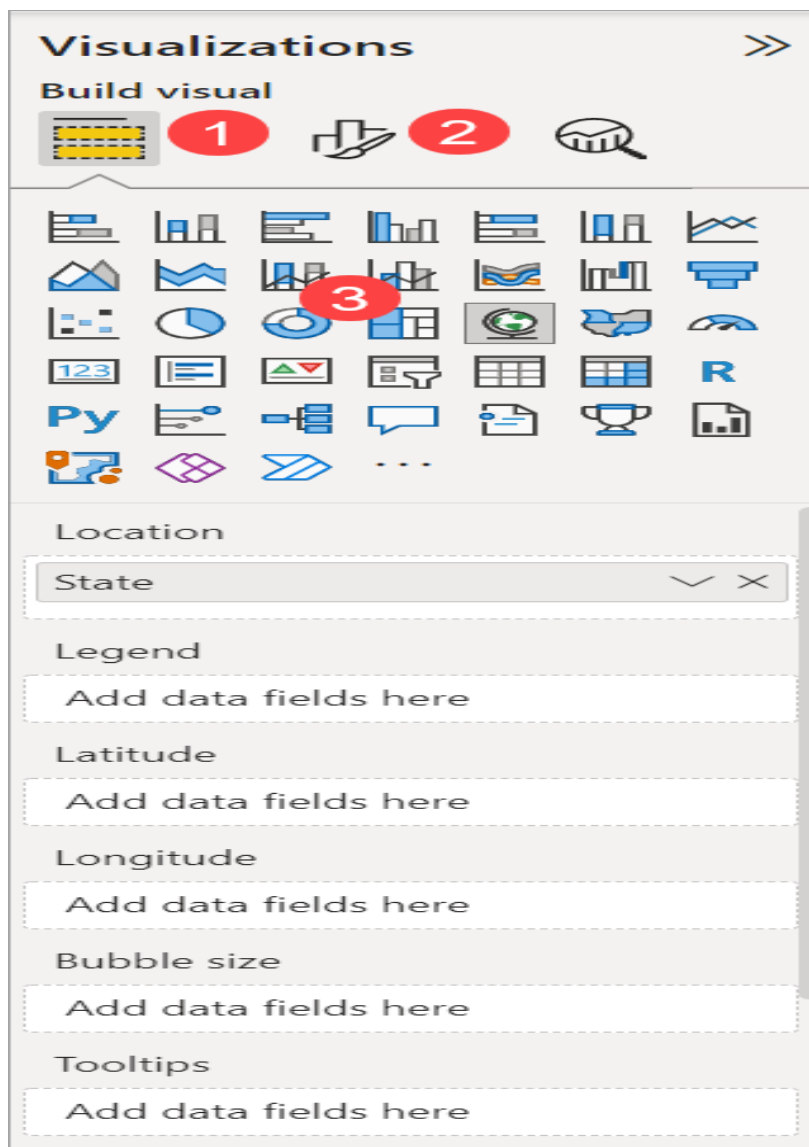
You can expand and collapse the **Filters**, **Visualizations**, and **Fields** panes by selecting the arrows at the tops of the panes. Collapsing the panes provides more space on the canvas to build cool visualizations.



The Visualizations pane shows information about the visualization and lets you modify it.

1. The Fields option in the Visualization pane lets you drag data fields to Legend and other field wells in the pane.
2. The Format option lets you apply formatting and other controls to visualizations.
3. The icons show the type of visualization created. You can change the type of a selected visualization by selecting a different icon, or create a new visualization by selecting an icon with no existing visualization selected
4. The options available in the Fields and Format areas depend on the type of visualization and data you have.
5. You want your map visualization to show only the top 10 weather states.

To show only the top 10 states, in the Filters pane, hover over State is (All) and expand the arrow that appears. Under Filter type, drop down and select Top N. Under Show items, select Bottom, because you want to show the items with the lowest numerical ranks, and enter *10* in the next field.

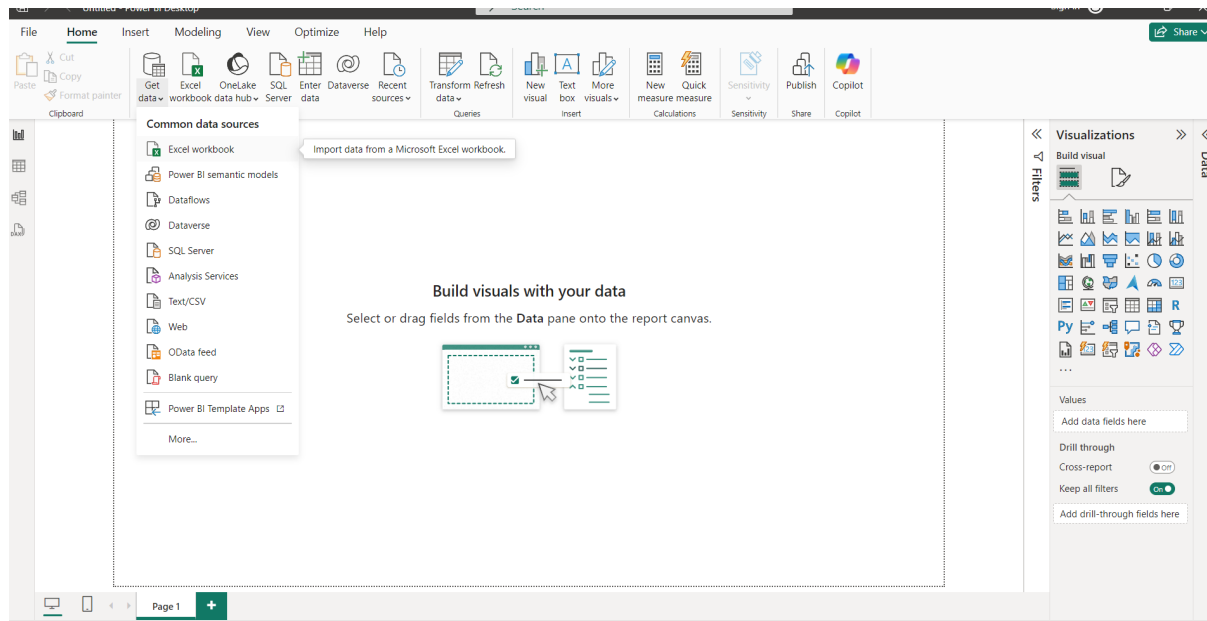


Program 7: Creating Reports & Visualizations - Different types of charts, Formatting charts with Title, Colors

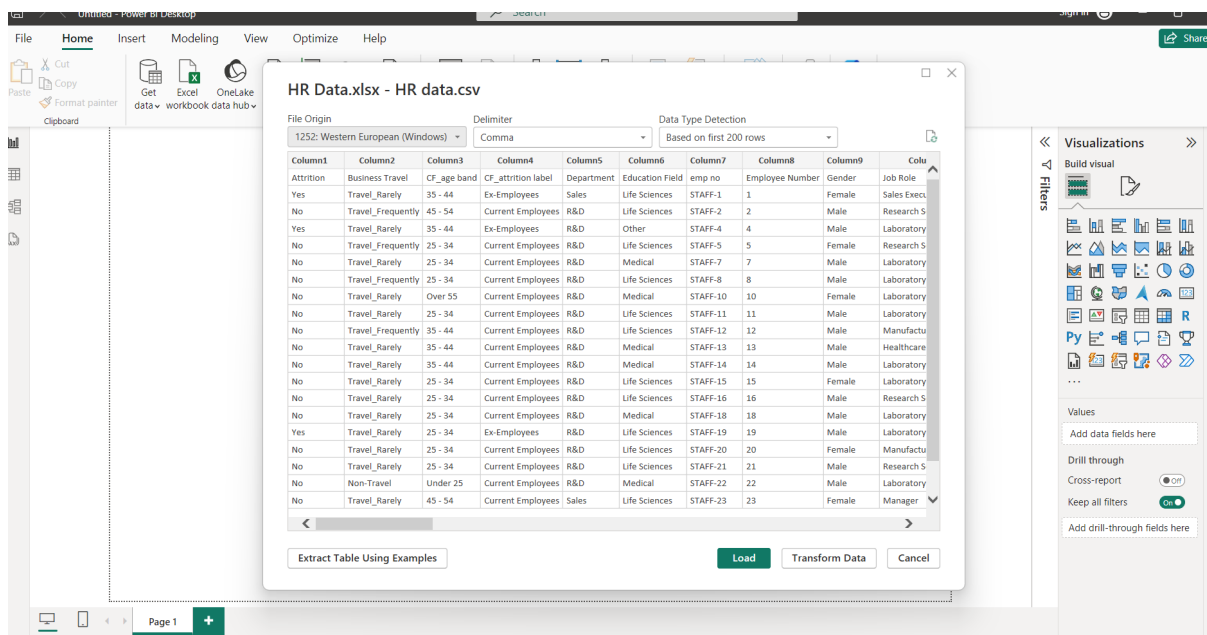
17 Most Common Charts available in Power BI:

- Bar Chart
- Line Chart
- Scatterplot
- Sparkline
- Pie Chart
- Gauge
- Waterfall Chart
- Funnel Chart
- Heat Map / Matrix
- Histogram
- Box Plot
- Maps
- Tables
- Indicators
- Area Chart
- Radar or Spider Chart
- Tree Map
- Open **Power BI Desktop**
- Click on **Get data** in ribbon pane
- Click on **Excel worksheet** option

Data Visualization Lab (BAIL504)



- Choose specific dataset and open it. Example: HR Data.csv
- Click on **Transform Data** button



- **Power Query Editor** window will open.

Data Visualization Lab (BAIL504)

Untitled - Power Query Editor

File Home Transform Add Column View Tools Help

Close & Apply New Source Recent Enter Data Data source settings Manage Parameters Refresh Preview Properties Advanced Editor Manage Query Choose Remove Columns Manage Columns Reduce Rows Sort Split Column Group By Data Type: Text Use First Row as Headers Merge Queries Append Queries Text Analytics Vision Azure Machine Learning

Queries [1]

HR Data.xlsx - HR data

Column1	Column2	Column3	Column4	Column5	Column6	Column7
1	Attrition	Business Travel	CF_age band	CF_attrition label	Department	emp no
2	Yes	Travel_Rarely	35 - 44	Ex-Employees	Sales	STAFF-1
3	No	Travel_Frequently	45 - 54	Current Employees	R&D	STAFF-2
4	Yes	Travel_Rarely	35 - 44	Ex-Employees	R&D	STAFF-4
5	No	Travel_Frequently	25 - 34	Current Employees	R&D	STAFF-5
6	No	Travel_Rarely	25 - 34	Current Employees	R&D	STAFF-7
7	No	Travel_Frequently	25 - 34	Current Employees	R&D	STAFF-8
8	No	Travel_Rarely	Over 55	Current Employees	R&D	STAFF-10
9	No	Travel_Rarely	25 - 34	Current Employees	R&D	STAFF-11
10	No	Travel_Frequently	35 - 44	Current Employees	R&D	STAFF-12
11	No	Travel_Rarely	35 - 44	Current Employees	R&D	STAFF-13
12	No	Travel_Rarely	35 - 44	Current Employees	R&D	STAFF-14
13	No	Travel_Rarely	25 - 34	Current Employees	R&D	STAFF-15
14	No	Travel_Rarely	25 - 34	Current Employees	R&D	STAFF-16
15	No	Travel_Rarely	25 - 34	Current Employees	R&D	STAFF-18
16	Yes	Travel_Rarely	25 - 34	Ex-Employees	R&D	STAFF-19
17	No	Travel_Rarely	25 - 34	Current Employees	R&D	STAFF-20
18	No	Travel_Rarely	25 - 34	Current Employees	R&D	STAFF-21
19	No	Non-Travel	Under 25	Current Employees	R&D	STAFF-22
20	No	Travel_Rarely	45 - 54	Current Employees	Sales	STAFF-23
21	No	Travel_Rarely	35 - 44	Current Employees	R&D	STAFF-24
22	No	Non-Travel	Under 25	Current Employees	R&D	STAFF-26
23	Yes	Travel_Rarely	35 - 44	Ex-Employees	Sales	STAFF-27
24	No	Travel_Rarely	25 - 34	Current Employees	R&D	STAFF-28
25	No	Travel_Rarely	Under 25	Current Employees	R&D	STAFF-30
26	Yes	Travel_Rarely	25 - 34	Ex-Employees	R&D	STAFF-31
27	No	Travel_Rarely	45 - 54	Current Employees	R&D	STAFF-32
28						

11 COLUMN(S) 99% ROW(S) Column outlines based on top 1000 rows

PREVIEW (COLUMN) CAPTION AT 104

Query Settings

PROPERTIES

Name

HR Data.xlsx - HR data

ALL PROPERTIES

APPLIED STEPS

Source

Changed Type

- We have to perform some transformation on this table
- Select row 1 and click on **Use first row as header**

Untitled - Power Query Editor

File Home Transform Add Column View Tools Help

Close & Apply New Source Recent Enter Data Data source settings Manage Parameters Refresh Preview Properties Advanced Editor Manage Query Choose Remove Columns Manage Columns Reduce Rows Sort Split Column Group By Data Type: Any Use First Row as Headers Merge Queries Append Queries Text Analytics Vision Azure Machine Learning

Queries [1]

HR Data.xlsx - HR data

Column1	Column2	Column3	Column4	Column5	Column6	Column7
1	Attrition	Business Travel	CF_age band	CF_attrition label	Department	emp no
2	Yes	Travel_Rarely	35 - 44	Ex-Employees	Sales	STAFF-1
3	No	Travel_Frequently	45 - 54	Current Employees	R&D	STAFF-2
4	Yes	Travel_Rarely	35 - 44	Ex-Employees	R&D	STAFF-4
5	No	Travel_Frequently	25 - 34	Current Employees	R&D	STAFF-5
6	No	Travel_Rarely	25 - 34	Current Employees	R&D	STAFF-7
7	No	Travel_Frequently	25 - 34	Current Employees	R&D	STAFF-8
8	No	Travel_Rarely	Over 55	Current Employees	R&D	STAFF-10
9	No	Travel_Rarely	25 - 34	Current Employees	R&D	STAFF-11
10	No	Travel_Frequently	35 - 44	Current Employees	R&D	STAFF-12
11	No	Travel_Rarely	35 - 44	Current Employees	R&D	STAFF-13
12	No	Travel_Rarely	35 - 44	Current Employees	R&D	STAFF-14
13	No	Travel_Rarely	25 - 34	Current Employees	R&D	STAFF-15
14	No	Travel_Rarely	25 - 34	Current Employees	R&D	STAFF-16
15	No	Travel_Rarely	25 - 34	Current Employees	R&D	STAFF-18
16	Yes	Travel_Rarely	25 - 34	Ex-Employees	R&D	STAFF-19
17	No	Travel_Rarely	25 - 34	Current Employees	R&D	STAFF-20
18	No	Travel_Rarely	25 - 34	Current Employees	R&D	STAFF-21
19	No	Non-Travel	Under 25	Current Employees	R&D	STAFF-22
20	No	Travel_Rarely	45 - 54	Current Employees	Sales	STAFF-23
21	No	Travel_Rarely	35 - 44	Current Employees	R&D	STAFF-24
22						

Column1: Attrition
Column2: Business Travel
Column3: CF_age band
Column4: CF_attrition label
Column5: Department

Query Settings

PROPERTIES

Name

HR Data.xlsx - HR data

ALL PROPERTIES

APPLIED STEPS

Source

Changed Type

- Then, we have to create new column for **attrition count**. For this, select attrition column → click on **Add Column** → new window will open then add details as follows. Once you are done with this, attrition count column will be added as a last row of the table

Data Visualization Lab (BAIL504)

- Change the datatype of this column to **whole number**

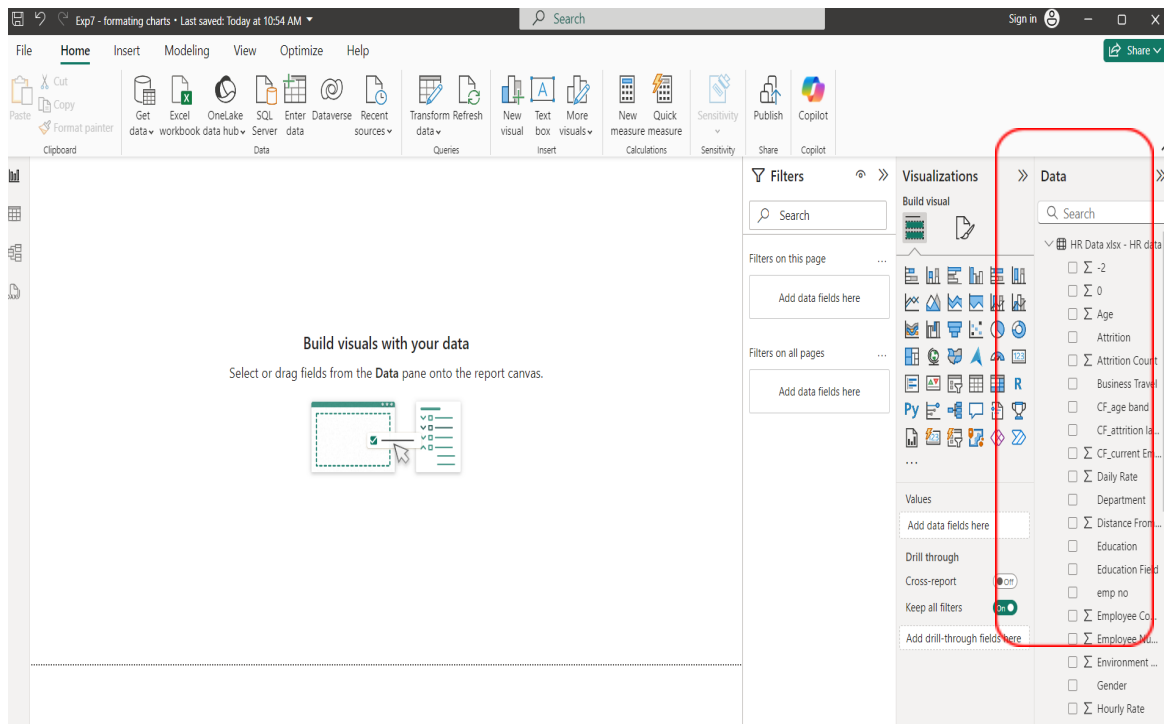
The screenshot shows the 'Add Conditional Column' dialog in Power Query. The 'New column name' is 'Attrition Count'. The condition is set to 'If Attrition equals 123, then output 1, else output 0'. The background data table has columns: Attrition, Business Travel, CF_age band, CF_attrition label, Department, Education Field, emp no. The status bar at the bottom indicates '11 COLUMNS, 999+ ROWS'.

- Click on **Close & Apply**.

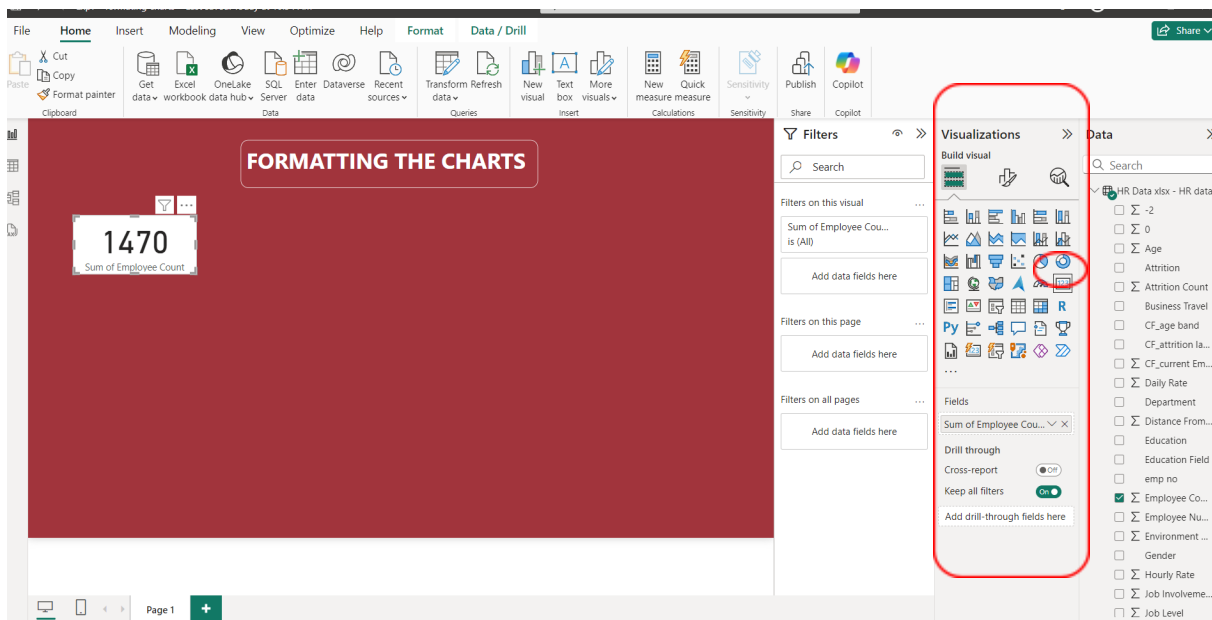
The screenshot shows the 'Close & Apply' button circled in red in the Power Query Editor. A callout box points to the button with the text 'Click on "Close & Apply"'. The background data table has columns: Age, Attrition, BusinessTravel, DailyRate, Department, DistancefromHome, Education. The status bar at the bottom indicates '28' rows.

- You will be back on canvas area with table loaded in **Data Pane** (in right side).

Data Visualization Lab (BAIL504)



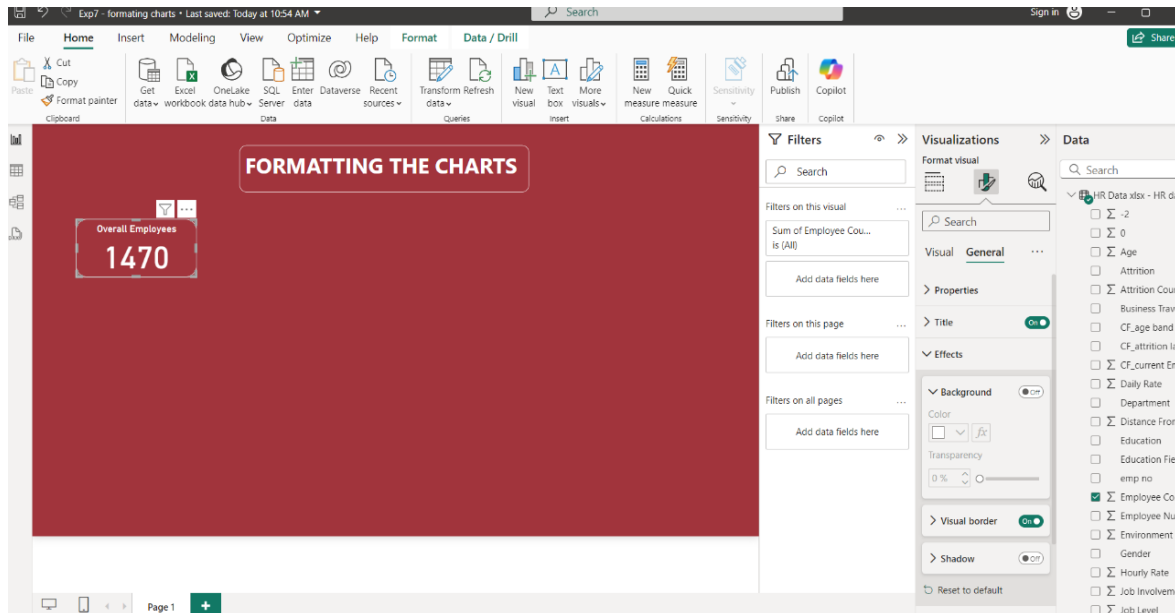
- We will start with **KPI Chart**
- A Key Performance Indicator (KPI) is a visual cue that communicates the amount of progress made toward a measurable goal



Now format this particular visual with title, size, colour.

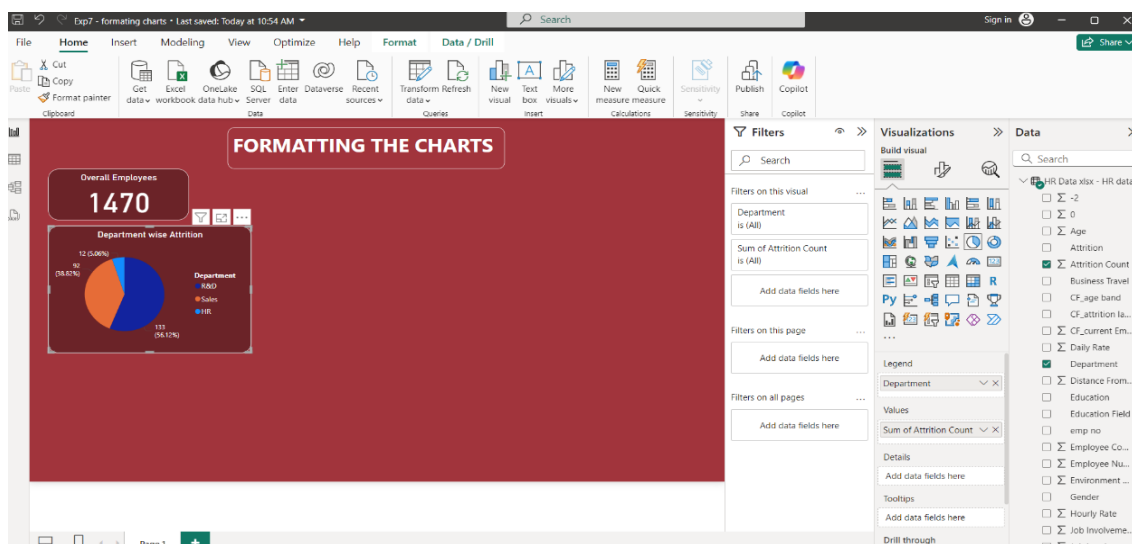
1. Click on “Format your visual” in **Visualization Pane**
2. Go to General tab
 - a. click on Title ☐ type “Overall Employees” in Text box, Horizontal alignment and colour of your choice
 - b. expand effects ☐ **OFF** the background of KPI chart
 - c. Effects ☐ **ON** visual border ☐ change the color and 20 rounded corners

- Now, go to Visual tab ☐ **OFF** the category label
- In visual tab, callout value ☐ change the font color



Kindly Note: If you want same format for all visuals, complete the formatting with one of the visual, click on format painter and click on the visual for which you want the formatting. Little bit formatting will be required as properties for each visual will be different

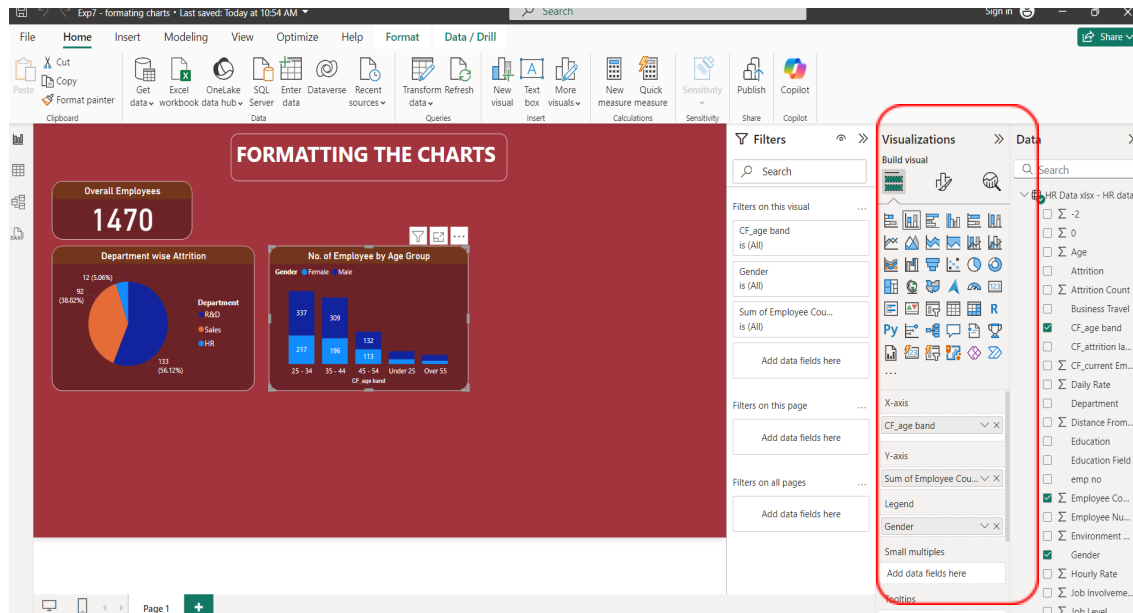
Select Pie Chart.



- Now apply same steps for creating **STACKED COLUMN CHART**.

Data Visualization Lab (BAIL504)

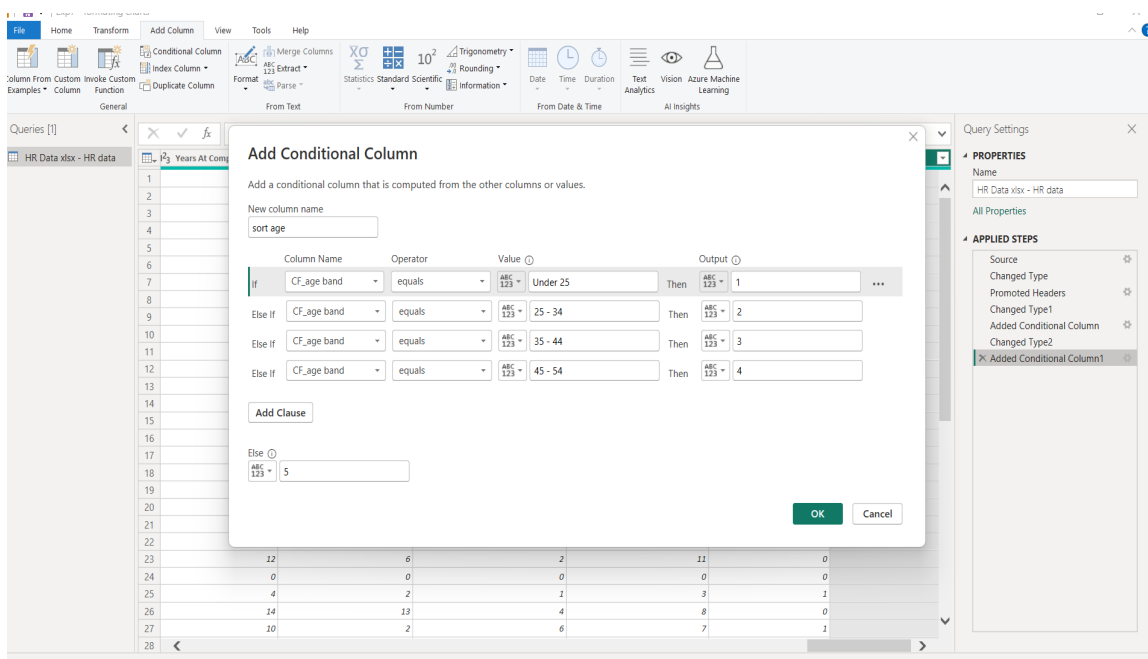
A column chart, commonly referred to as a vertical bar graph, is a visual tool utilized to display and compare numerical data across different categories. Each column within the chart corresponds to a specific category, with the height of the column proportionally representing the associated value.



Optional: As you can see, age is not sorted correctly, so we have to create additional column.

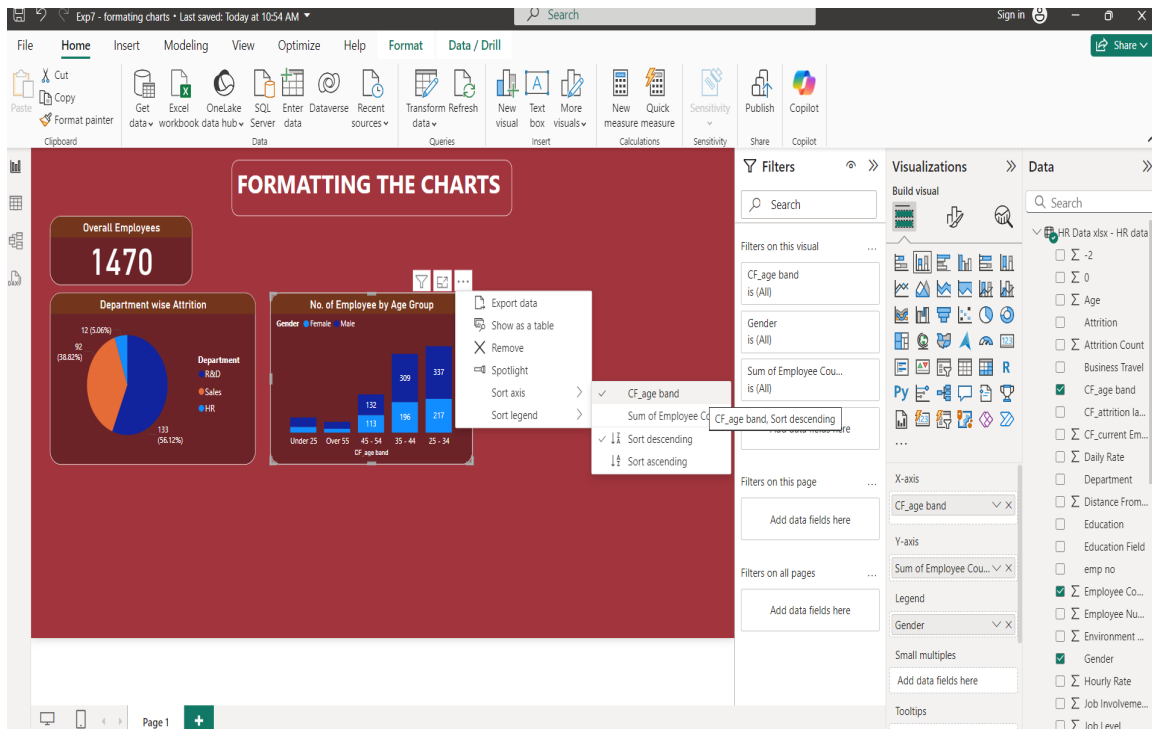
Once **sort age** column is created change the datatype of column if its not in whole number.

Click on “Close & Apply”

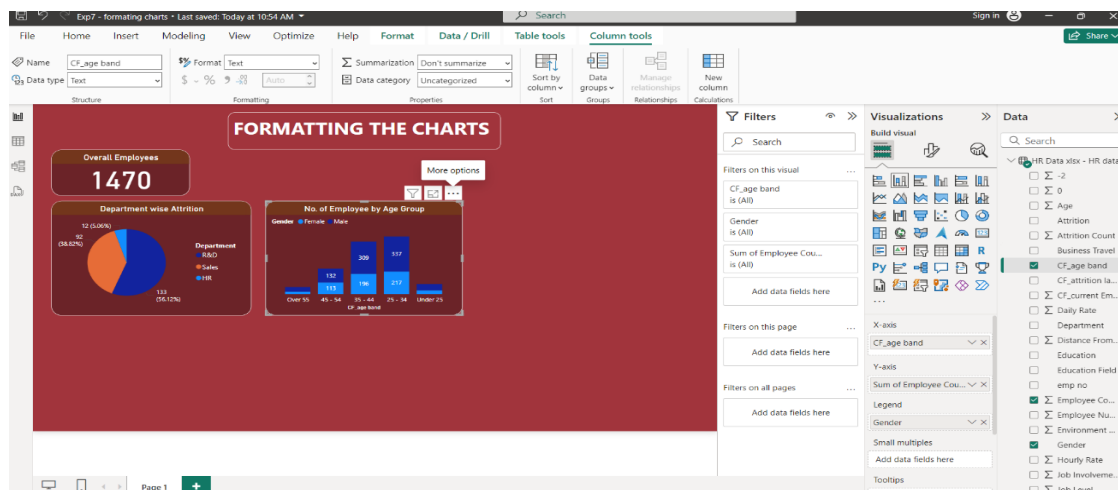


Data Visualization Lab (BAIL504)

Now, on canvas, in data pane □ select CP_age_band □ click on sort by column □ select newly created column sort age and now click on visual and follow the steps, Finally, output will be as follows:



Finally, output will be as follows

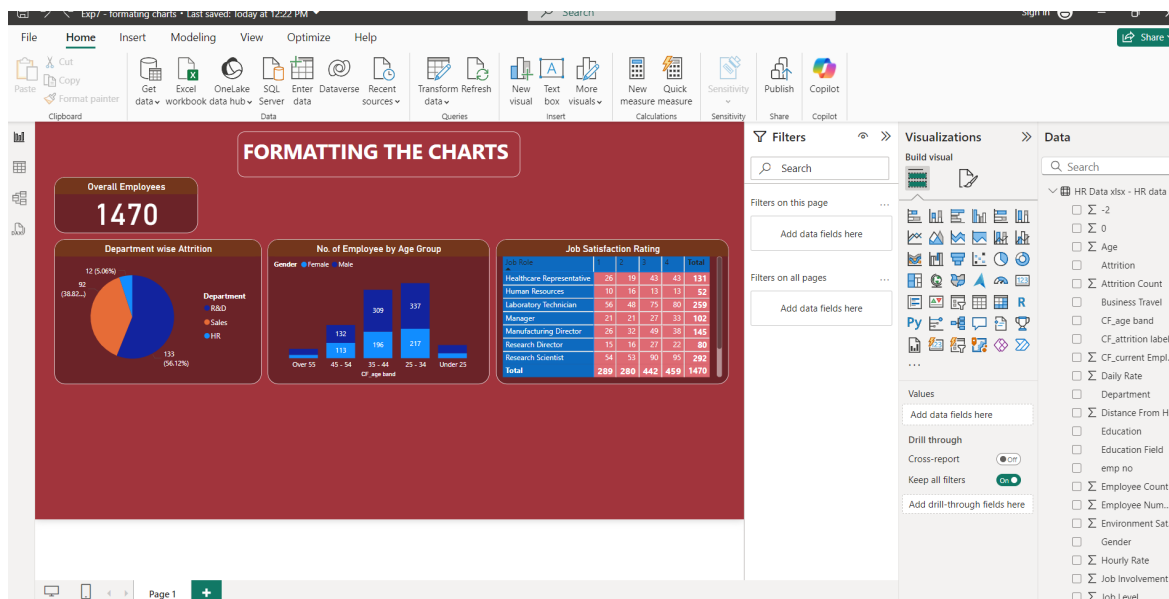


- Now apply same steps for creating **MATRIX**.

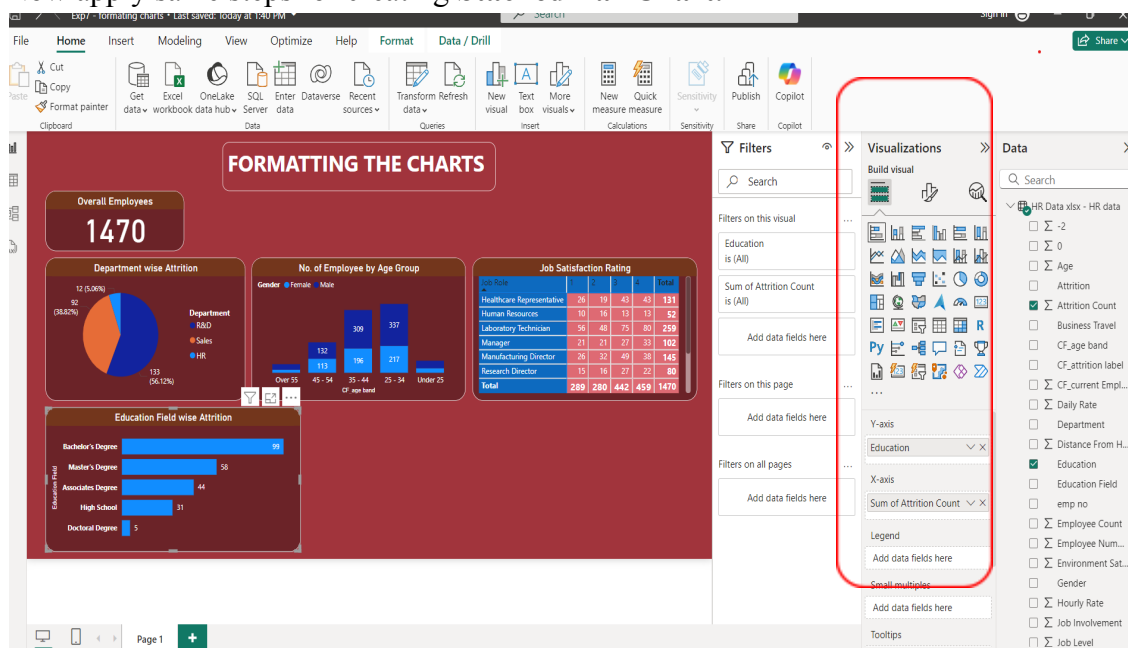
The matrix visual is a type of table visual that supports a stepped layout. A table supports two dimensions, but a matrix makes it easier to display data meaningfully across multiple dimensions. Often, report designers include matrixes in reports and dashboards to allow users to select one or more element (rows, columns, cells) in the matrix to cross-highlight other visuals on a report page.

Format the **row header & column header** text color & background color

Also, format the **Row grand total & column grand total**



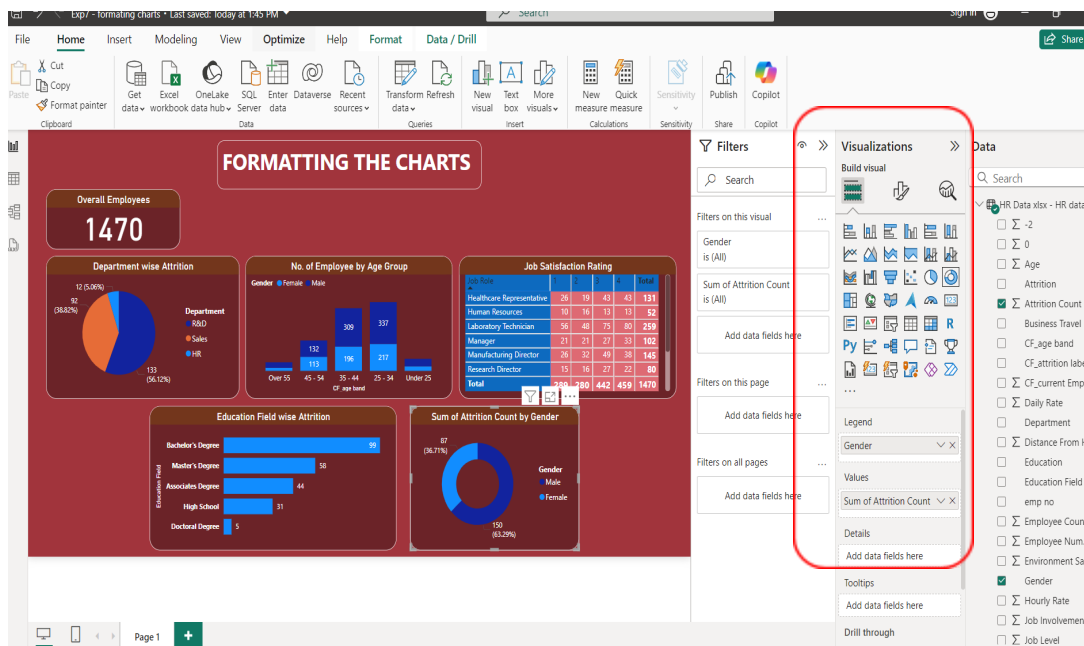
Now apply same steps for creating **Stacked Bar Chart**.



Now apply same steps for creating **Donut**.

A doughnut chart is similar to a pie chart in that it shows the relationship of parts to a whole. The only difference is that the center is blank and allows space for a label or icon.

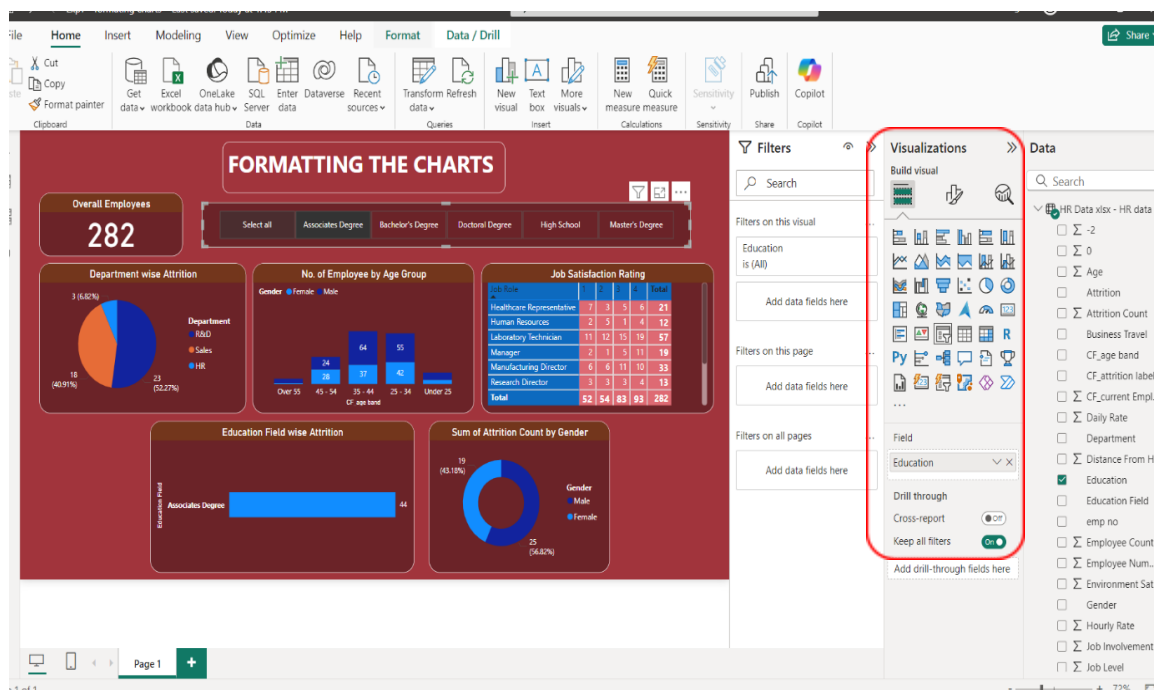
Doughnut charts work best when you use them to compare a particular section to the whole, rather than comparing individual sections with each other.



Slicers: A slicer is a standalone chart that can be used to filter the other visuals on the page. Slicers come in many different formats (category, range, date, etc.) and can be formatted to allow selection of only one, many, or all of the available values.

Slicers are a great choice to:

- Display commonly used or important filters on the report canvas for easier access.
- Make it easier to see the current filtered state without having to open a drop-down list.
- Filter by columns that are unneeded and hidden in the data tables.
- Create more focused reports by putting slicers next to important visuals.



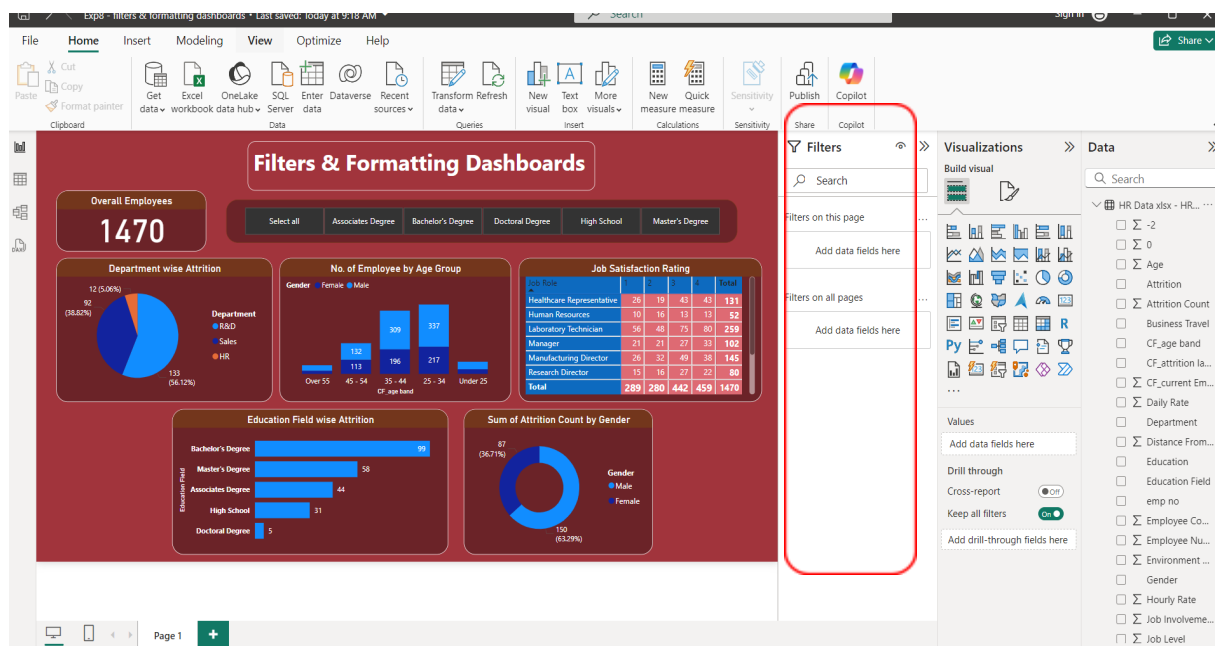
Experiment No. 8: Dashboards - Filters in Power BI, Formatting dashboards

Filters remove all but the data you want to focus on.

Filter Pane: You can apply filters in the Filters pane, or make selections in slicers directly on the report page itself. The Filters pane shows the fields in individual visuals and any other filters the report designer adds.

There are four standard types of filters that you create in the Filters pane.

- **Visual filter** applies to a single visual on a report page. You see visual-level filters when you select a visual on the report canvas. Even if you can't edit a report, you can select a visual and filter it.
- **Page filter** applies to all the visuals on the report page.
- **Report filter** applies to all pages in the report.
- **Drill through filter** With drill through in the Power BI service and Power BI Desktop, you create a *destination* report page that focuses on a specific entity, such as a supplier. From the other report pages, users can right-click a data point for that entity and drill through to the focused page.

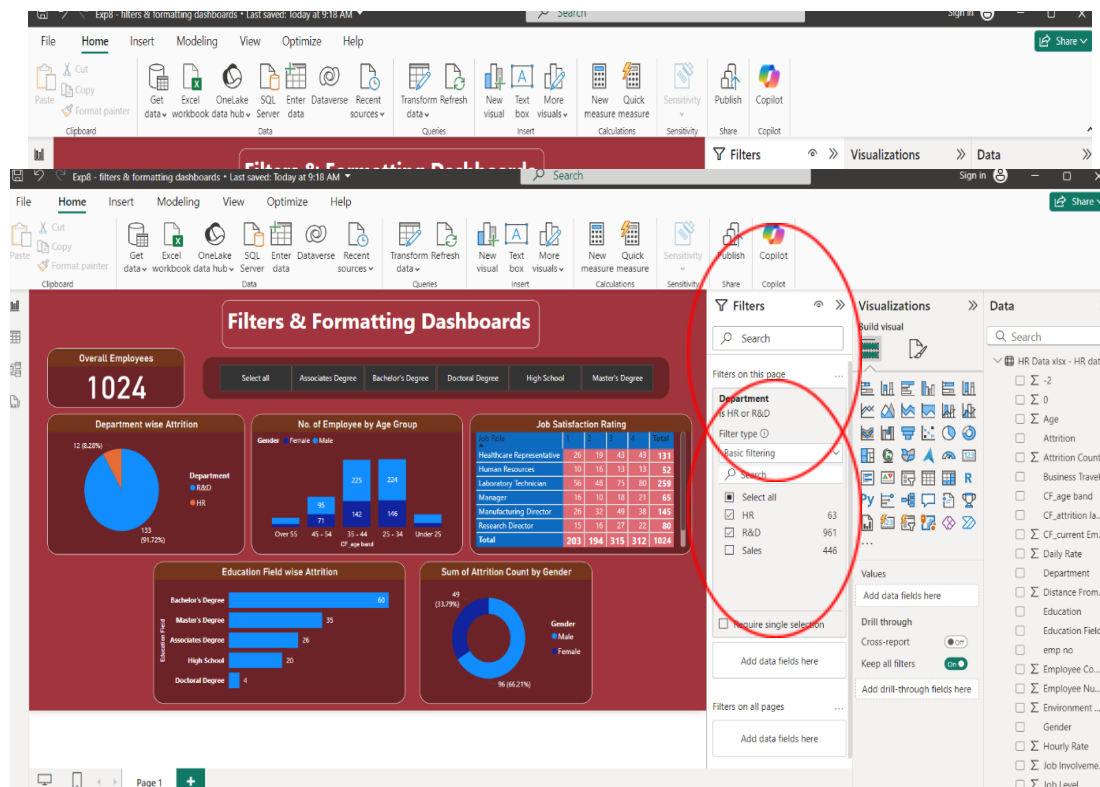


We will be using HR dataset (same used for Exp 7).

Extending same dashboard with using filters & let's format the final dashboard.

Let's apply filter for department (Particular visual).

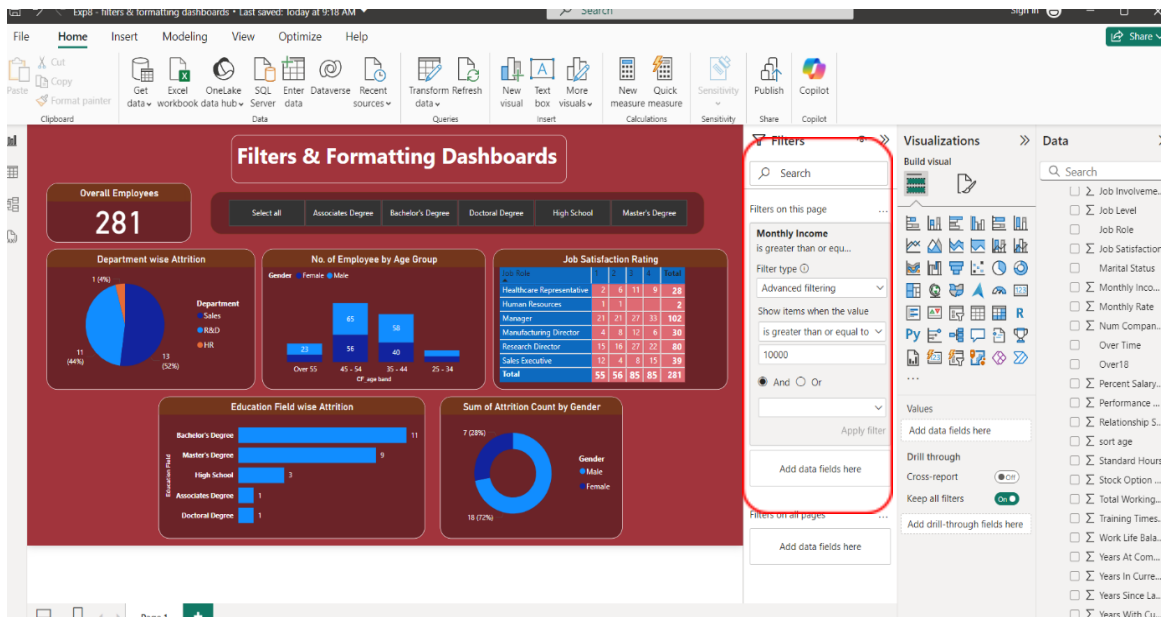
1. Drag Department from Data Pane to Filters ☐ Filters on this page textbox. ☐ Basic Filtering
2. Now, you can see, HR dept. is selected and now in below picture, you can see that only HR data is visible, whereas, R&D and Sales data will not be shown.



Now, HR and R&D departments are selected.

3. Now, let's try for advanced filter
 Let's find out results for **salary greater than equal to 10000**.
 Drag and drop **Monthly Income** in filter
 Filter type: advanced filtering
 Show items when the value: is greater than or equal to
 Value: 10000

Data Visualization Lab (BAIL504)



4. Now, try for Top N filtering. Try to display top 4 Job roles having highest job satisfaction.

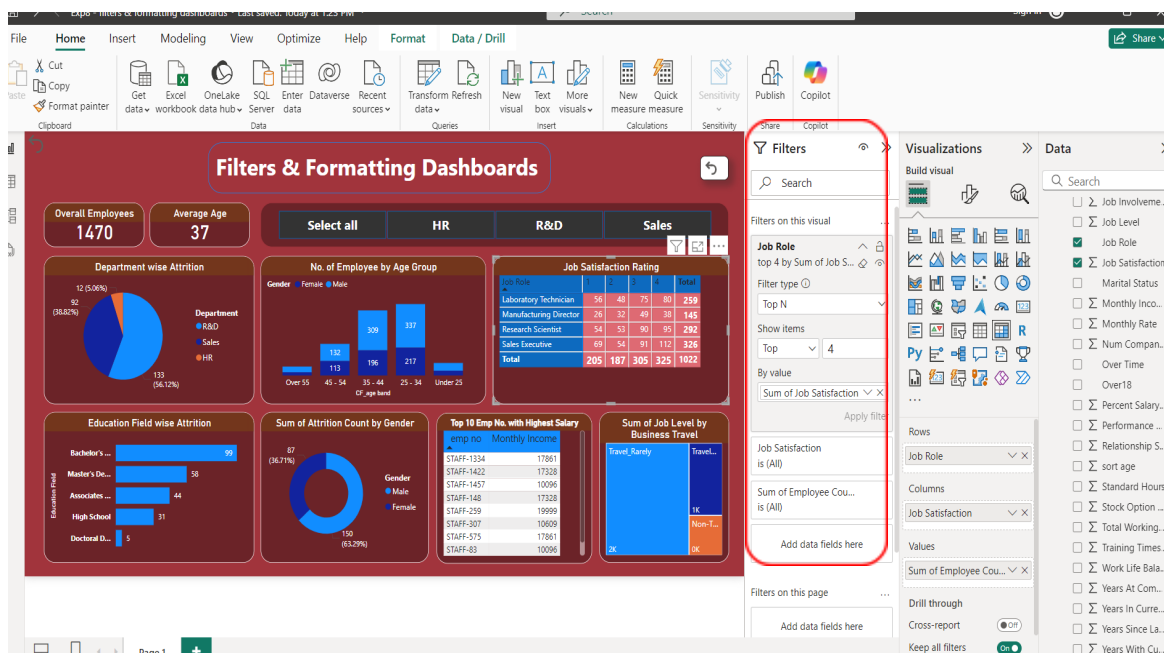
- Select “Job satisfaction rating” visual ☐ In Filters Pane, Filters on this visual ☐

Job Role ☐

Filter type: Top N

Show item: Top : 4

By value: Sum of Job Satisfaction



Program 9: BUILDING DASHBOARD

Analysis of revenue in sales dataset:

- Create a choropleth map (fill the map) to spot the special trends to show the state which has the highest revenue.
- Create a line chart to show the revenue based on the month of the year.
- Create a bin of size 10 for the age measure to create a new dimension to show the revenue.
- Create a donut chart view to show the percentage of revenue per region by creating zero access in the calculated field.
- Create a butterfly chart by reversing the bar chart to compare female & male revenue based on product category.
- Create a calculated field to show the average revenue per state & display profitable & non-profitable state.
- Build a dashboard.

Solution:

Step1: Upload the revenue dataset

Step2: In the power query editor as part of transformation remove the unnecessary columns (Remove the last null column)

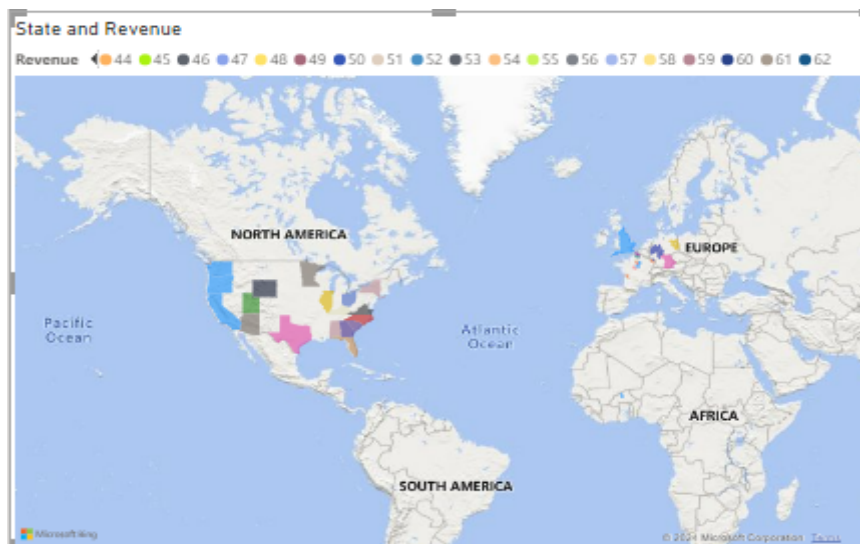
Question 1: Create a choropleth map (fill the map) to spot the special trends to show the state which has the highest revenue.

Step1: Select the "Map" visualization from the Visualizations pane.(filled map)

Step2: Set Up the Map:

- Drag the state field to the "Location" field well.
- Drag the revenue field to the "Size" or "Values" field well.

Step3: Customize: In the "Format" pane, adjust settings such as color, size, and tooltips to enhance readability. You can use color gradients to indicate different revenue levels, helping to spot trends.



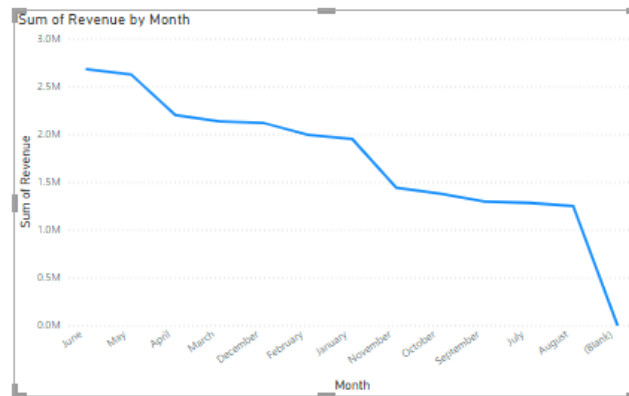
Question 2: Create a line chart to show the revenue based on the month of the year.

Step1: Add a Line Chart: Select the "Line chart" visualization from the Visualizations pane.

Step2: Configure the Chart:

- Drag the month field to the "Axis" field well.
- Drag the revenue field to the "Values" field well.

Step3: Format: In the "Format" pane, you can customize the line color, axis titles, and other aspects to clearly present the revenue trend throughout the year



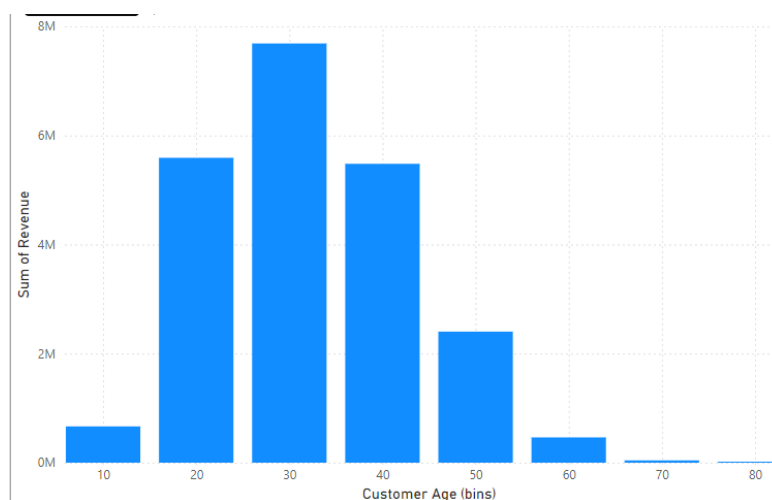
Question 3: Create a bin of size 10 for the age measure to create a new dimension to show the revenue.

Step1: Create Bins for age

- Go to the "Data" view and select the age field.
- Right-click on the age field and choose "New group".
- In the "Group" window, select "Bin" and set the bin size to 10.

Step2: Add to Visualization:

- Create a new visualization (e.g., bar chart or column chart). Here we used Stacked column chart.
- Drag the new age bins field to the "X Axis" and the revenue field to the "Y axis".

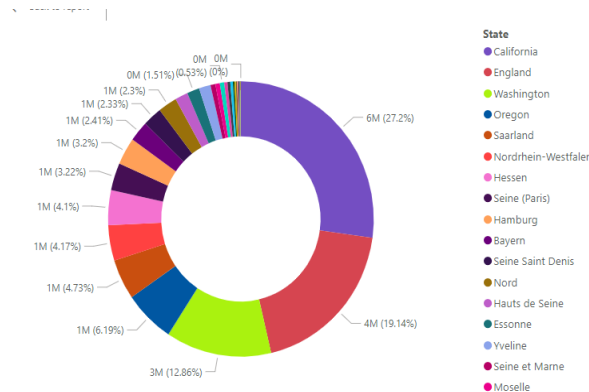


Question 4: Create a donut chart view to show the percentage of revenue per region by creating zero access in the calculated field.

Step1: Add a Donut Chart: Select the "Donut chart" visualization from the Visualizations pane.

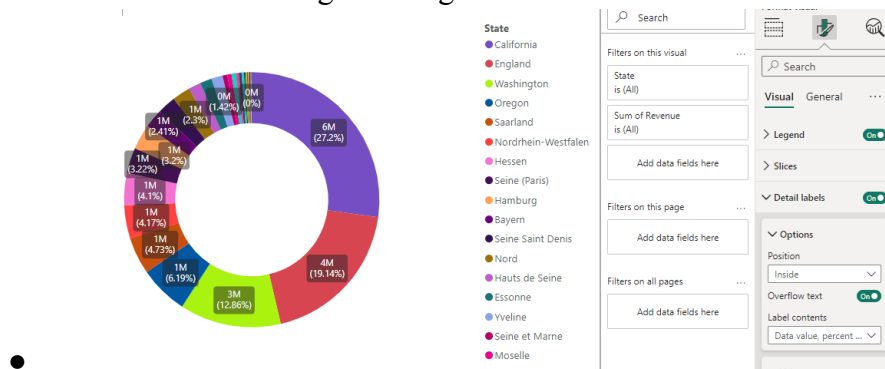
Step2:Set Up the Chart:

- Drag the region field to the "Legend" field well.
- Drag the revenue field to the "Values" field well.



Step3: Create Zero Access:

- Go to the "Format" pane, select "Detail labels", and set the "Label position" to "Inside" to create a zero access effect.
- Adjust the "Detail" and "Percentage" settings as needed.



Note: The "zero access effect" is a visual design technique often used in data visualizations to emphasize or clearly show zero values or the absence of certain data. This effect is particularly useful in charts where you want to highlight how values are distributed relative to zero, or where zero plays a significant role in the interpretation of the data.

Donut Charts:

In a donut chart, the zero access effect can be used to enhance readability by placing labels or markers at the center of the chart or using a specific design to show where there is no data.

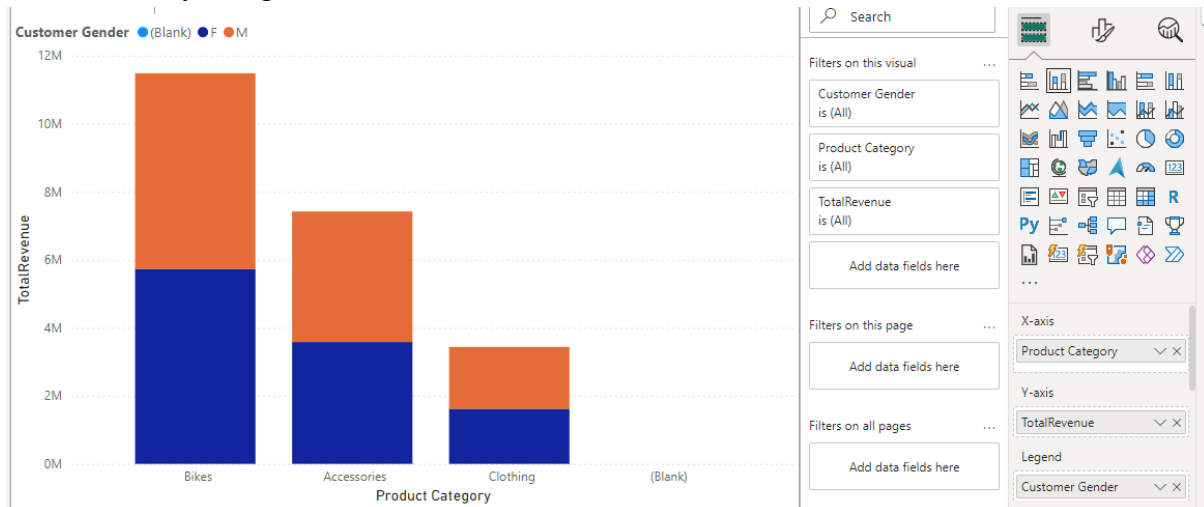
For example, if one segment of a donut chart represents zero revenue, you might design the chart so that this segment is clearly visible or highlighted to indicate no revenue.

Question 5: Create a butterfly chart by reversing the bar chart to compare female & male revenue based on product category.

Step1: Create a New Measure

TotalRevenue = $\text{sum}(\text{SalesTable}[\text{Revenue}])$

Method-1: By using stacked column chart



Method 2:

Step 1:

Add Two Bar Charts:

- o Create two separate bar charts from the "Visualizations" pane.

Step 2:

Configure the First Bar Chart (e.g., Female Revenue):

Drag **ProductCategory** to the "Axis" field.

Drag **TotalRevenue** to the "Values" field.

Apply a Filter:

- In the "Filters" pane, add a filter to show only Female revenue. You can drag Gender to the "Filters" pane and set the filter to include only Female.

Step 3:

Configure the Second Bar Chart (e.g., Male Revenue):

Drag **ProductCategory** to the "Axis" field.

Drag **TotalRevenue** to the "Values" field.

Apply a Filter:

- In the "Filters" pane, add a filter to show only Male revenue. You can drag Gender to the "Filters" pane and set the filter to include only Male.

Step 4:

Reversing the Bars:

- To create the butterfly effect, you need to reverse one of the bar charts. Go to formatting chart → Visual → X-axis → “on” invert range option

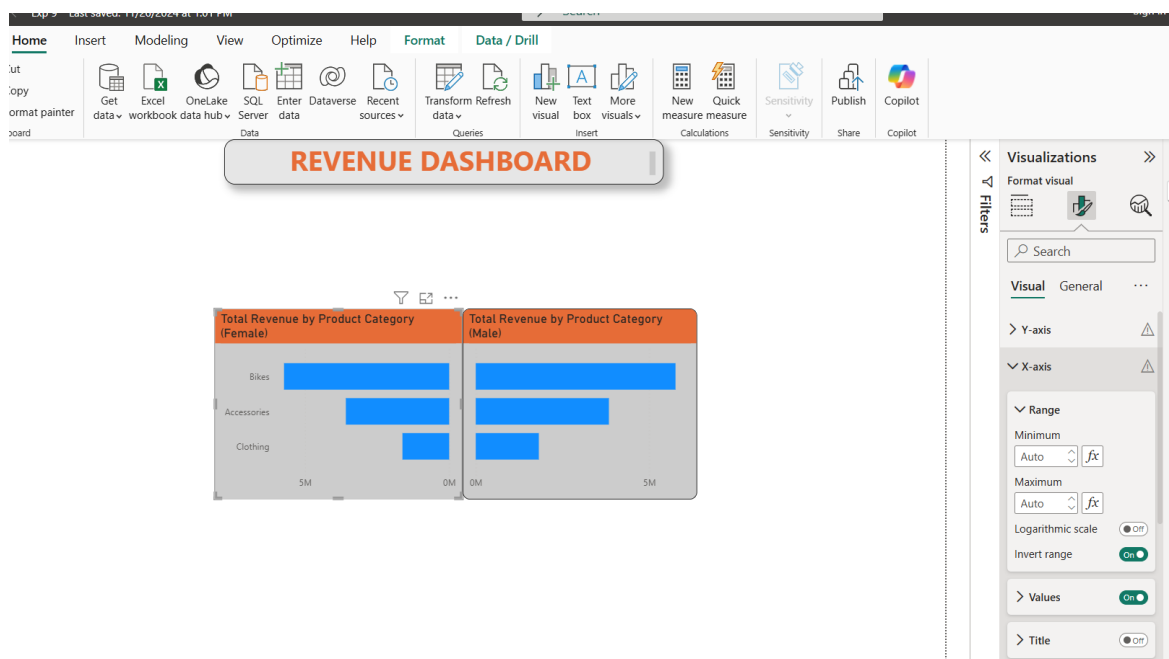
This involves adjusting the direction of the bars so that they face opposite directions from the center.

o **Reverse the Bars:**

- For one of the charts (e.g., Male revenue), you will need to use a calculated column or measure to make the bars extend in the opposite direction. In Power BI, this can be achieved by adjusting the data in the chart's settings or using custom visualizations if necessary.

🎬 **Add Titles and Labels:**

- Add clear titles and labels to each chart to indicate what data they represent (e.g., "Female Revenue" and "Male Revenue").
- Customize the chart's appearance to enhance readability.



Question 6: Create a calculated field to show the average revenue per state & display profitable & non-profitable state.

Step1: Create a New Measure

- Go to the Modeling tab and select "New Measure".
- Create the Average Revenue Measure:
- Enter the following DAX formula to calculate the average revenue per state:

AverageRevenuePerState =

```
AVERAGEX(
    VALUES(SalesTable[State]),
    CALCULATE(SUM(SalesTable[Revenue]))
)
```

Step2: Create a Calculated Column to Categorize States

Next, create a calculated column to classify states as profitable or non-profitable based on the average revenue.

1. **Go to the Modeling tab** and select **"New Column"**.
2. **Create the Profitability Column:**

Enter the following DAX formula to create a column that categorizes states as profitable or non-profitable:

```
ProfitabilityStatus =
IF(SalesTable[AverageRevenuePerState] > 1000,
    "Profitable",
    "Non-Profitable"
)
```

Step 3: Display the Results

1. **Add a Table** and select state, AverageRevenueState and ProfitabilityStatus.

State	AverageRevenuePerState	ProfitabilityStatus
	642.00	Non-Profitable
Alabama	59.00	Non-Profitable
Alabama	1,155.00	Profitable
Arizona	71.00	Non-Profitable
Arizona	1,949.00	Profitable
Bayern	1,63,271.00	Non-Profitable
Bayern	3,74,137.00	Profitable
Brandenburg	20,497.00	Non-Profitable
Brandenburg	67,941.00	Profitable
California	24,92,858.00	Non-Profitable
California	35,84,058.00	Profitable
Charente-Maritime	16,993.00	Non-Profitable
Charente-Maritime	20,874.00	Profitable
England	14,97,497.00	Non-Profitable
England	27,78,723.00	Profitable
Essonne	1,06,052.00	Non-Profitable
Essonne	2,31,515.00	Profitable
Florida	1,653.00	Non-Profitable
Florida	1,908.00	Profitable
Garonne (Haute)	21,192.00	Non-Profitable
Garonne (Haute)	48,495.00	Profitable
Total	4,85,765.61	

Extra : To get the Total value or single value

In Power BI, a **Card** visualization is used to display a single, important piece of data, such as a key metric or a number. It is commonly used to show aggregate values like:

- **Total Sales**
- **Average Profit**
- **Total Units Sold**

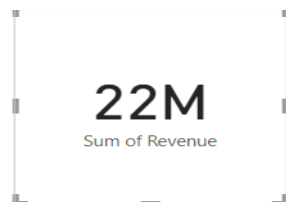
● Number of Customers

The Card provides a clean and simple way to highlight critical metrics that are important for decision-making. It's ideal for dashboard views where quick insights are needed.

To show the total revenue

Steps : 1. Select the card in the visualization pane.

2. Drag the Revenue field into the field well



To Add filter or Slicer

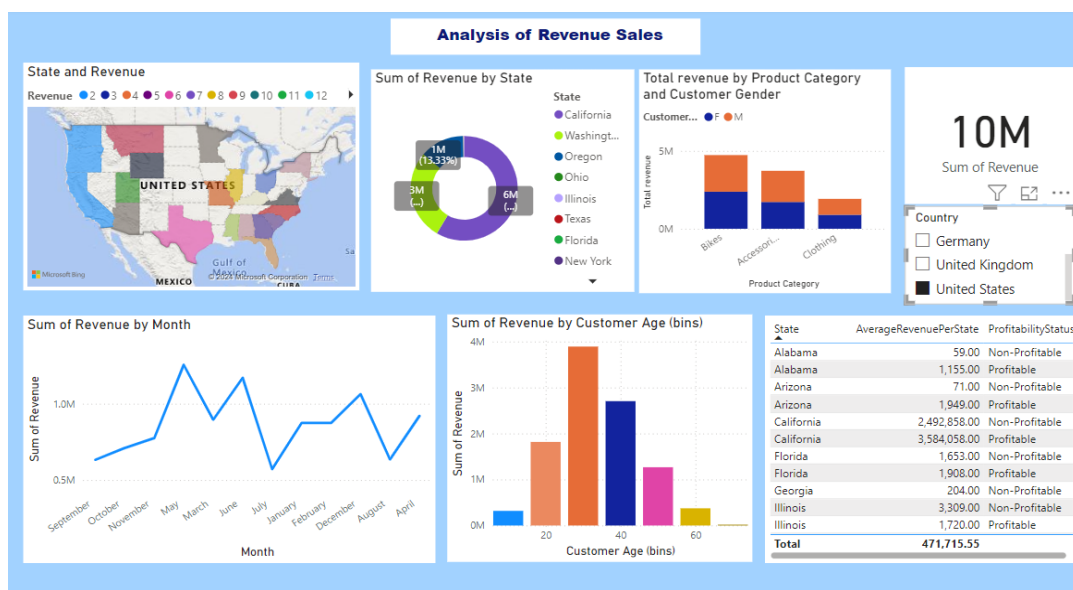
Filter Data: Slicers filter data across multiple charts and visuals in a report. For example, selecting a specific region or product category in a slicer can update all connected visuals to reflect data only for that selection.

Steps : 1. Select slicer from the Visual pane

2. Drag the Country field into the field well



Question 7: Build a dashboard.



Program10: Analysis of GDP dataset:

Step 1: Import the GDP Dataset

Open Power BI Desktop.

Click Home → Get Data → Excel (or CSV).

Select your downloaded World Bank GDP file.

In the Navigator window, tick the sheet and click Load or Transform Data (choose Transform if you want to clean first).

Step 2: Open Power Query Editor

Click Transform Data (from Home tab).

This opens the Power Query Editor window.

You'll now see columns like:

Country Name | Country Code | Indicator Name | Indicator Code | 2000 | 2001 |
2002 | ... | 2023

Step 3: Unpivot Year Columns

We need to turn the wide table (many year columns) into a long table (single “Year” column with GDP values).

Steps:

Select all columns except:

Country Name

Country Code

Indicator Name

Indicator Code

Right-click on any of the selected year columns.

Choose Unpivot Columns.

Each year is in its own column — we need to unpivot them.

Step 4: Clean the Data

Do these simple cleanups:

Rename columns clearly:

Attribute → Year

Value → GDP (current US\$)

Change Data Type:

Year → Whole Number

GDP (current US\$) → Decimal Number

Step 6: Apply & Load

Once you're done:

Click Close & Apply (top-left in Power Query).

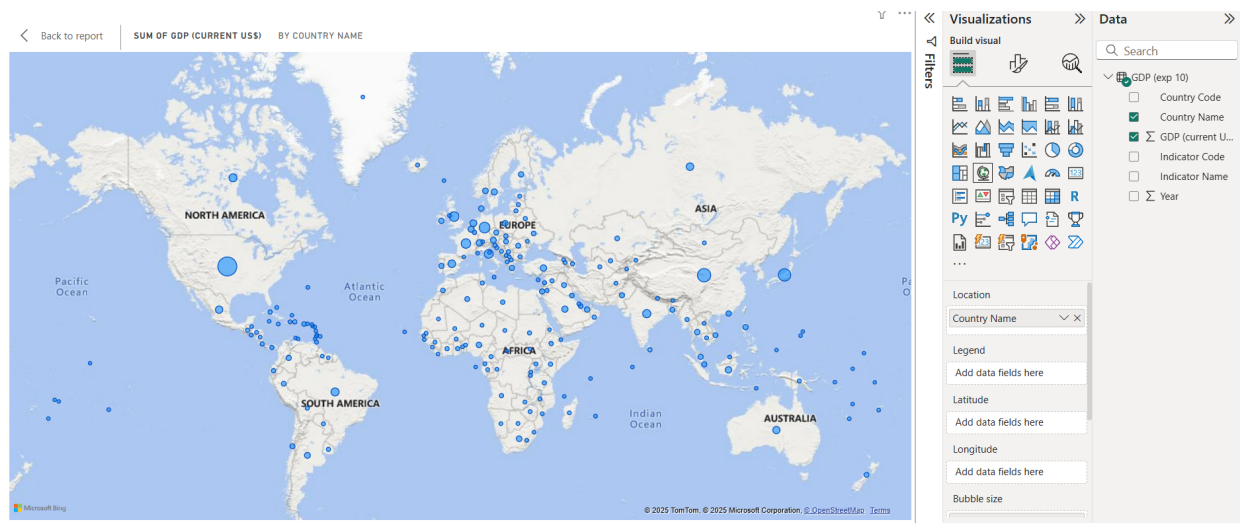
Power BI will load your transformed data model.

Let's now create dashboard

i) Visualize the countries data given in the dataset with respect to latitude and longitude along with country name using symbol maps

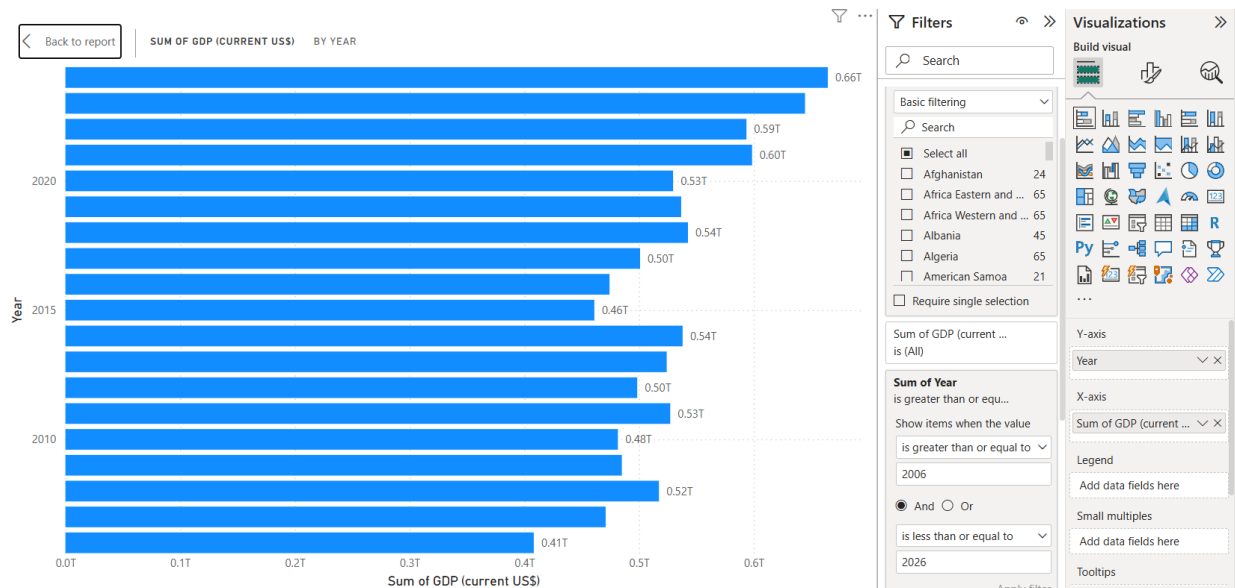
1. Take map visual
2. Drag Country in Location and GDP in bubble Size

Data Visualization Lab (BAIL504)



ii) Create a bar graph to compare GDP of Belgium between 2006 – 2026.

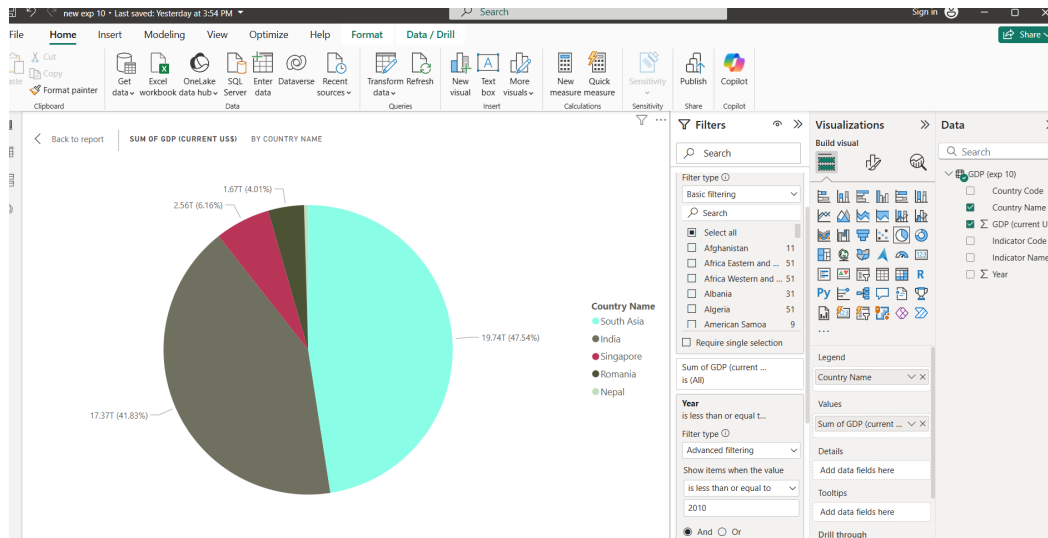
1. Take stacked bar chart
2. Drag Year to Y-axis & GDP to X-axis
3. In filter on this visual → select country name as “belgium”
4. Drag and drop **Year** in filter to this visual → Advance Filtering → **is greater than or equal to 2006 & less than or equal to 2026**



iii) Using pie chart, visualize the GDP of India, Nepal, Romania, South Asia, Singapore by the year 2010.

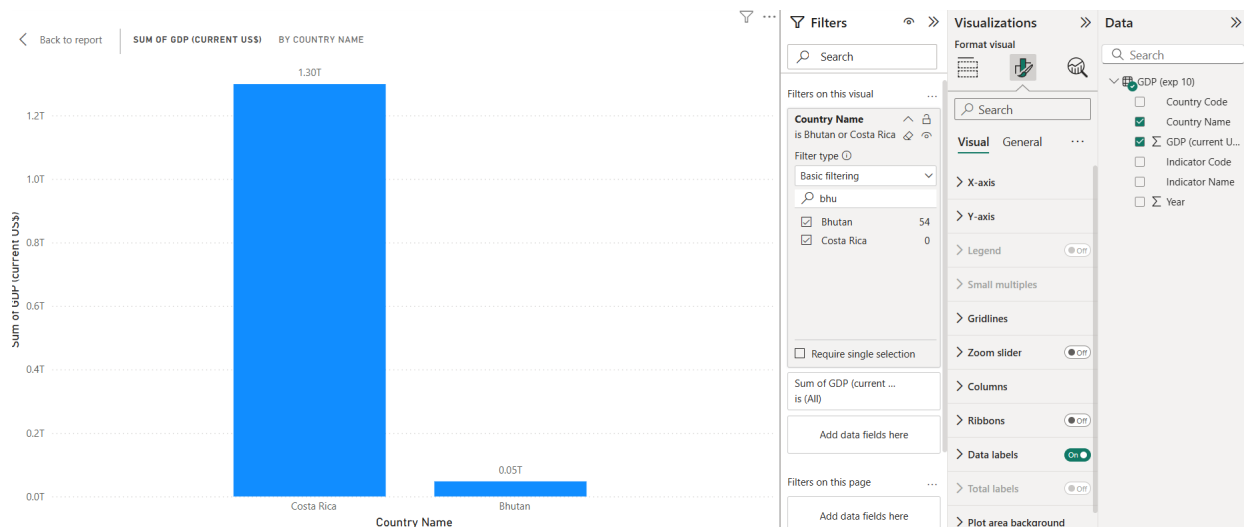
1. Take Pie chart
2. Drag **Country names** to legend & **GDP** to values
3. Apply filter (in filter on this visual) for Country Name → select only **India, Nepal, Romania, South Asia, Singapore**
4. Drag **Year** to filter on this visual → advance filtering → **is less than or equal to 2010** → Apply filter

Data Visualization Lab (BAIL504)



iv) Visualize the countries Bhutan & Costa Rica competing in terms of GDP.

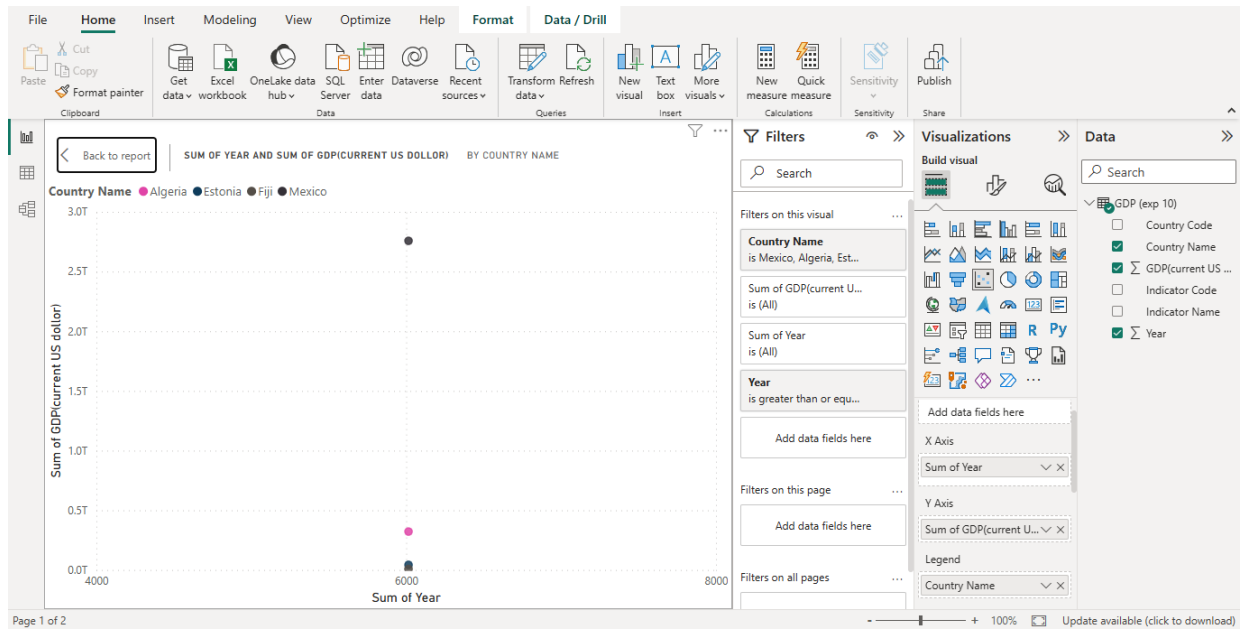
1. Take Stacked Column Chart
2. Drag Country name to X-axis & GDP to Y-axis
3. Drag Country name to filter to this visual → basic filtering → select **Bhutan & Costa Rica**



v) Create a scatter plot or circle views of GDP of Mexico, Algeria, Fiji, Estonia from 2004 to 2006.

1. Take scatter plot visual
2. Drag Year to X-axis, GDP to Y-axis and Country names to legend
3. Filter on this visual :
 - Country names : **Mexico, Algeria, Fiji, Estonia**
 - Year : **Advance filtering → 2004 to 2006.**

Data Visualization Lab (BAIL504)



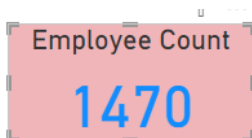
Program 11. Analysis of HR Dataset:

- i) Create KPI to show employee count, attrition count, attrition rate, active employees, and average age.
- ii) Create a Lollipop Chart to show the attrition rate based on gender category.
- iii) Create a pie chart to show the attrition percentage based on Department Category- Drag department into colours and change automatic to pie. Entire view, Drag attrition count to angle. Label attrition count, change to percent, add total also, edit label.
- iv) Create a bar chart to display the number of employees by Age group,
- v) Create a highlight table to show the Job Satisfaction Rating for each job role based on employee count.
- vi) Create a horizontal bar chart to show the attrition count for each Education field Education field wise attrition – drag education field to rows, sum attrition count to col,
- vii) Create multiple donut chart to show the Attrition Rate by Gender for different Age group.

Solution :

i) Create KPI to show employee count, attrition count, attrition rate, attrition count, active employees, and average age.

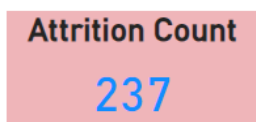
Step1: Choose KPI card in the visualization and drag and drop the Employee Count. Format your visuals of your style.



Step2: Create a Calculated field “Attrition Count”

IF Attrition='Yes' THEN 1 ELSE 0 END

Step3: Choose KPI card in the visualization and drag and drop the Attrition Count. Format your visuals of your style.



Step5: Create a Calculated field “Attrition Rate”

$$\frac{\text{SUM(Attrition Count)}}{\text{SUM(Employee Count)}}$$

Choose KPI card in the visualization and drag and drop the Attrition Rate. Format your visuals of your style.

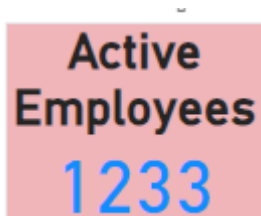
Go to format of this visual → percentage → make it 0 decimal



Step6: To find active employees create calculated field “Active Employees”

$$\text{sum}([\text{Employee Count}]) - \text{sum}([\text{Attrition Count}])$$

Step7: Choose KPI card in the visualization and drag and drop the Active Employees. Format your visuals of your style.



Step8: Choose KPI card in the visualization and drag and drop the Average Age. Format your visuals of your style.

Go to format of this visual and select number → numbers(custom) → decimal places should be 0



ii) Create a Lollipop Chart to show the attrition rate based on gender category.

Power BI does not have a native Lollipop Chart, so you will simulate it using (any chart) a **Line and Stacked column Chart**

step 1: Drag Gender to Column

Step 2: Drag Attrition Count to Rows . Then press control & drag Attrition Count in rows itself.

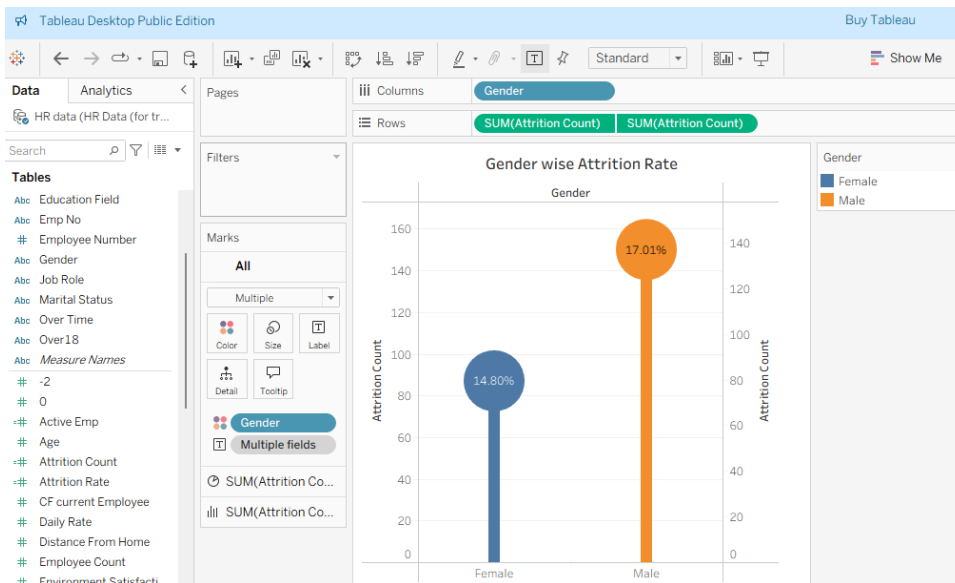
Step 3: Convert Attrition Count(1st) to pie chart & Attrition Count(2nd) to Bar chart.

Step 4: Then, right click on Attrition Count(2nd) in rows → dual axis

Step 5: Adjust the size of both pie chart as well as bar chart

Step 6: in ALL marks pane ; drag gender to colors

Step 7: in pie chart (marks pane) drag and drop attrition rate → convert into percentage (format)



iii) Create a pie chart to show the attrition percentage based on Department Category-

Drag department into colours and change automatic to pie. Entire view, Drag attrition count to angle. Label attrition count, change to percent, add total also, edit label.

- From the **Visualizations** pane on the right, select the **Pie Chart** visual icon. This will add a blank pie chart to your report canvas.

Set Up the Pie Chart:

- Drag the Department Field** to the **Legend** area.
- Drag the Attrition Count Measure** to the **Values** area.

Configure Data Labels and Formatting:

- Click on the **Pie Chart** to select it.
- Open the **Format Pane** (paint roller icon).

Change Data Label Settings:

- Go to the Data Labels section** in the Format pane.
- Toggle Data Labels to On.**
- In the **Data Label settings**, change **Label Style** to **Percent**. This will show the percentage of each department's attrition relative to the total.

- To show the **Total** alongside the percentages:
- Ensure that **Data Labels** are visible and set to **Show**.
- You can add a **Total Label** in the **Title** or **Tooltips** sections if needed for additional context.

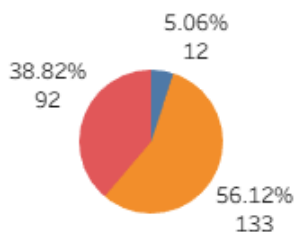
Format the Pie Chart:

- **Adjust Colors:**
 - Go to the **Data Colors** section in the Format pane.
 - You can customize colors for each department by clicking on the color next to the department name and choosing the color you prefer.
- **Edit Labels:**
 - If you want to customize the text in the labels, you can use the **Data Label** formatting options to adjust font size, color, and display units.

Finalize Your Visualization:

- Ensure your pie chart looks as expected with percentages representing the attrition rate for each department.

Attrition Percentage by Dept.

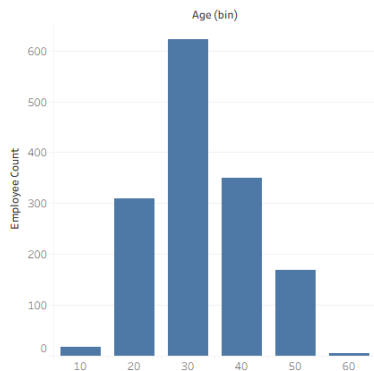


iv) Create a bar chart to display the number of employees by Age group,

Step1: right click Age and choose a new group and set bin size as 10.

Step2: Choose any bar chart drag and drop new age bin and employee count.

No. of Emp by Age Group



V) Create a highlight table to show the Job Satisfaction Rating for each job role based on employee count.

- Create a **Matrix** visual from the Visualizations pane.
- Drag the Job Role field to **Rows**.
- Drag Job Satisfaction from measure to dimensions then Drag the Job Satisfaction Rating field to **Columns**.
- Drag the Employee Count measure to **Values**.
- Then in SHOW ME, select highlight table
- Swap the Rows & columns from Toolbar

Job Satisfaction by Job Role

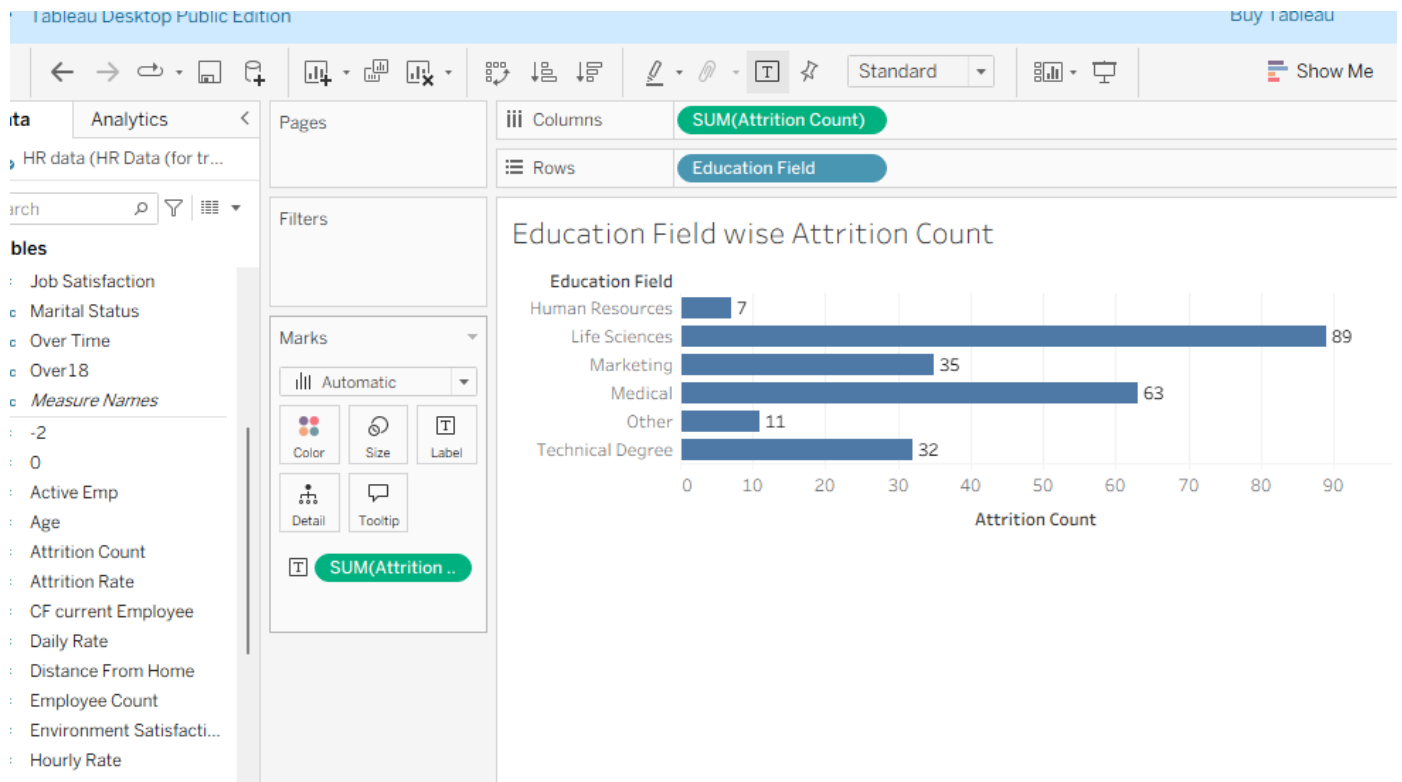
Job Role	Job Satisfaction			
	1	2	3	4
Healthcare Representative	26	19	43	43
Human Resources	10	16	13	13
Laboratory Technician	56	48	75	80
Manager	21	21	27	33
Manufacturing Director	26	32	49	38
Research Director	15	16	27	22
Research Scientist	54	53	90	95
Sales Executive	69	54	91	112
Sales Representative	12	21	27	23

VI) Create a horizontal bar chart to show the attrition count for each Education field wise

Attrition – drag education field to rows, sum attrition count to col,

Step1: Horizontal bar chart It's called the **Clustered Bar Chart** or **Stacked Bar Chart** in the visualization pane

Choose stacked bar chart and set y axis is education filed and x axis is attrition count.



vii) Create multiple donut charts to show the Attrition Rate by Gender for different Age group. Choose donut chart and drag and drop legend as gender and value as attrition rate.

Step 1: Drag CF age band to columns

Step 2: write min(1) and hit enter to create dummy axis

Step 3: Convert it to pie chart from marks pane

Step 4: now create one more dummy axis by clicking on ctrl + drag min(1) in rows pane

Step 5: Now you will get to axis with pie chart.

Drag Gender to colors to min(1) - the first dummy axis

Also, drag and drop Attrition Rate to angle of first dummy axis

Increase size of pie chart from marks pane

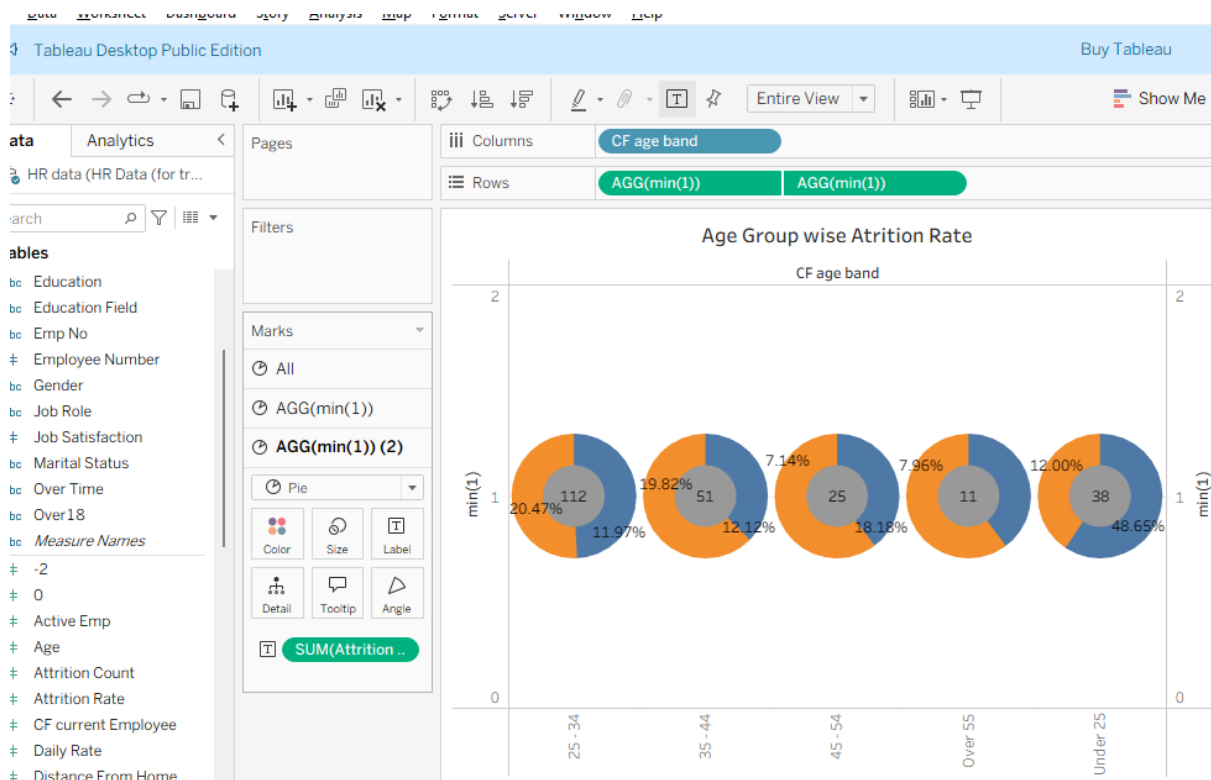
Step 6: For second dummy axis of min(1), reduce the size from marks pane

Step 7: Then, right click on min(1) second one in rows → dual axis

Step 8: for labeling:

first axis (marks pane): drag and drop attrition rate to text → convert into percentage

second axis (marks pane) : drag and drop attrition count to text



Program 12: Analysis of Amazon Prime Dataset:

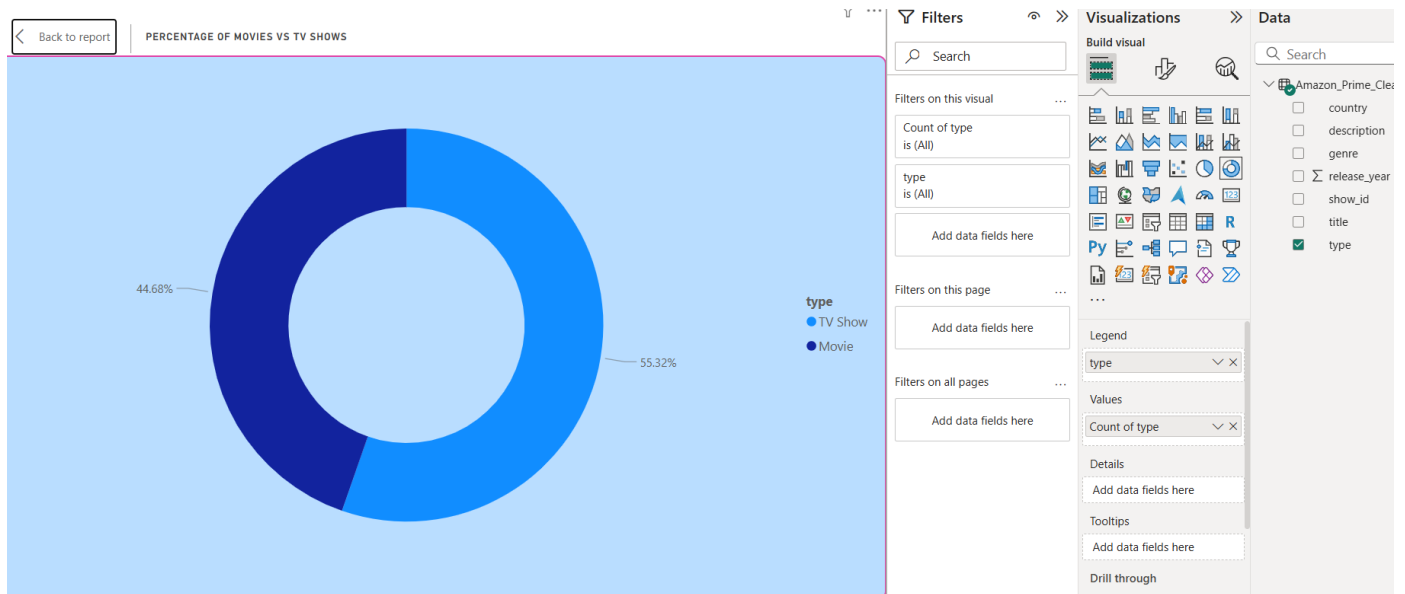
- Create a Donut chart to show the percentage of movie and tv shows
- Create a area chart to shows by release year and type
- Create a horizontal bar chart to show Top 10 genre
- Create a map to display total shows by country
- Create a text sheet to show the description of any movie/movies.
- Build an interactive Dashboard.

Step1: Upload the Amazon_Prime CSV dataset in Power BI.

Step 2:

i).Create a Donut chart to show the percentage of movie and tv shows

- From the **Visualizations** pane, select the **Donut chart**.
- Drag the '**Type**' field to the **Legend** section.
- Drag any suitable column (e.g., **ID** or **Title**) to **Values**, then set the aggregation to **Count**.
- Use filters to filter only movie and TV show.This will show the percentage of **Movies** vs **TV Shows**.

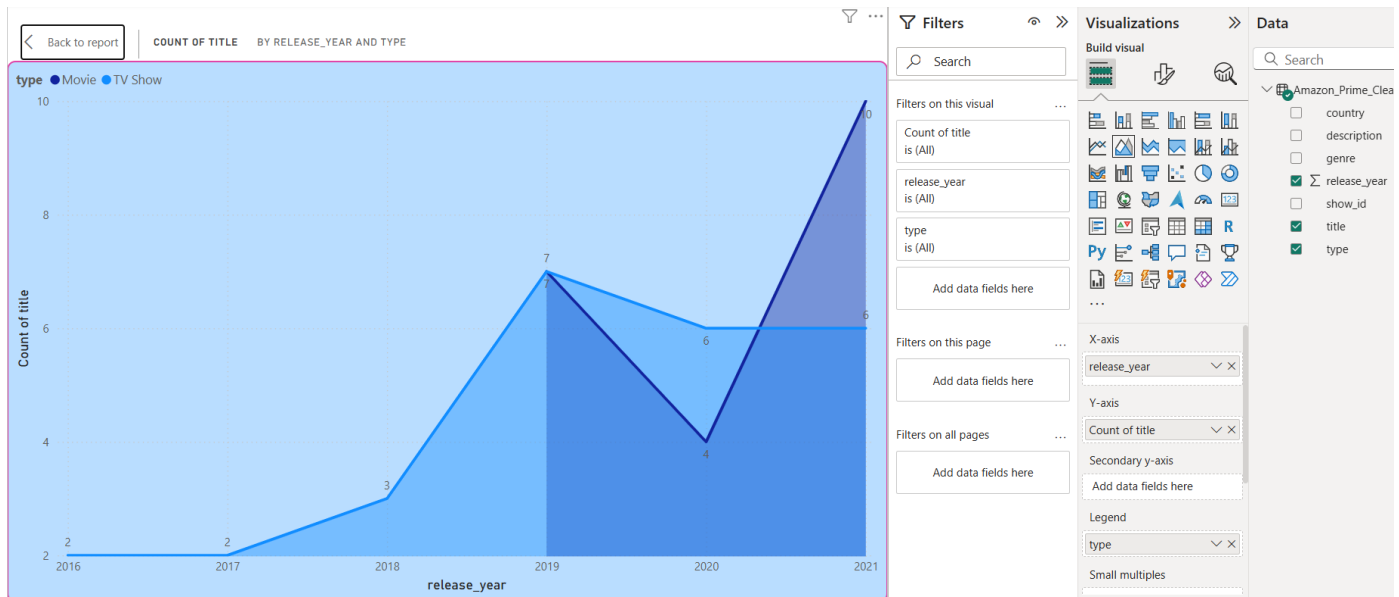


ii).Create a area chart to shows by release year and type.

- Ensure your dataset contains a **Release Year** column and a **Type** column (Movies/TV Shows).

Steps to Create Area Chart:

- Choose **Area chart** from the Visualizations pane.
- Drag the '**Release Year**' field to the **X-Axis** section.
- Drag the '**Type**' field to **Legend**.
- Drag the **Title** (or other identifying fields) to **Y Axis**, and set the aggregation to **Count**.
- You'll now see an area chart with Movies and TV Shows distributed over the years.
 - Note: Use filters to filter only movies and TV show.

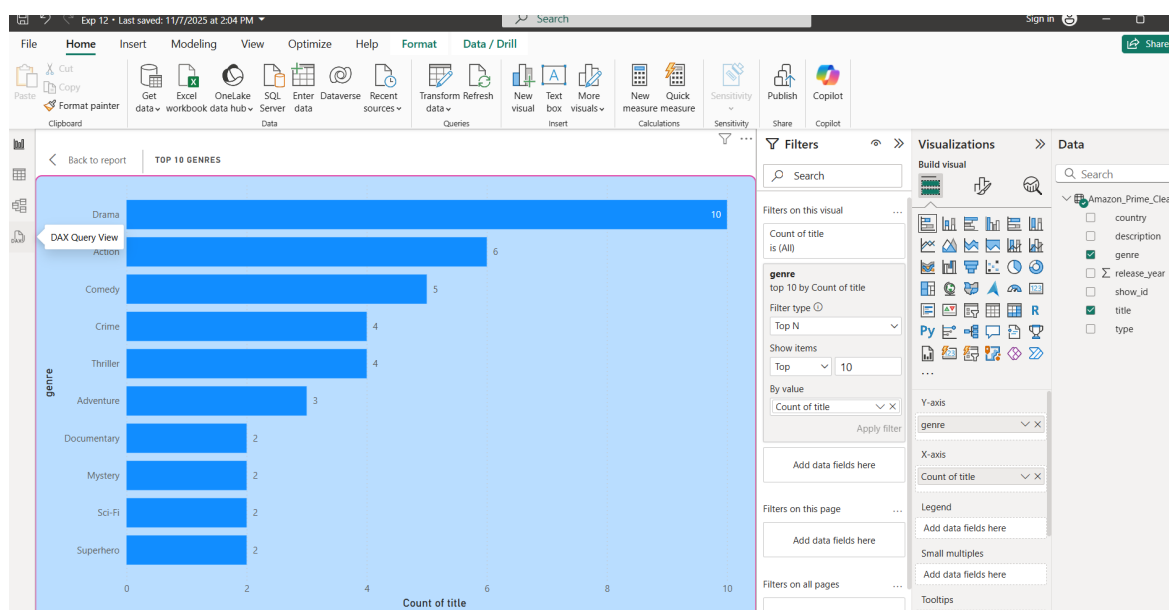


iii. Create a horizontal bar chart to show Top 10 genre.

Note: Make sure you have a **Genre** column in your dataset.(Rename the column listed in to Genre)

Steps to Create Horizontal Bar Chart:

- From the Visualizations pane, select the Stacked **Bar chart** and adjust it to display horizontally.
- Drag the **Genre** column to the Y-Axis section.
- Drag the **Title** (or other identifier) to **X-axis**.
- In the **Filters** pane, filter the **Top N** to display the **Top 10** Genres by the count of content.

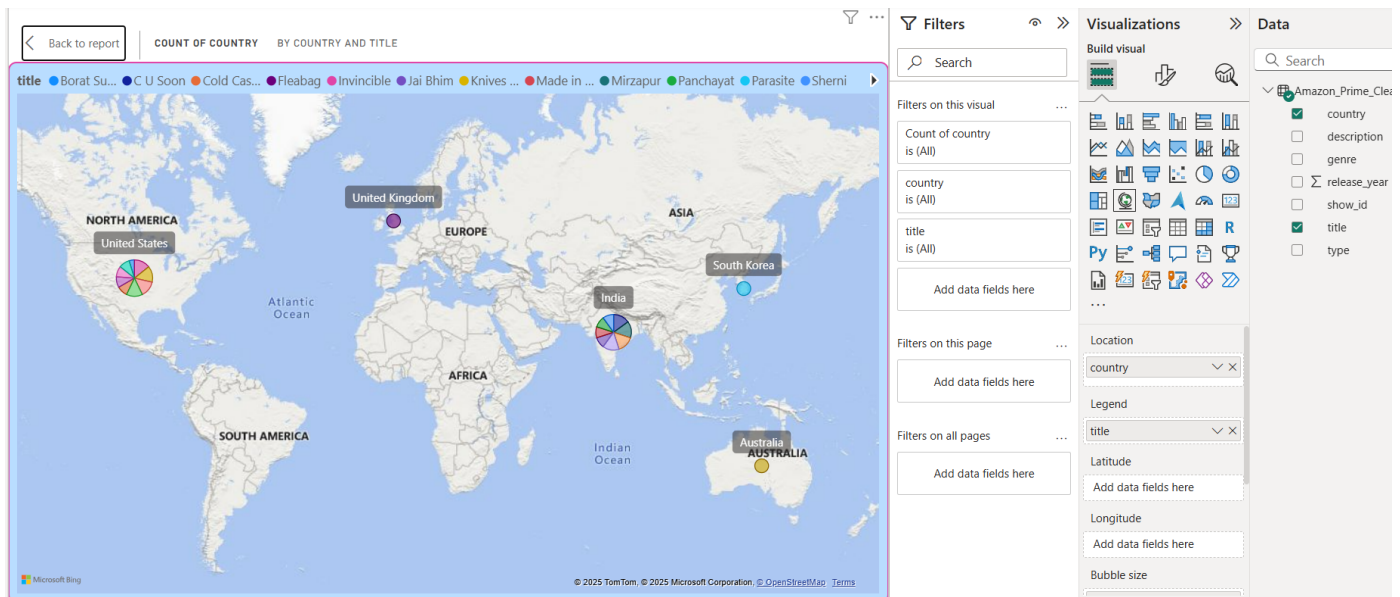


iv. Create a map to display total shows by country.

Make sure you have a country column in your dataset.

Steps to Create a Map:

- Choose **Map** from the Visualizations pane.
- Drag the **Country** field to the **Location** section.
- Drag **Count the title** in **legend**.
- Drag **Type** to **Bubble Size**



v) Create a text sheet to show the description of any movie/movies.

- Ensure your dataset has a **Description** column for each movie/TV show.
- Choose Table from the visuals and check the title and description columns.
- Drag Type, title, description to columns of table visual.
- Apply filter on this visual → type→ basic filtering → click on movies



Back to report

title	type	release_year	description
The Test	TV Show	2020	A behind-the-scenes look at the Australian cricket team's path to redemption after a cheating scandal.
Mirzapur	TV Show	2018	A crime saga that revolves around power struggles, weapons, and lawlessness in Mirzapur.
Knives Out	Movie	2019	A detective investigates the death of a patriarch of a wealthy, eccentric family.
Fleabag	TV Show	2016	A dry-witted woman navigates life and love in London while trying to cope with tragedy.
Sherri	Movie	2021	A forest officer navigates the hostile environment of bureaucracy and societal pressures while tracking a tiger.
The Boys	TV Show	2019	A group of vigilantes set out to take down corrupt superheroes who abuse their powers.
Sound of Metal	Movie	2019	A heavy-metal drummer's life is thrown into turmoil when he begins to lose his hearing.
Jai Bhim	Movie	2021	A lawyer fights for the rights of tribal people wrongfully accused by corrupt police officers.
Wheel of Time	TV Show	2021	A magical world where only certain women can wield the One Power, and a prophecy might change everything.
Upload	TV Show	2020	A man chooses his own afterlife after his untimely death by uploading his consciousness to a virtual world.
The Family Man	TV Show	2019	A middle-class man secretly works as an intelligence officer for the T.A.S.C. while balancing family life.
Parasite	Movie	2019	A poor family schemes to become employed by a wealthy family and infiltrate their household.
C U Soon	Movie	2020	A software engineer investigates his cousin's online girlfriend, uncovering dark secrets.
Invincible	TV Show	2021	A teenage boy learns his father is the world's most powerful superhero and struggles with his legacy.
The Tomorrow War	Movie	2021	A time traveler recruits soldiers to fight in a future war where humanity is losing against an alien invasion.
Panchayat	TV Show	2020	An engineering graduate joins as a secretary of a village panchayat office due to lack of better job options.
Borat Subsequent Moviefilm	Movie	2020	Kazakh TV reporter Borat returns to America and releases his daughter into the wild of U.S. culture.
Shershaah	Movie	2021	The true story of Captain Vikram Batra, an Indian Army officer who fought bravely in the Kargil War.
Cold Case Files	TV Show	2017	True crime series revisiting unsolved murder cases using modern forensic techniques.
Made in Heaven	TV Show	2019	Two wedding planners in Delhi navigate modern relationships, traditions, and societal norms.

vi) Build an interactive Dashboard:

