

Part A:

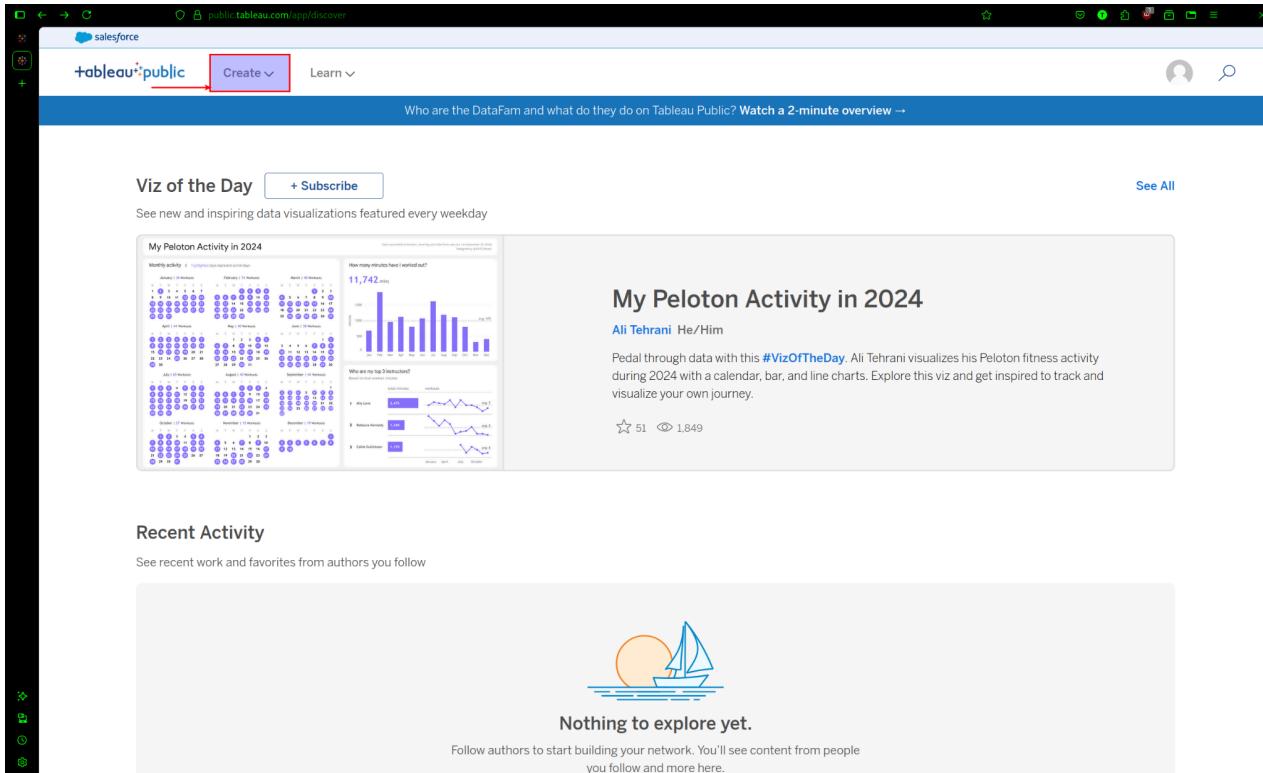
Data Visualization with Tableau and PowerBI

Prepared by **Mohit Nair (1MS22IS079)**

General Instructions

Installation

Tableau Public is a free-to-use, public software used for Data Visualization. To install Tableau Public, follow the following steps:

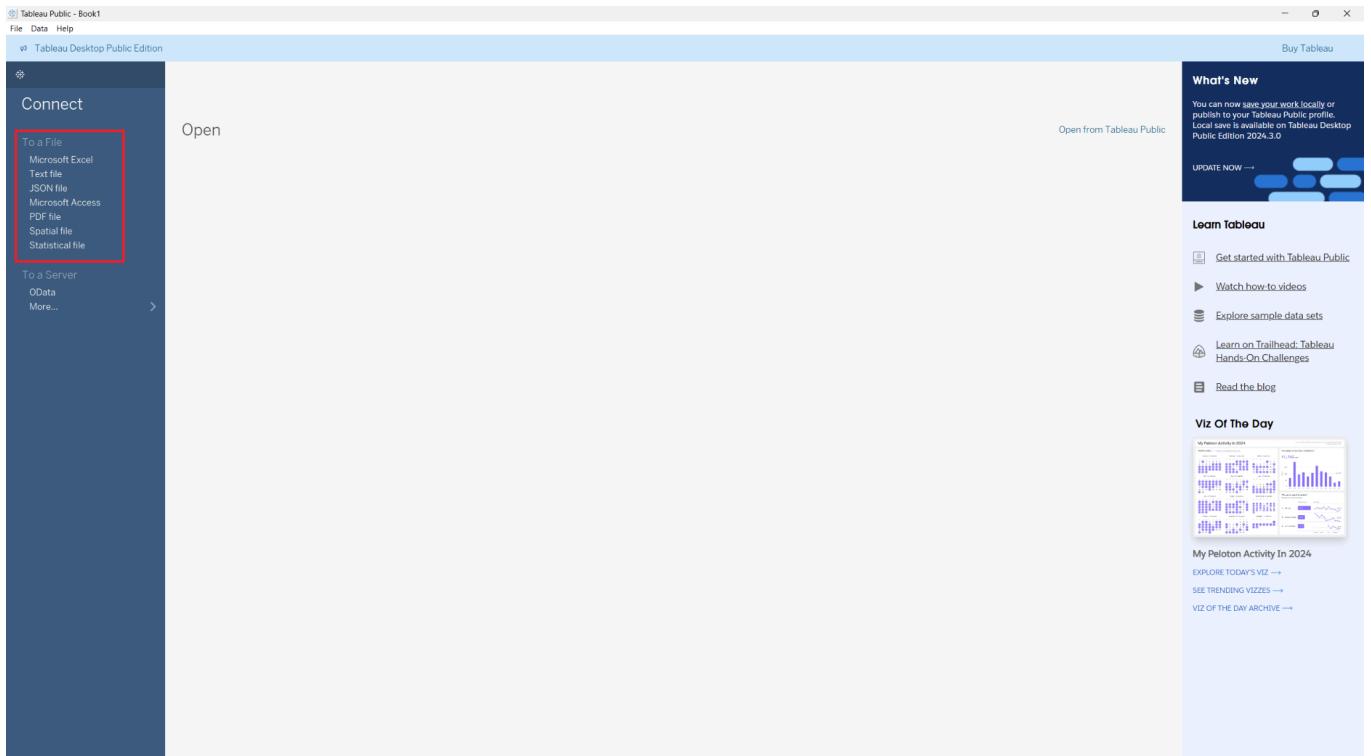


1. Navigate to the link: <https://www.tableau.com/products/public/download>
2. Click on Create, and in the subsequent dropdown, choose the option “Download Tableau Desktop Public Edition”.
3. Fill in your particulars, and click “Download the App”.
4. Based on the platform you use, download the supported executable. Tableau Public is only supported on MacOS and Windows. It is sadly NOT supported on Wine in Linux.
5. Be sure to allow pop-ups (just this one time) on your browser to download the executable.
6. Click on the executable in your Downloads, and go through the Installation Process.

Importing and Using Data in Tableau

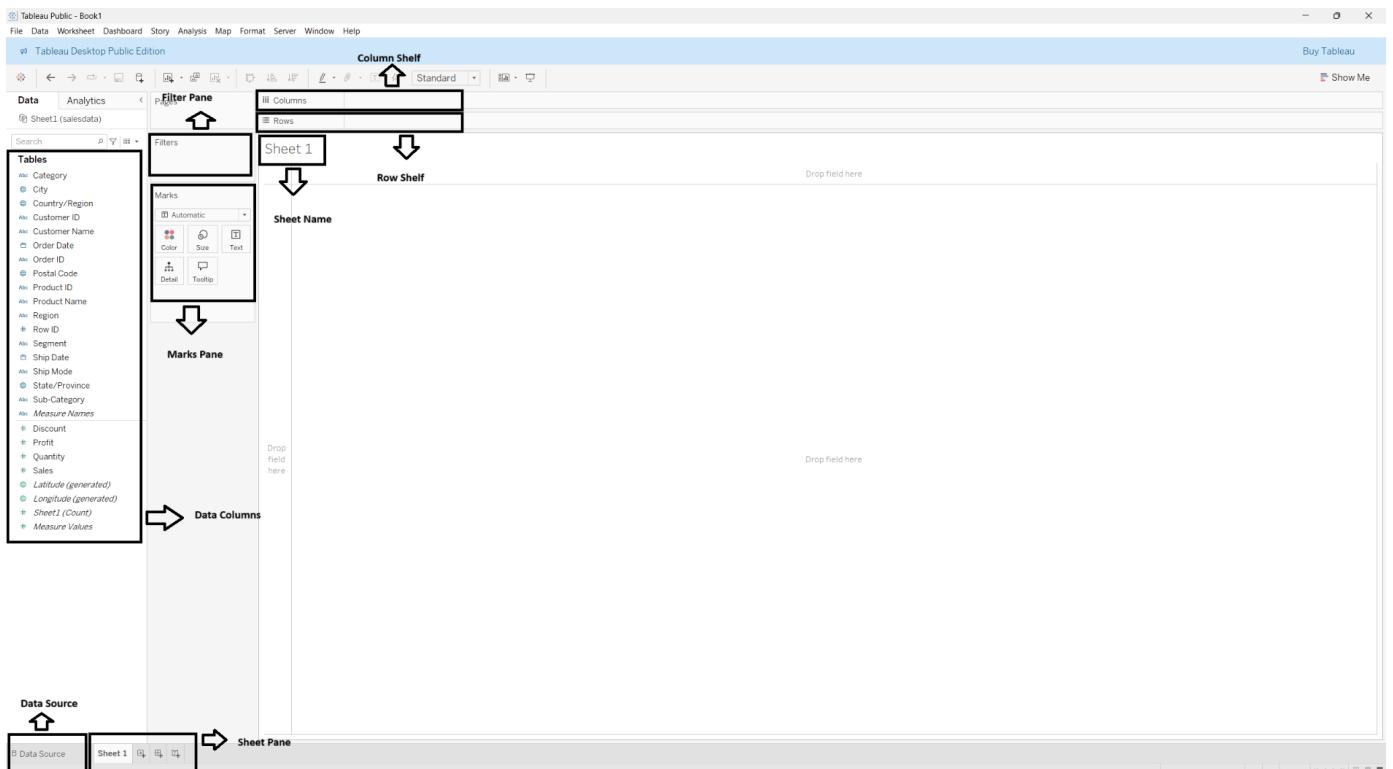
Some Important points to remember:

1. On Opening Tableau, you will see a list of file types you can import, plug-in and use in Tableau.



Text files encompass **CSV (Comma Separated Values)** and **TSV (Tab Separated Values)** files.

2. Each Visualization is done in a **Sheet**. One Sheet consists of one or more associated charts.
3. The Sheets when clubbed in a layout is called a **Dashboard**.
4. The **Sheet Pane** lists down the Sheets present in your Tableau workspace. You may add/create sheets and Dashboards to combine these sheets.



Vocabulary

1. **Column and Row Shelves:** Used to calibrate the visualization by dragging Data Columns to it.
2. **Sheet Name:** Used to edit the name of the sheet.
3. **Marks Pane:** Used to modify the visualization using various parameters such as Size, Tooltips, Details and Colors.
4. **Data Columns:** To interact with Columns in the data we intend to visualize.
5. **Filter Pane:** Used to view the data filters currently used in your visualization.
6. **Data Source:** Used to view the figures in your data; mostly used for adding new Calculated Fields to your Data to make visualization easier.
7. **Sheet Pane:** Used to navigate among and create Sheets and Dashboards.

Exercises

Exercise 1: Exploring and Visualizing Sales Data

- Import a sample sales dataset into Tableau. Create a dashboard that includes the following visualizations:
- A bar chart showing total sales by product category.
- A line chart showing monthly sales trends over the past year.
- A geographic map showing sales distribution by region.

Exercise 2: Advanced Visualization Techniques

- Using a dataset on customer purchases, create a dashboard with the following advanced visualizations:
- A scatter plot showing the relationship between customer age and total spending.
- A heat map illustrating product sales intensity by store location.
- A dual-axis chart comparing sales and profit margins over time.

Exercise 3: Analysing Sales Performance: Create various visualizations to analyze the sales performance.

- Create a line chart to show sales trends over time.
- Create a bar chart to compare sales across different regions.
- Use a pie chart to display the distribution of sales among different product categories.
- Create a dashboard combining these visualizations to provide an overall view of sales performance.

Exercise 4: Financial Performance Dashboard: Create a comprehensive dashboard to monitor the financial performance of a company.

- Create a combination of line and bar charts to compare actual revenue and expenses against budgeted figures.
- Use a gauge chart to display key financial metrics such as net profit margin.
- Create a waterfall chart to show the contribution of different factors to the overall profit.
- Design an interactive dashboard that allows users to filter data by different time periods (e.g., monthly, quarterly, yearly).

Exercise 1

Exploring and Visualizing Sales Data

Import a sample sales dataset into Tableau. Create a dashboard that includes the following visualizations:

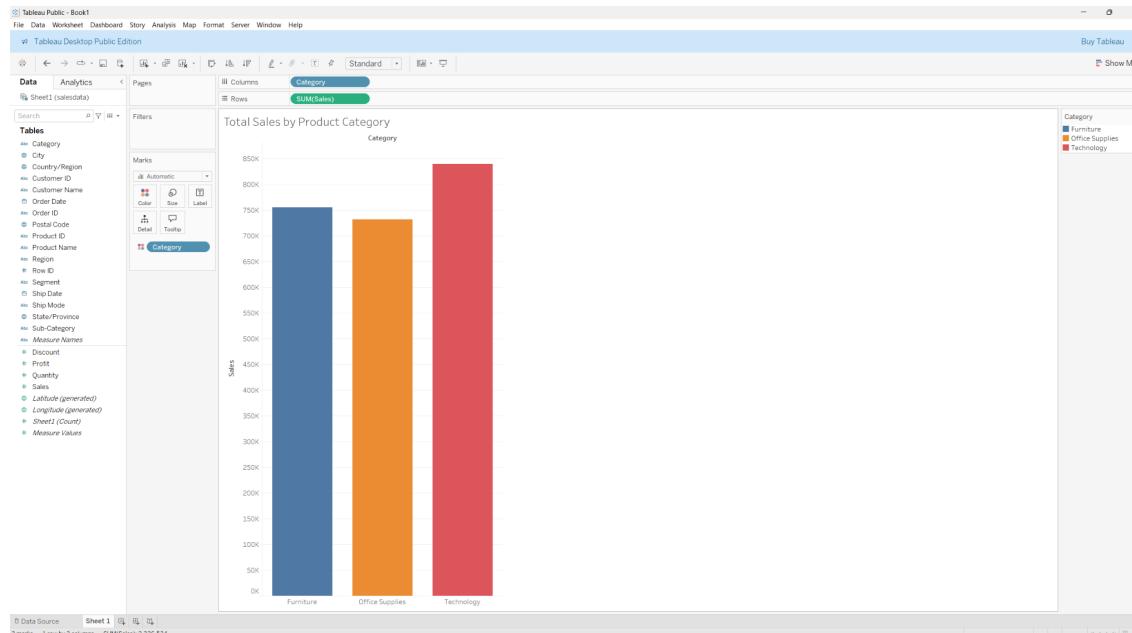
- A bar chart showing total sales by product category.
- A line chart showing monthly sales trends.
- A geographic map showing sales distribution by State/Province.

You may obtain the dataset at:

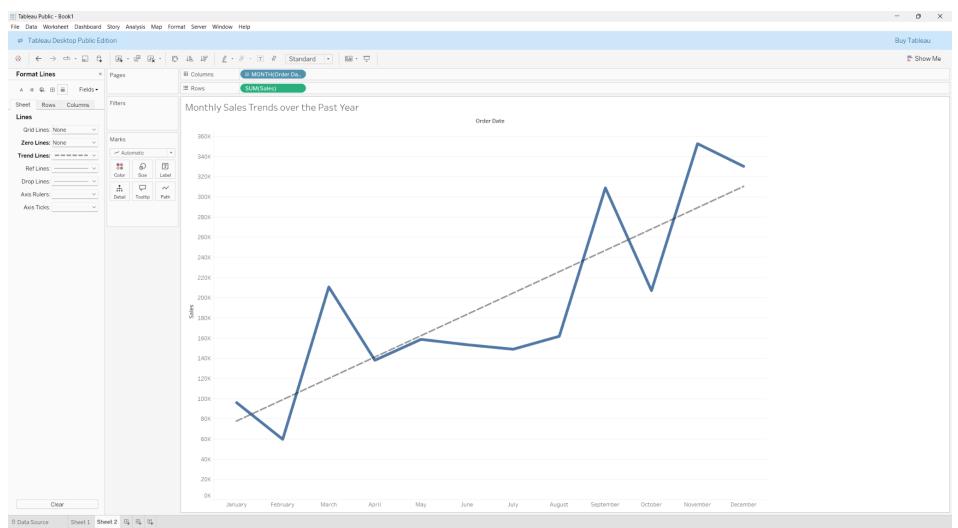
https://github.com/themohitnair/DVLab/blob/main/Tableau-PowerBI-Exercises-Part-A/PA_ex1/salesdata.xlsx

Procedure

1. Import the excel file in Tableau.
2. Each visualization must be done in a new sheet. Navigate to Sheet 1 using the Sheet Pane.
3. Create Visualizations:
 - a. A bar chart showing total sales by product category.

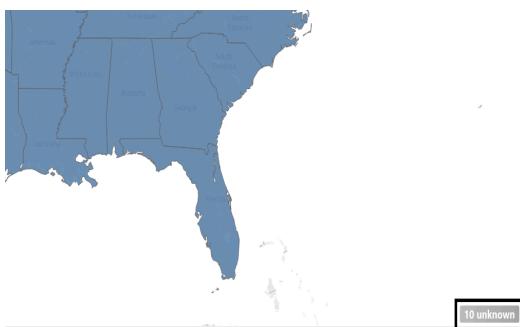


- ❖ Name the sheet appropriately by clicking on the Sheet Name and editing the same.
- ❖ Drag the **Category** column from the **Data Columns** to the **Column Shelf**.
- ❖ Drag the **Sales** column from the **Data Columns** to the **Row Shelf**.
- ❖ In the **Marks Pane**, click on the dropdown and choose **Bar** as the Mark type.

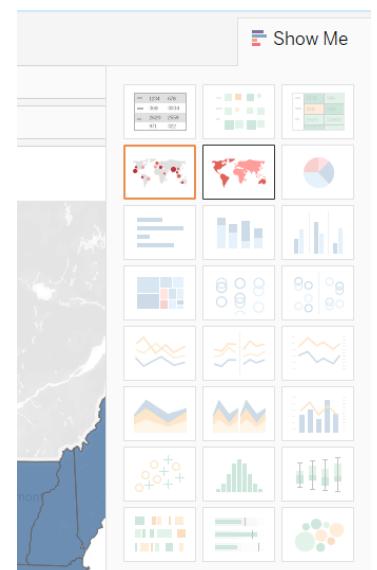
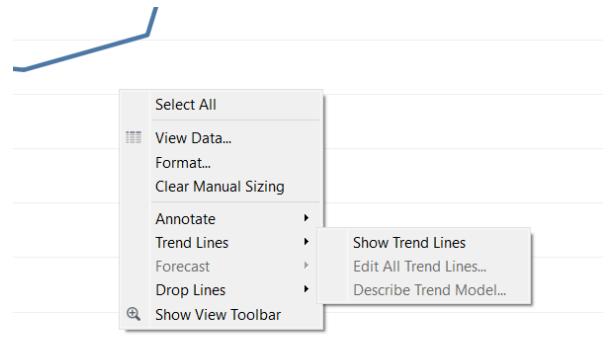
- ❖ You may also drag **Category** to the **Color Tab** in the **Marks Pane** to assign different colors to categories.
- b. A line chart showing monthly sales trends.
- ❖ Add a new **Sheet** in the **Sheet Pane**
 - ❖ Name the sheet appropriately.
 - ❖ Drag **Order Date** from the **Data Columns** to the **Column Shelf**. Click on **Order Date** to reveal a dropdown, and choose the Month option to chart by Month.
 - ❖ Drag **Sales** from the **Data Columns** to the **Row Shelf**.
 - ❖ Since the data consists of sales only from the year 2020, filtering by year is unnecessary.
 - ❖ Drag **Sales** to the **Label Tab** within the **Marks Pane** to get a labelled Line Chart visualization.
 - ❖ Feel free to play with and tweak the thicknesses and colors of the Trend Line and the Line plot.
- 

- c. A geographic map showing sales distribution by State/Province.

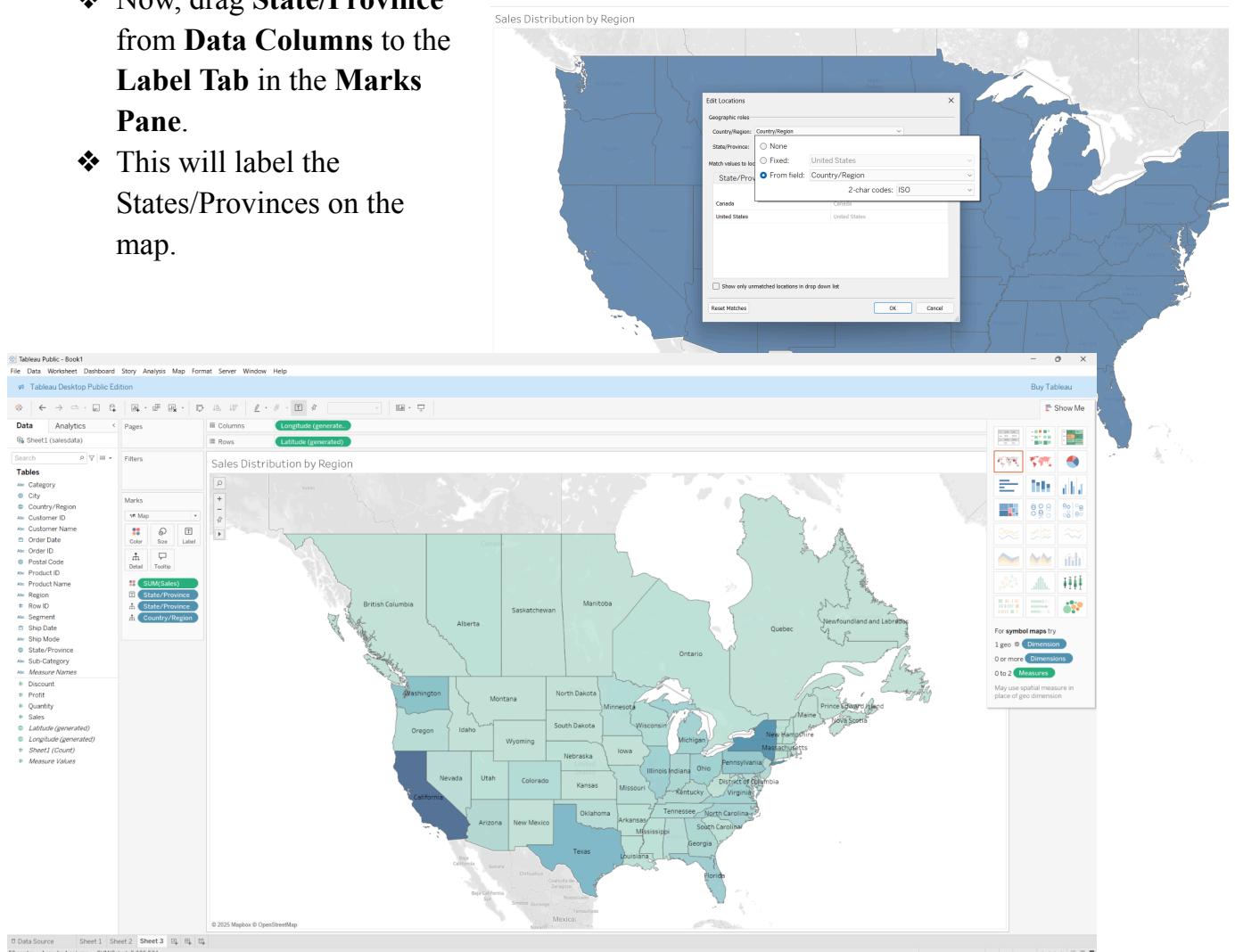
- ❖ Add a new **Sheet** in the **Sheet Pane**
- ❖ Name the sheet appropriately.
- ❖ Add State/Province from Data Columns to the Column shelf.
- ❖ Click on the **Show Me** dropdown on the Top Right, and choose the Map Option (the Fifth one). A map will appear on your sheet once you do this.



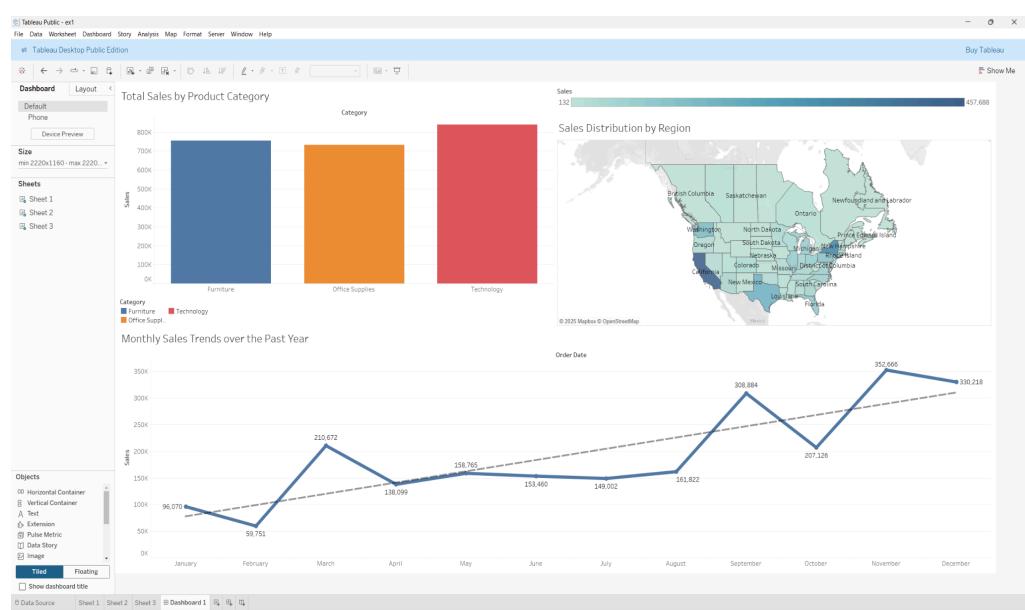
- ❖ On the bottom-left corner of the Map, you might see, for instance, an indication like “10 unknown”. Click on it, and choose **Edit Locations** in the dialog that appears.



- ❖ Choose the option **From Field** and set the field to **Country/Region**. This will sort out all unknowns and add them to your map. Click OK.
- ❖ Now, drag **Sales** from the Data Columns to the **Color Tab** inside the **Marks Pane**. This will create a choropleth map of the Sales Data.
- ❖ Now, drag **State/Province** from **Data Columns** to the **Label Tab** in the **Marks Pane**.
- ❖ This will label the States/Provinces on the map.



4. Create a Dashboard from the Sheet Pane and drag and drop all the Sheets into the Dashboard in any preferred layout. You may save the workbook for future use.



Exercise 2

Advanced Visualization Techniques

Using a dataset on customer purchases, create a dashboard with the following advanced visualizations:

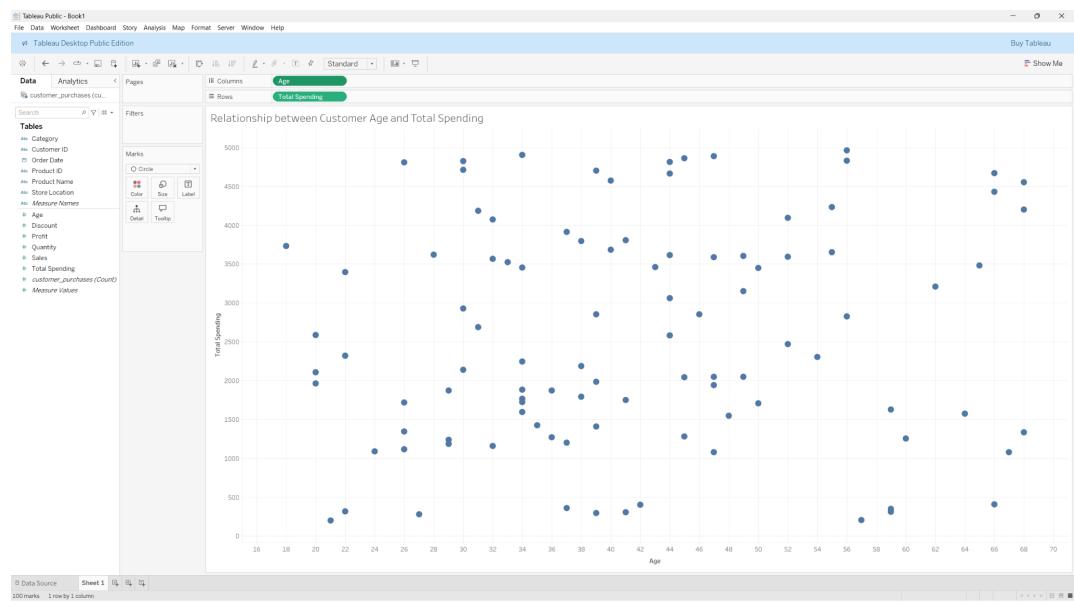
- A scatter plot showing the relationship between customer age and total spending.
- A heat map illustrating product sales intensity by store location.
- A dual-axis chart comparing sales and profit margins over time.

You may obtain the dataset at:

https://github.com/themohitnair/DVLab/blob/main/Tableau-PowerBI-Exercises-Part-A/PA_ex2/customer_purchases.xlsx

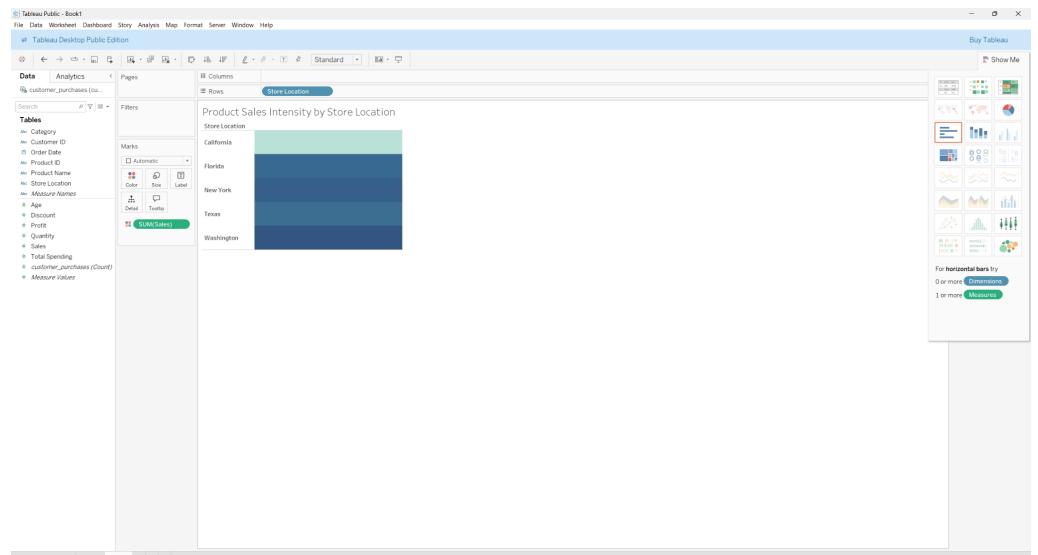
Procedure

1. Import the excel file in Tableau.
2. Navigate to Sheet 1 using the Sheet Pane.
3. Create Visualizations:
 - a. A scatter plot showing the relationship between customer age and total spending.
 - ❖ Name the sheet appropriately
 - ❖ Drag **Age** to the **Column Shelf** from the **Data Columns**.
 - ❖ Right-click on the **Age** Column in the **Column Shelf**, and choose the option that says **Dimension**.
 - ❖ Drag **Total Spending** from the **Data columns** to the **Row Shelf**.
 - ❖ Right-click on the **Total Spending** Column in the **Row Shelf**, and choose the option that says **Dimension**.
 - ❖ In the **Marks** **Pane**, change the **Mark Type** from **Automatic** to **Circle**.
 - ❖ You may tweak the Sizes and Colors in the Scatter plot.

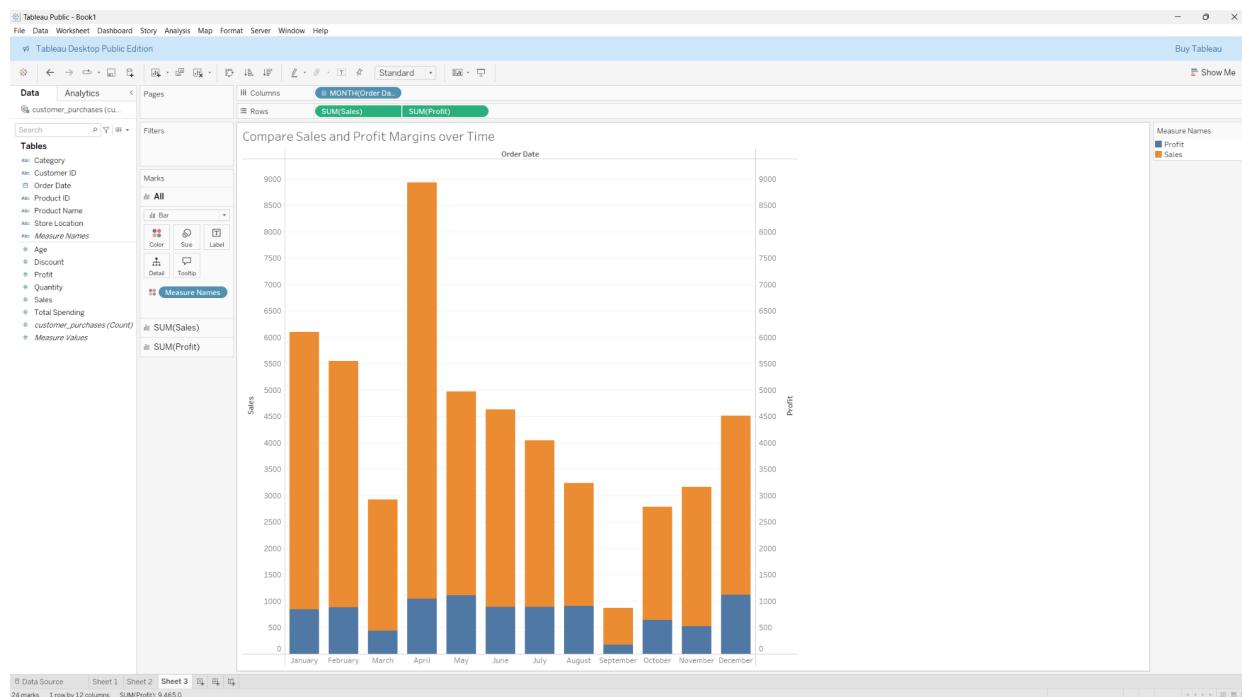


- b. A heat map illustrating product sales intensity by store location.

- ❖ Create a new Sheet in the Sheet Pane.
- ❖ Name the Sheet Appropriately.
- ❖ Drag Store Location from the Data Columns to the Row Shelf.
- ❖ Drag Sales to the Color Tab in the Marks Pane to form a Heatmap Chart.
- ❖ You may manipulate the sizes for a better view.

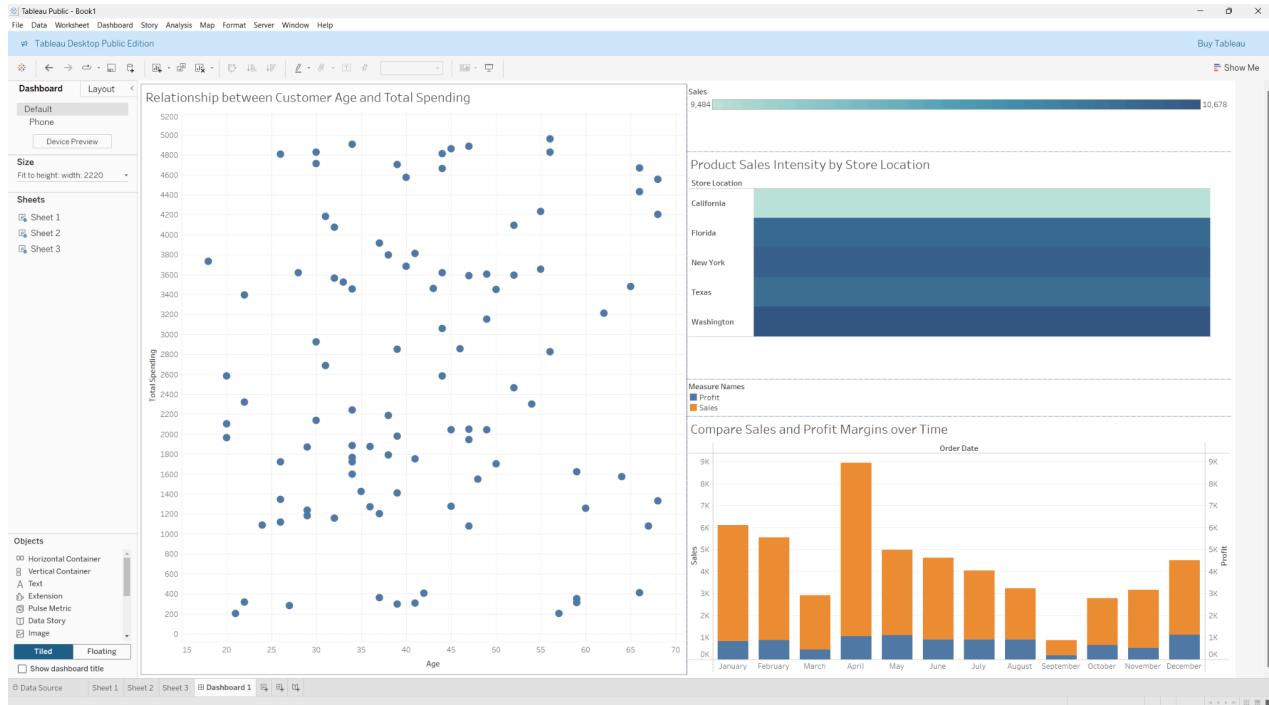


- c. A dual-axis chart comparing sales and profit margins over time.



- ❖ Create a new Sheet in the Sheet Pane.
- ❖ Name the Sheet Appropriately.
- ❖ Drag Sales and Profit from Data Columns to the Row Shelf. Right-click on any one of the columns (Sales or Profit), and choose the option Dual Axis to combine the two metrics into one chart.

- ❖ Now Drag **Order Date** from the **Data Columns** to the **Column Shelf**. Right-click on the **Order Date** in the **Column Shelf**, and choose **Month** instead of **Year** in the options.
 - ❖ Right-click on the **Right Vertical axis** in the chart, and choose **Synchronize Axis**.
 - ❖ If you aren't seeing a Bar Chart, go to the **Marks Pane** and choose the **Mark Type** as **Bar** instead of **Automatic**.
4. Create a Dashboard from the Sheet Pane and drag and drop all the Sheets into the Dashboard in any preferred layout. You may save the workbook for future use.



Exercise 3

Analysing Sales Performance

Create various visualizations to analyze the sales performance.

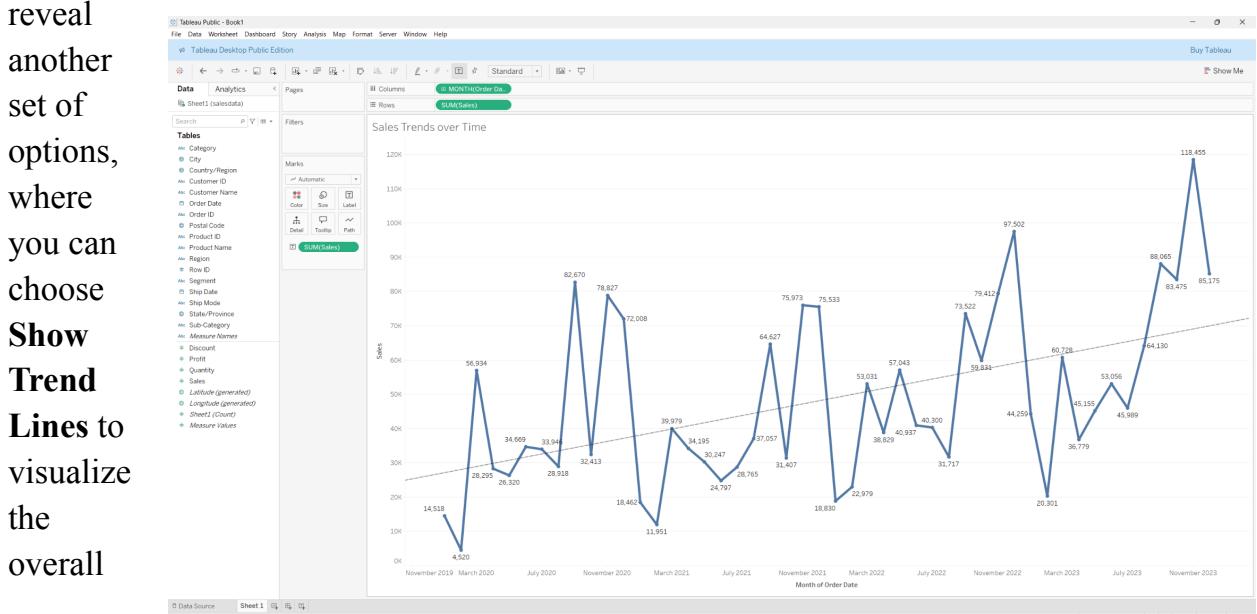
- Create a line chart to show sales trends over time.
- Create a bar chart to compare sales across different regions.
- Use a pie chart to display the distribution of sales among different product categories.
- Create a dashboard combining these visualizations to provide an overall view of sales performance.

You may obtain the dataset at:

https://github.com/themohitnair/DVLab/blob/main/Tableau-PowerBI-Exercises-Part-A/PA_ex3/salesdata.xlsx (same dataset used for Exercise 1)

Procedure

1. Import the excel file in Tableau.
2. Navigate to Sheet 1 using the Sheet Pane.
3. Create Visualization:
 - a. Create a line chart to show sales trends over time.
 - ❖ Name the Sheet appropriately.
 - ❖ Drag **Sales** from the **Data Columns** to the **Row Shelf**.
 - ❖ Drag **Order Date** from the **Data Columns** to the **Column Shelf**. Right-click the **Order Date** on the **Column Shelf** and choose **Month** instead of **Year**.
 - ❖ Right-click anywhere on the sheet to view options. Hover on the **Trend Lines** option to reveal another set of options, where you can choose **Show Trend Lines** to visualize the overall trend.

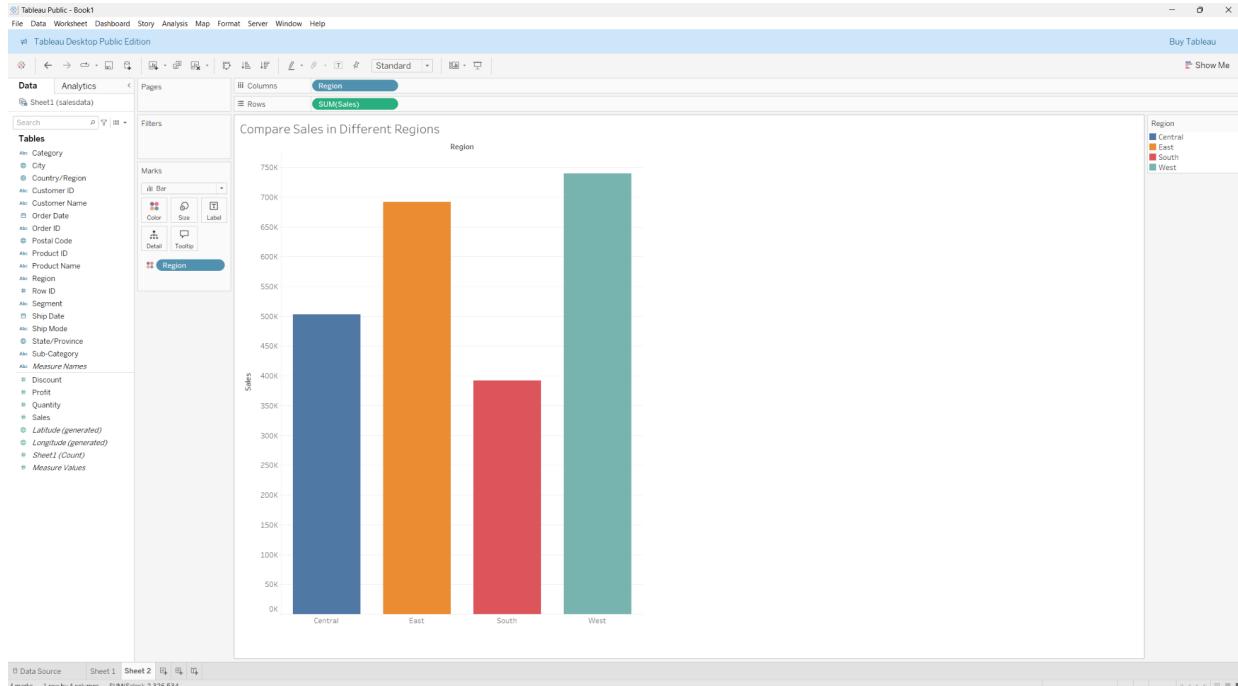


trend in your Line Chart.

- ❖ If a line chart did not show, change the **Mark Type** in the **Marks Pane** from **Automatic** to **Line**.
- ❖ Drag **Sales** from **Data Columns** to the **Label Tab** in the **Marks Pane**.
- ❖ You may tweak the **Sizes** and **Colors** in the Scatter plot from the **Marks Pane**.

b. Create a bar chart to compare sales across different regions.

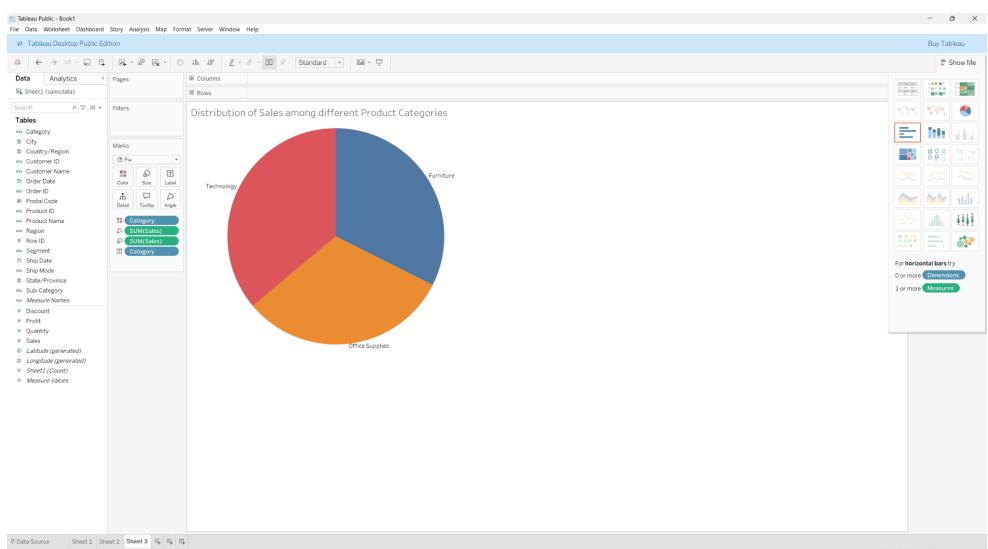
- ❖ Create a new **Sheet** from the **Sheet Pane**.



- ❖ Name the Sheet appropriately.
- ❖ Drag **Region** to the **Column Shelf** from the **Data Columns**.
- ❖ Drag **Sales** to the **Row Shelf** from the **Data Columns**.
- ❖ Change **Mark Type** to **Bar** in the **Marks Pane**.
- ❖ Now drag the **Region** Column to the **Color Tab** in the **Marks Pane**.

c. Use a pie chart to display the distribution of sales among different product categories.

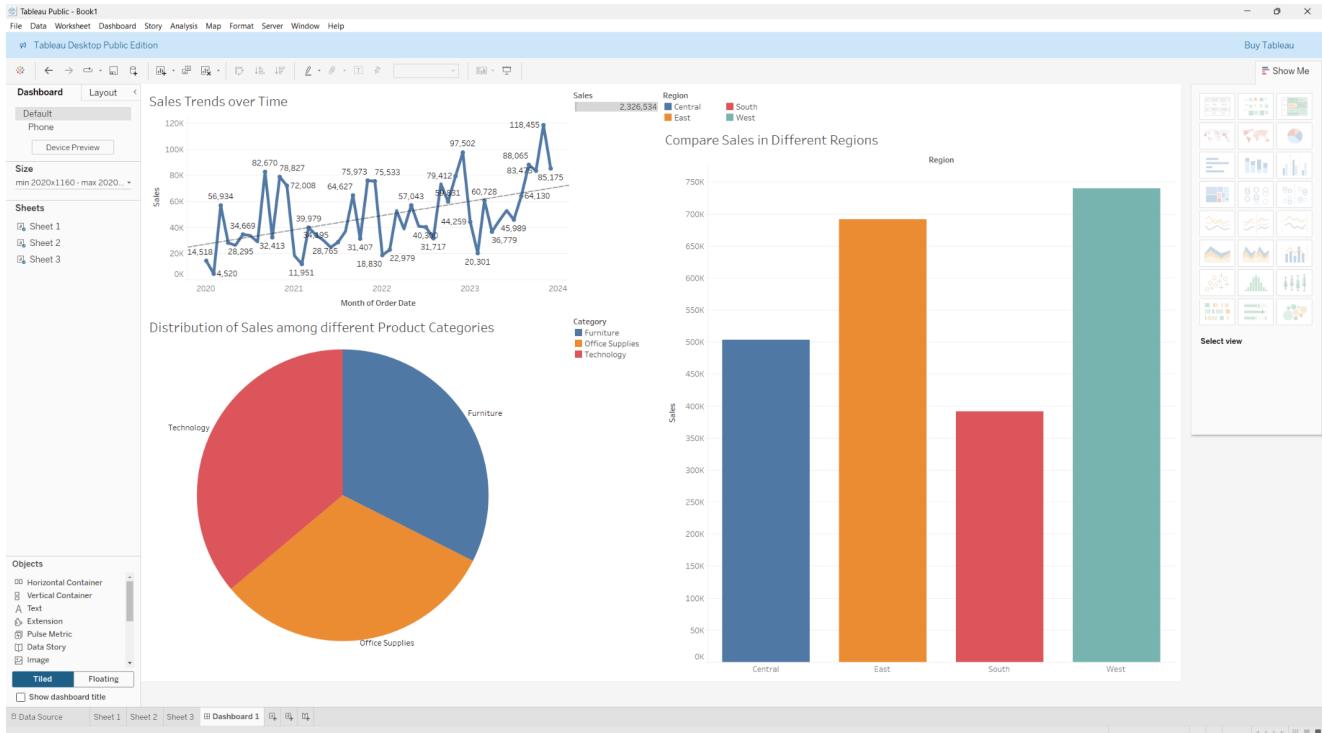
- ❖ Create a new **Sheet** from the **Sheet Pane**.
- ❖ Name the Sheet appropriately.
- ❖ Drag the **Category** **Column** from the **Data Columns** to



Column Shelf. Drag the Sales from the **Data Columns** to the **Row Shelf**.

- ❖ Click on the **Show Me** dropdown on the Top Right, and choose the Pie Chart Option (the Sixth one). A pie chart will appear on your sheet once you do this.
- ❖ Now, drag the **Category** Column from the **Data Columns** to the **Label Tab** in the **Mark Pane**. This will label all the different colors according to their categories in the Pie Chart.

4. Create a Dashboard from the Sheet Pane and drag and drop all the Sheets into the Dashboard in any preferred layout. You may save the workbook for future use.



Exercise 4

Financial Performance Dashboard

Create a comprehensive dashboard to monitor the financial performance of a company.

- Create a combination of line and bar charts to compare actual revenue and expenses against budgeted figures.
- Use a gauge chart to display key financial metrics such as net profit margin.
- Create a waterfall chart to show the contribution of different factors to the overall profit.
- Design an interactive dashboard that allows users to filter data by different time periods (e.g., monthly, quarterly, yearly).

You may obtain the dataset at:

https://github.com/themohitnair/DVLab/blob/main/Tableau-PowerBI-Exercises-Part-A/PA_ex4/financial.xlsx

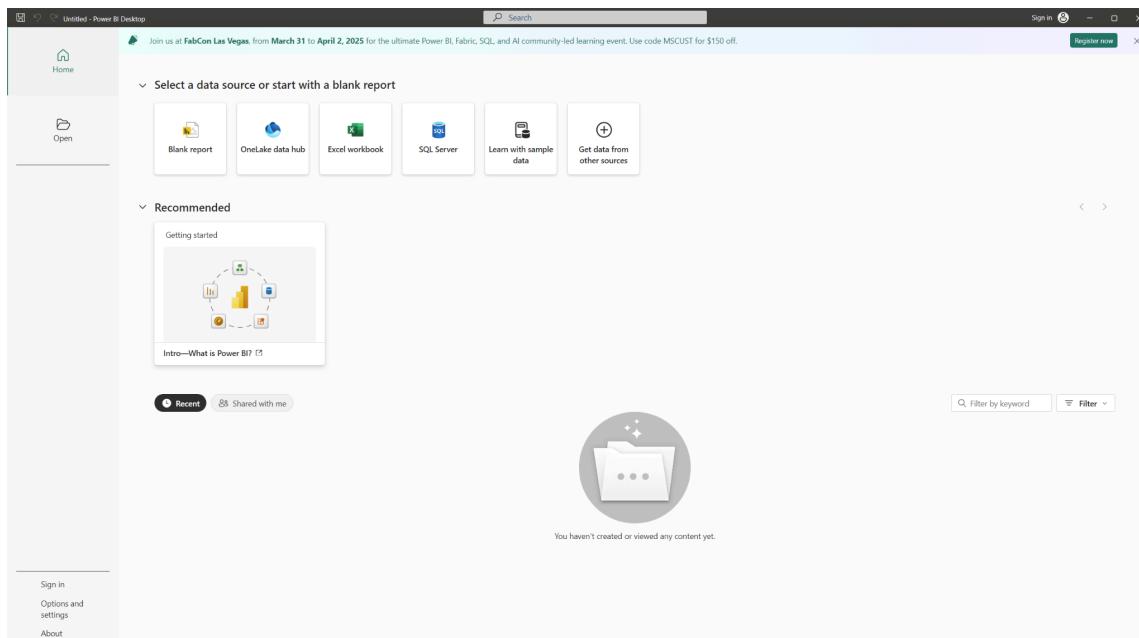
Gauge Charts and Waterfall Charts are only available in PowerBI. So, this manual will use PowerBI Desktop for Exercise 4.

Installation of PowerBI Desktop can be done in Windows 10 or 11 using the instructions given in the link:

<https://learn.microsoft.com/en-us/power-bi/fundamentals/desktop-get-the-desktop>

General Instructions

1. Since we are using Excel Data files, choose Excel Workbook after opening PowerBI Desktop.



- Choose the given Excel Data file and click Load.

Navigator

Display Options ▾

financial.xlsx [1]

financial

Date	Category	Actual Revenue	Actual Expenses	Budgeted Revenue
01-01-2023	Product A	50000	30000	
01-01-2023	Product B	60000	35000	
01-01-2023	Product C	70000	40000	
01-02-2023	Product A	52000	31000	
01-02-2023	Product B	63000	36000	
01-02-2023	Product C	72000	41000	
01-03-2023	Product A	53000	32000	
01-03-2023	Product B	64000	37000	
01-03-2023	Product C	74000	42000	
01-04-2023	Product A	54000	33000	
01-04-2023	Product B	65000	38000	
01-04-2023	Product C	75000	43000	
01-05-2023	Product A	55000	34000	
01-05-2023	Product B	66000	39000	
01-05-2023	Product C	76000	44000	
01-06-2023	Product A	56000	35000	
01-06-2023	Product B	67000	40000	
01-06-2023	Product C	77000	45000	
01-07-2023	Product A	57000	36000	
01-07-2023	Product B	68000	41000	
01-07-2023	Product C	78000	46000	
01-08-2023	Product A	58000	37000	
01-08-2023	Product B	69000	42000	

Load Transform Data Cancel

Vocabulary

United - Power BI Desktop

File Home Insert Modeling View Optimize Help

Clipboard Report View Table View

Build visuals with your data

Select or drag fields from the Data pane onto the report canvas.

Visualizations pane

Data pane

Page pane

1. Visualizations

Pane: Contains Chart Types that you can use for different kinds of Visualizations

2. Data Pane:

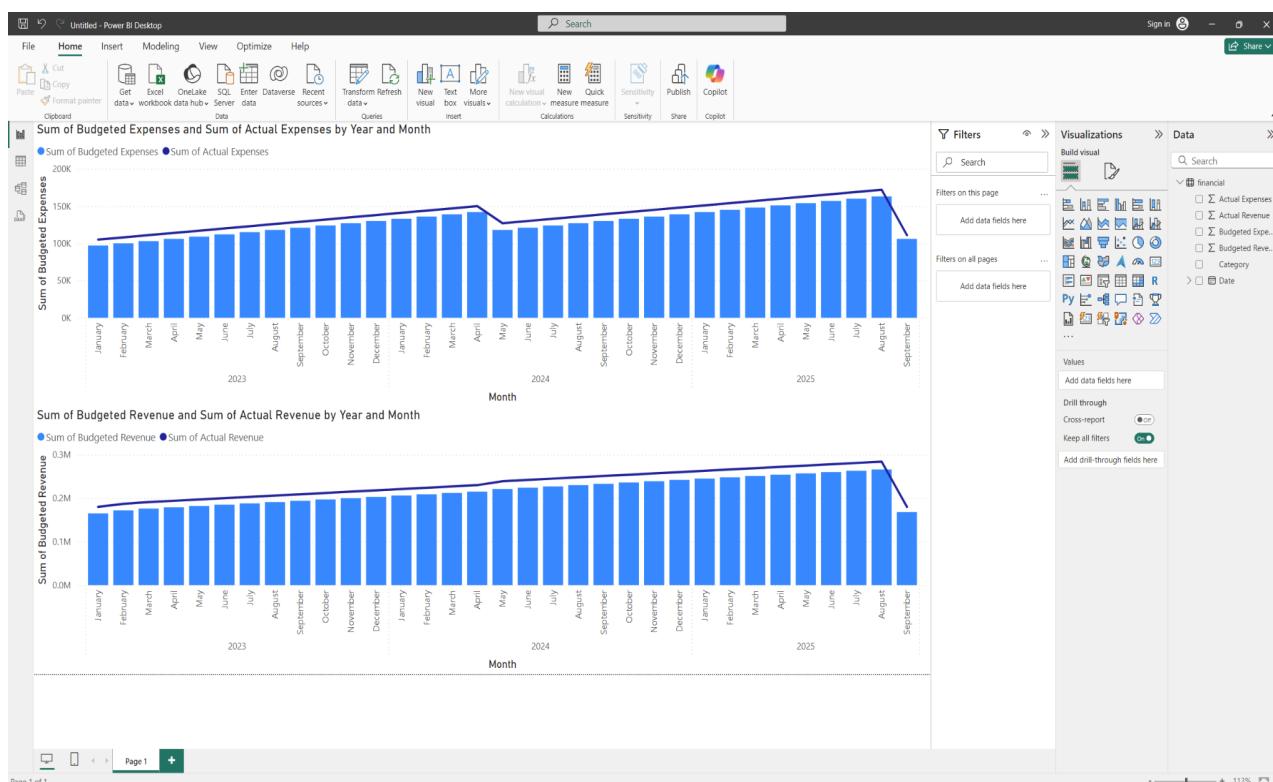
Equivalent to the Data Columns in the Vocabulary for Tableau Public.

Contains Columns from your Data file that you can drag into the Visualizations Pane to incorporate them into your report.

- 3. Report View:** The default view of charts in your report
- 4. Table View:** Shows all the columns and the data in your Data File. Useful to add new Columns to the Data and incorporate them into your Dashboard.
- 5. Page Pane:** Used to Navigate among and create new Pages to add Charts and Visualizations.
- 6. Important Charts/Visualization Types for this exercise:** Listed from top:
 - Line and Stacked Column Chart
 - Waterfall Chart
 - Gauge Chart

Procedure

1. Open PowerBI Desktop using the given Excel Data file.
2. Create Visualizations:
 - a. Create a combination of line and bar charts to compare actual revenue and expenses against budgeted figures.
 - ❖ Click on **Line and Stacked Column Chart** from the **Visualizations Pane** (first one shown in the picture under Vocabulary heading above), and place it on the Page.
 - ❖ Drag **Actual Expenses** from **Data Pane** to the **Visualizations Pane** under **Line y-axis**.
 - Drag **Budgeted Expenses** from the **Data Pane** to the **Visualizations Pane** under **Column y-axis**.
 - ❖ Drag **Date** from the **Data Pane** to the **Visualizations Pane** under **X-axis**.



- ❖ You may remove unnecessary indications such as **Quarter** and **Day** from the **X-axis** metric under the **Visualizations Pane**.
 - ❖ Follow the same Procedure from Step 3 to 5 for **Actual Revenue** and **Budgeted Revenue**. This would result in two combined **Line and Bar Charts** comparing Actual and **Budgeted figures** for **Expenses** and **Revenue**.
- b. Use a gauge chart to display key financial metrics such as net profit margin.
- ❖ To use **Net Profit Margin** in our reports, we need Columns such as **Profit** and **Net Profit Margin**.

$$\text{Profit} = \text{Actual Revenue} - \text{Actual Expenses}$$

$$\text{Net Profit Margin (\%)} = \frac{\text{Profit}}{\text{Actual Revenue}} \times 100$$

- ❖ Navigate to **Table View**. Click on any of the Columns in your table, and click on the **New Column** option that appears on top.

Date	Category	Actual Revenue	Actual Expenses	Budgeted Revenue	Budgeted Expenses
01 January 2023	Product A	50000	30000	45000	28000
01 January 2023	Product B	60000	35000	55000	32000
01 January 2023	Product C	70000	40000	65000	37000
01 February 2023	Product A	52000	31000	47000	29000
01 February 2023	Product B	63000	36000	58000	33000
01 February 2023	Product C	72000	41000	67000	38000
01 March 2023	Product A	53000	32000	48000	30000
01 March 2023	Product B	64000	37000	59000	34000
01 March 2023	Product C	74000	42000	69000	39000
01 April 2023	Product A	54000	33000	49000	31000

- ❖ Clear the **formula input** (the input bar in the above picture with ‘`Column =`’ in it) and type in the following: (Here, financial is the name of the Data File you are using)

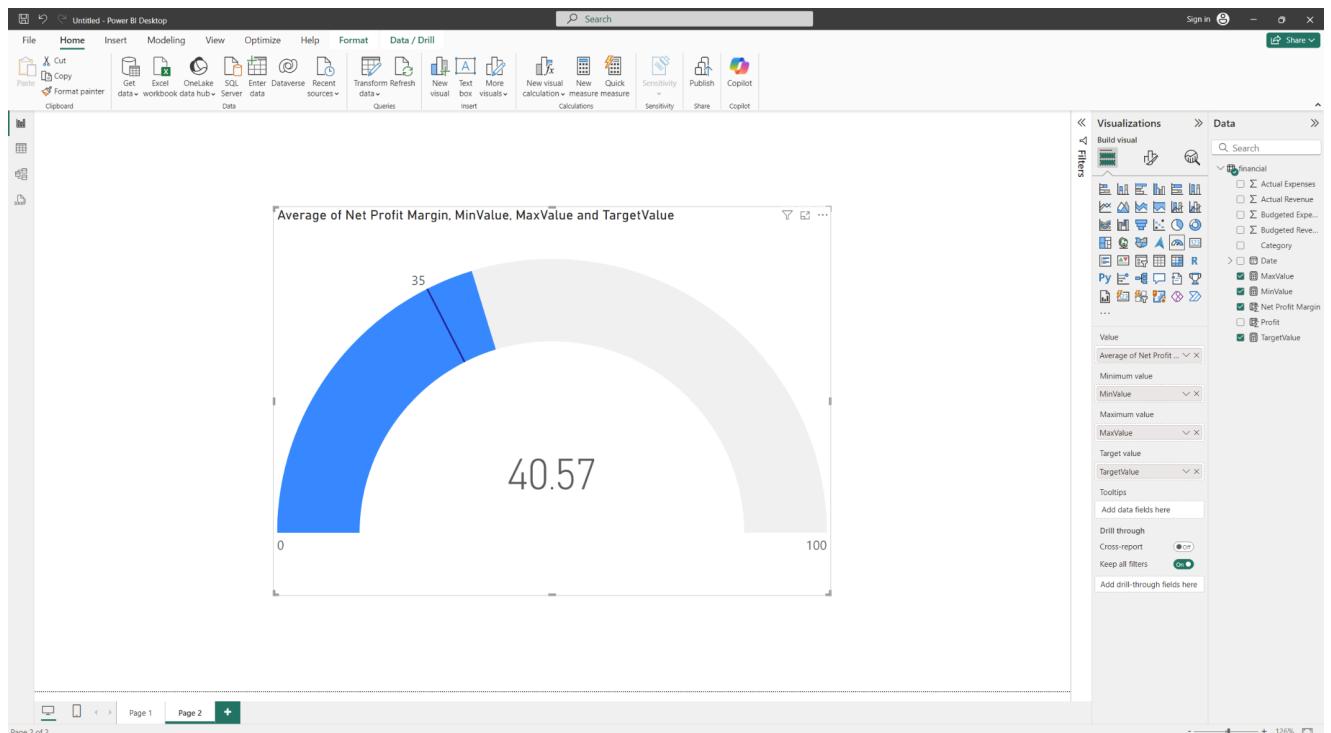
```
Profit = financial[Actual Expenses] - financial[Actual Revenue]
```

- ❖ Follow the same procedure to add a column called **Net Profit Margin** to the Data. Use the formula: (Here, financial is the name of the Data File you are using)

```
Net Profit Margin = (financial[Profit] / financial[Actual Revenue]) * 100
```

Date	Category	Actual Revenue	Actual Expenses	Budgeted Revenue	Budgeted Expenses	Profit	Net Profit Margin
01 January 2023	Product A	50000	30000	45000	28000	20000	40
01 January 2023	Product B	60000	35000	55000	32000	25000	41.66666666666667
01 January 2023	Product C	70000	40000	65000	37000	30000	42.8571428571429
01 February 2023	Product A	52000	31000	47000	29000	21000	40.3846153846154
01 February 2023	Product B	63000	36000	58000	33000	27000	42.8571428571429
01 February 2023	Product C	72000	41000	67000	38000	31000	43.0555555555556
01 March 2023	Product A	53000	32000	48000	30000	21000	39.622641509434
01 March 2023	Product B	64000	37000	59000	34000	27000	42.1875
01 March 2023	Product C	74000	42000	69000	39000	32000	43.2432432432432
01 April 2023	Product A	54000	33000	49000	31000	21000	40.00000000000001

- ❖ Now go back to the default **Report View** where your charts are located. Use the **Page Pane** to create a new Page.
- ❖ Click on **Gauge Chart** from the **Visualizations Pane** (third one shown in the picture under Vocabulary heading above), and place it on the new Page.
- ❖ Now, click on the **New Measure** option appearing on the **Top Bar**. This Option allows you to use figures in your visualizations without having to create new Columns.
- ❖ In the **Input Field** that appears, enter `.MaxValue = 100`. This creates a new measure in your columns, called **.MaxValue**, that you can use.
- ❖ Follow the same to create two other values: `.MinValue = 0` and `.TargetValue = 35`.



- ❖ Now, click on the **Gauge Chart** in your page to activate the **Visualizations Pane**. From the **Data Pane**, drag **Net Profit Margin** to the **Value Field** in the **Visualizations Pane**. Click on the **Net Profit Margin** that was just dragged, and click **Average**, instead of **Sum**. This would let us create the **Gauge Chart** with the average of the **Net Profit Margin** values in the Column.
 - ❖ Now drag **.MaxValue** from the **Data Pane** to the **Maximum Value** field in the **Visualizations Pane**. Similarly, drag the **.MinValue** from the **Data Pane** to the **Minimum Value** field and the **.TargetValue** from the **Data Pane** to the **Target Field**.
- c. Create a waterfall chart to show the contribution of different factors to the overall profit.
- ❖ Use the **Page Pane** to create a new Page.
 - ❖ Click on **Waterfall Chart** from the **Visualizations Pane** (second one shown in the picture under Vocabulary heading above), and place it on the new Page.
 - ❖ From the **Data Pane**, drag **Category** to the **Category Field** in the **Visualizations Pane**.

- ❖ Drag **Profit** from the **Data Pane** to the **Y-axis** field in the **Visualizations Pane**.
 - ❖ Drag any one of the values: **Budgeted Expenses**, **Budgeted Revenue**, **Actual Expenses** or **Actual Revenue** to the **Breakdown Field** in the **Visualizations Pane**. This would give you the **Waterfall Chart** corresponding to the effect of the chosen field on the **Profit** value based on product **Category**.
3. Your multi-page dashboard/report is now ready. You may save it for future use.



Note:

All Exercises and Instructions are pushed to the repository at:
<https://github.com/themohitnair/DVLab>