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ASSIGNMENT-5

Part B: Assignments based on R & Python

Aim:

Perform the following data visualization operations using Tableau on Adult and Iris datasets

1. **1D (Linear) Data visualization**
2. **2D (Planar) Data Visualization**
3. **3D (Volumetric) Data Visualization**
4. **Temporal Data Visualization**
5. **Multidimensional Data Visualization**
6. **Tree/ Hierarchical Data visualization**
7. **Network Data visualization**

Introduction

Data visualization or data visualization is viewed by many disciplines as a modern equivalent of visual communication. It involves the creation and study of the visual representation of data, meaning "information that has been abstracted in some schematic form, including attributes or variables for the units of information".

Data visualization refers to the techniques used to communicate data or information by encoding it as visual objects (e.g., points, lines or bars) contained in graphics. The goal is to communicate information clearly and efficiently to users. It is one of the steps in data analysis or data science

1D/Linear

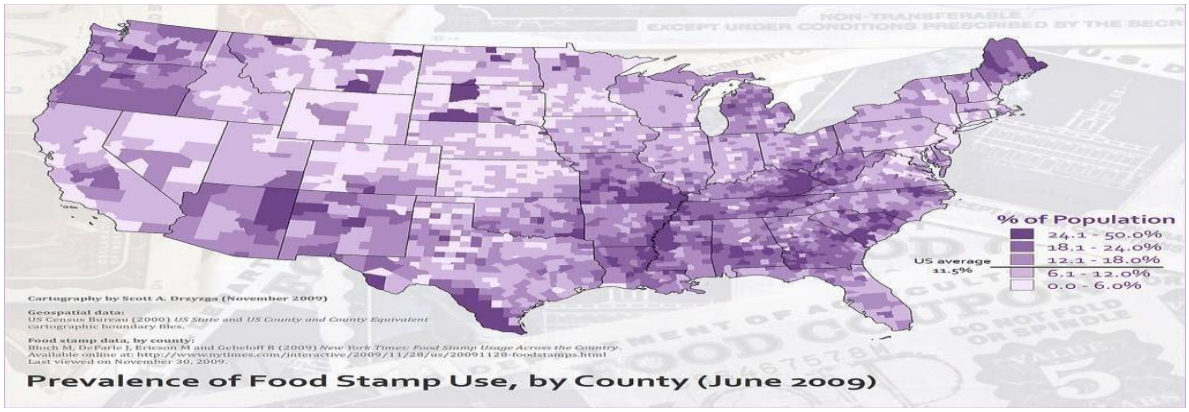
Examples:

- lists of data items, organized by a single feature (e.g., alphabetical order) (not commonly visualized)

2D/Planar (especially geospatial)

Examples (geospatial):

- **choropleth**



3D/Volumetric

3D/Volumetric

Broadly, examples of scientific visualization:

- 3D computer models

In 3D computer graphics, **3D modeling** (or **three-dimensional modeling**) is the process of developing a mathematical representation of any *surface* of an object (either inanimate or living) in three dimensions via specialized software. The product is called a **3D model**. Someone who works with 3D models may be referred to as a **3D artist**. It can be displayed as a two-dimensional image through a process called *3D rendering* or used in a computer simulation of physical phenomena. The model can also be physically created using 3D printing devices.

- surface and volume rendering

Rendering is the process of generating an image from a model, by means of computer programs. The model is a description of three-dimensional objects in a strictly defined language or data structure. It would contain geometry, viewpoint, texture, lighting, and shading information. The image is a digital image or raster graphics image. The term may be by analogy with an "artist's rendering" of a scene. 'Rendering' is also used to describe the process of calculating effects in a video editing file to produce final video output.

Volume rendering is a technique used to display a 2D projection of a 3D discretely sampled data set. A typical 3D data set is a group of 2D slice images acquired by a CT or MRI scanner. Usually these are acquired in a regular pattern (e.g., one slice every millimeter) and usually have a regular number of image pixels in a regular pattern. This is an example of a regular volumetric grid, with each volume element, or voxel represented by a single value that is obtained by sampling the immediate area surrounding the voxel.

- computer simulations

Computer simulation is a computer program, or network of computers, that attempts to simulate an abstract model of a particular system. Computer

simulations have become a useful part of mathematical modeling of many natural systems in physics, and computational physics, chemistry and biology; human systems in economics, psychology, and social science; and in the process of engineering and new technology, to gain insight into the operation of those systems, or to observe their behavior.[6] The simultaneous visualization and simulation of a system is called visulation.

Temporal

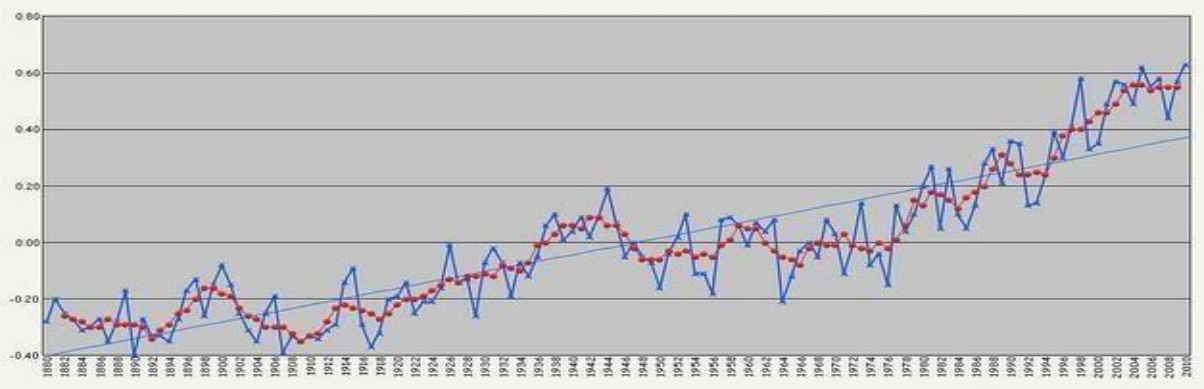
Examples:

- **timeline**

Tools: SIMILE Timeline, TimeFlow, Timeline JS, Excel

Image:
Friendly, M. & Denis, D. J. (2001). Milestones in the history of thematic cartography, statistical graphics, and data visualization. Web document, http://www.datavis.ca/milestones/. Accessed: August 30, 2012.

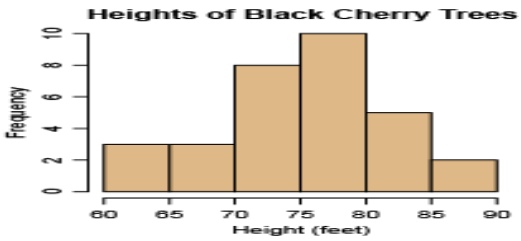
- **time series**



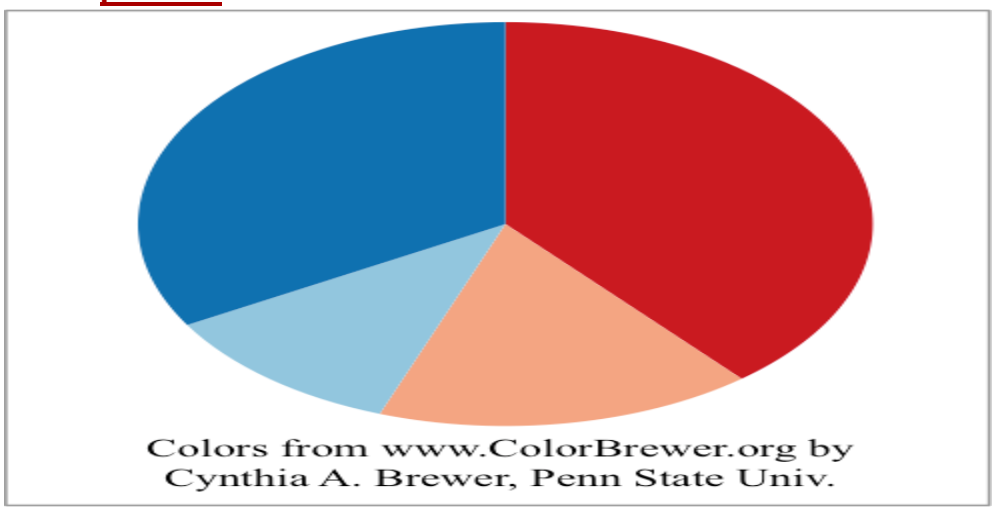
nD/Multidimensional

Examples (category proportions, counts):

- **histogram**



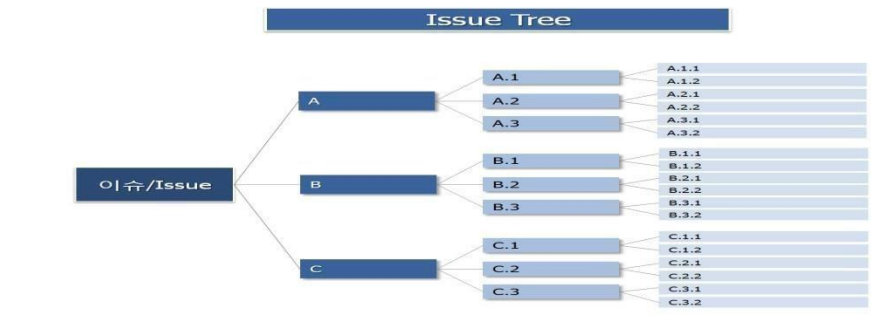
- **pie chart**



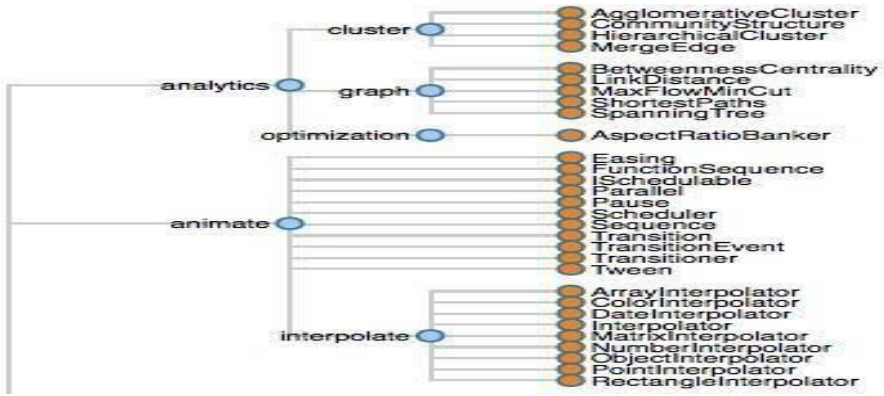
Tree/Hierarchical

Examples:

- **general tree visualization**



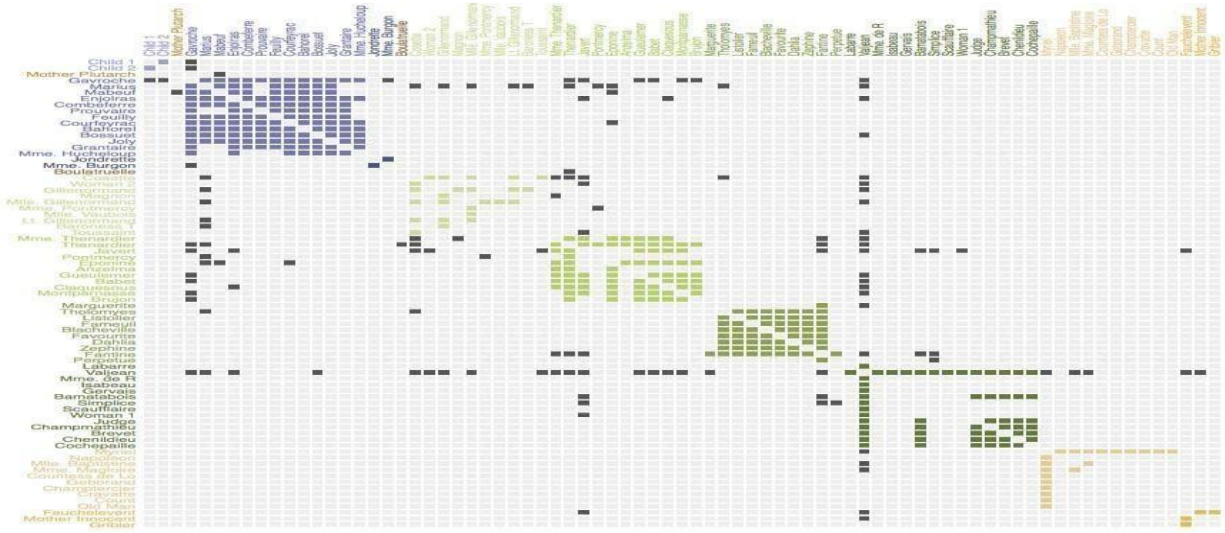
- **dendrogram**



Network

Examples:

- **matrix**



- **node-link diagram (link-based layout algorithm)**

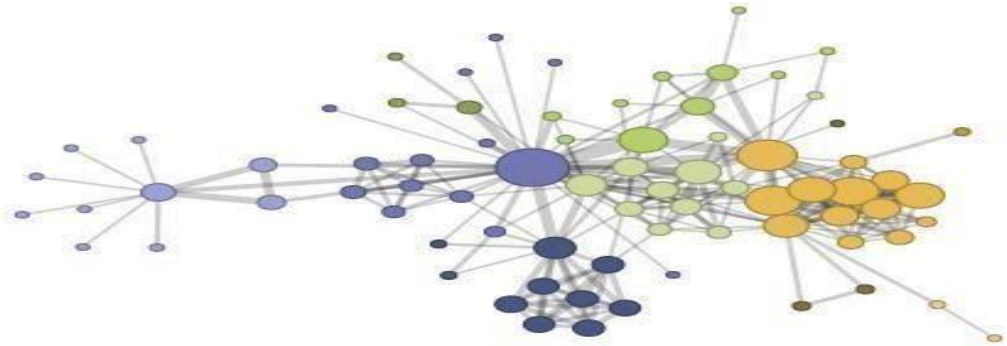


Tableau:

Tableau is a Business Intelligence tool for visually analyzing the data. Users can create and distribute an interactive and shareable dashboard, which depict the trends, variations, and density of the data in the form of graphs and charts. Tableau can connect to files, relational and Big Data sources to acquire and process data. The software allows data blending and real-time collaboration, which makes it very unique. It is used by businesses, academic researchers, and many government organizations for visual data analysis. It is also positioned as a leader Business Intelligence and Analytics Platform in Gartner Magic Quadrant.

Tableau Features:

Tableau provides solutions for all kinds of industries, departments, and data environments. Following are some unique features which enable Tableau to handle diverse scenarios.

- **Speed of Analysis** − As it does not require high level of programming expertise, any user with access to data can start using it to derive value from the data.

- **Self-Reliant** − Tableau does not need a complex software setup. The desktop version which is used by most users is easily installed and contains all the features needed to start and complete data analysis.
- **Visual Discovery** − The user explores and analyzes the data by using visual tools like colors, trend lines, charts, and graphs. There is very little script to be written as nearly everything is done by drag and drop.
- **Blend Diverse Data Sets** − Tableau allows you to blend different relational, semi structured and raw data sources in real time, without expensive up-front integration costs. The users don't need to know the details of how data is stored. **Architecture Agnostic** − Tableau works in all kinds of devices where data flows. Hence, the user need not worry about specific hardware or software requirements to use Tableau.
- **Real-Time Collaboration** − Tableau can filter, sort, and discuss data on the fly and embed a live dashboard in portals like SharePoint site or Salesforce. You can save your view of data and allow colleagues to subscribe to your interactive dashboards so they see the very latest data just by refreshing their web browser. **Centralized Data** − Tableau server provides a centralized location to manage all of the organization's published data sources. You can delete, change permissions, add tags, and manage schedules in one convenient location. It's easy to schedule extract refreshes and manage them in the data server. Administrators can centrally define a schedule for extracts on the server for both incremental and full refreshes.

There are three basic steps involved in creating any Tableau data analysis report.

These three steps are −

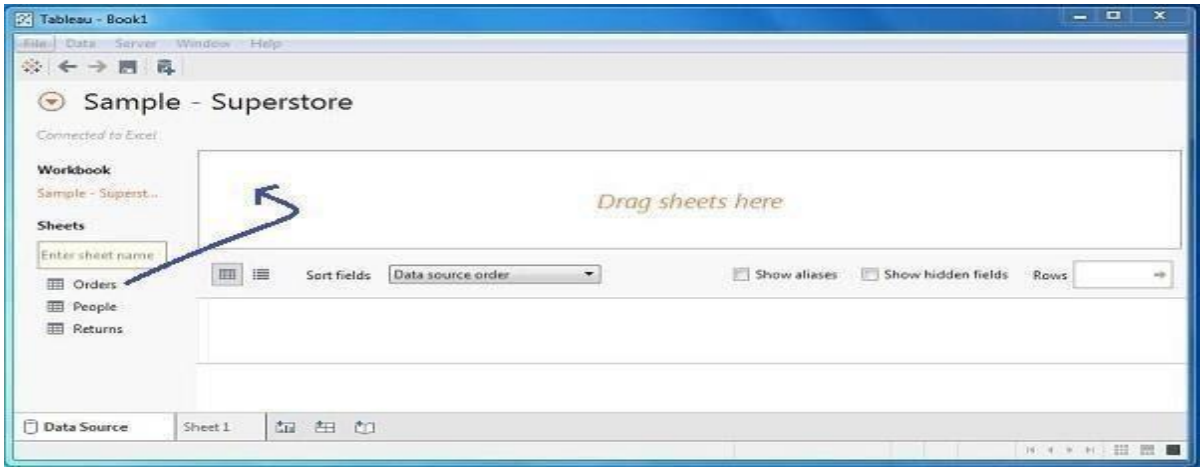
- **Connect to a data source** − It involves locating the data and using an appropriate type of connection to read the data. **Choose dimensions and measures** − This involves selecting the required columns from the source data for analysis. **Apply**

visualization technique − This involves applying required visualization methods, such as a specific chart or graph type to the data being analyzed.

For convenience, let's use the sample data set that comes with Tableau installation named sample – superstore.xls. Locate the installation folder of Tableau and go to **My Tableau Repository**. Under it, you will find the above file at **Datasources\9.2\en_USUS**.

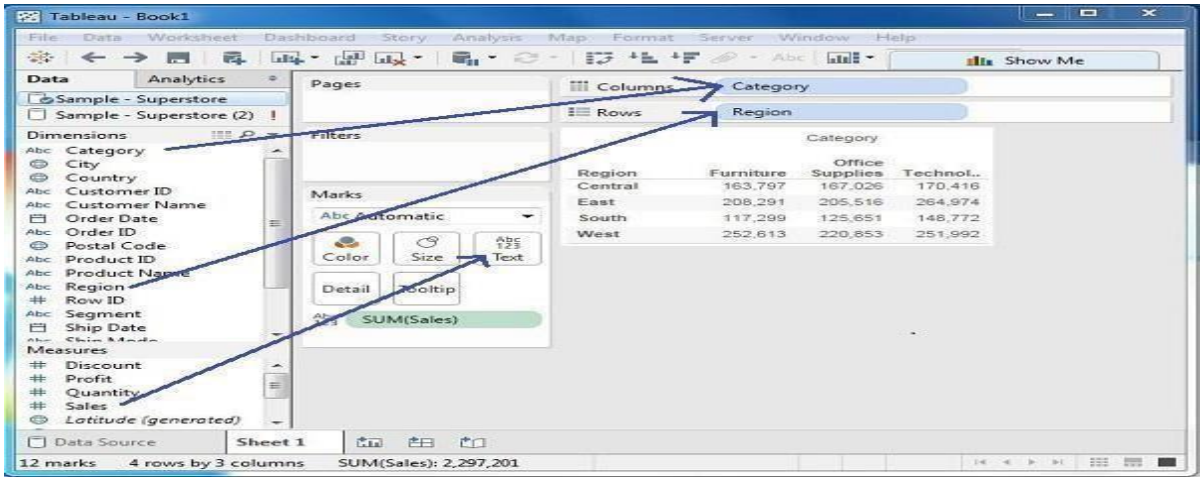
Connect to a Data Source

On opening Tableau, you will get the start page showing various data sources. Under the header **"Connect"**, you have options to choose a file or server or saved data source. Under Files, choose excel. Then navigate to the file **"Sample – Superstore.xls"** as mentioned above. The excel file has three sheets named Orders, People and Returns. Choose **Orders**.



Choose the Dimensions and Measures

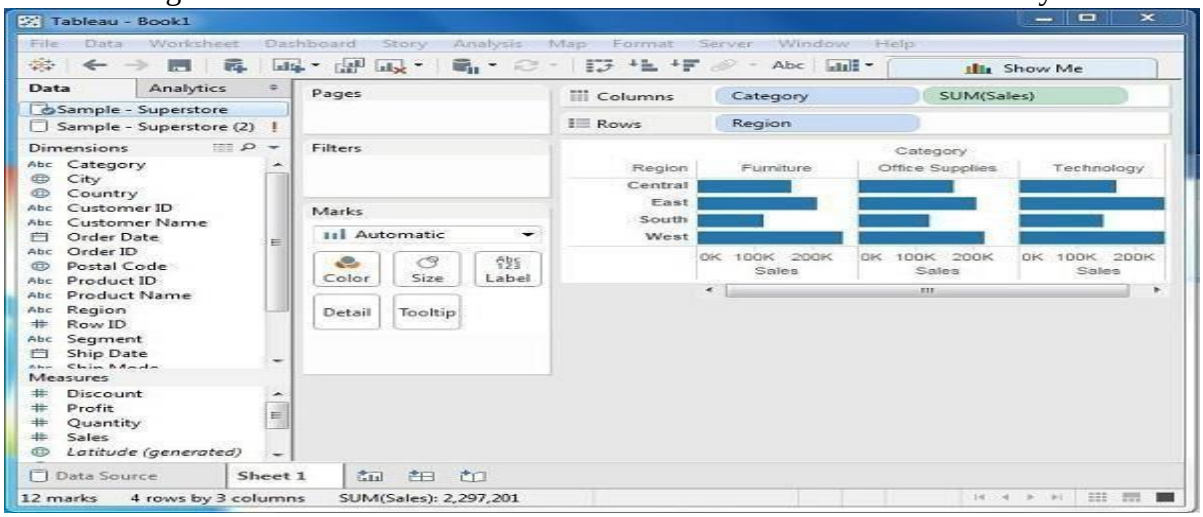
Next, choose the data to be analyzed by deciding on the dimensions and measures. Dimensions are the descriptive data while measures are numeric data. When put together, they help visualize the performance of the dimensional data with respect to the data which are measures. Choose **Category** and **Region** as the dimensions and **Sales** as the measure. Drag and drop them as shown in the following screenshot. The result shows the total sales in each category for each region.



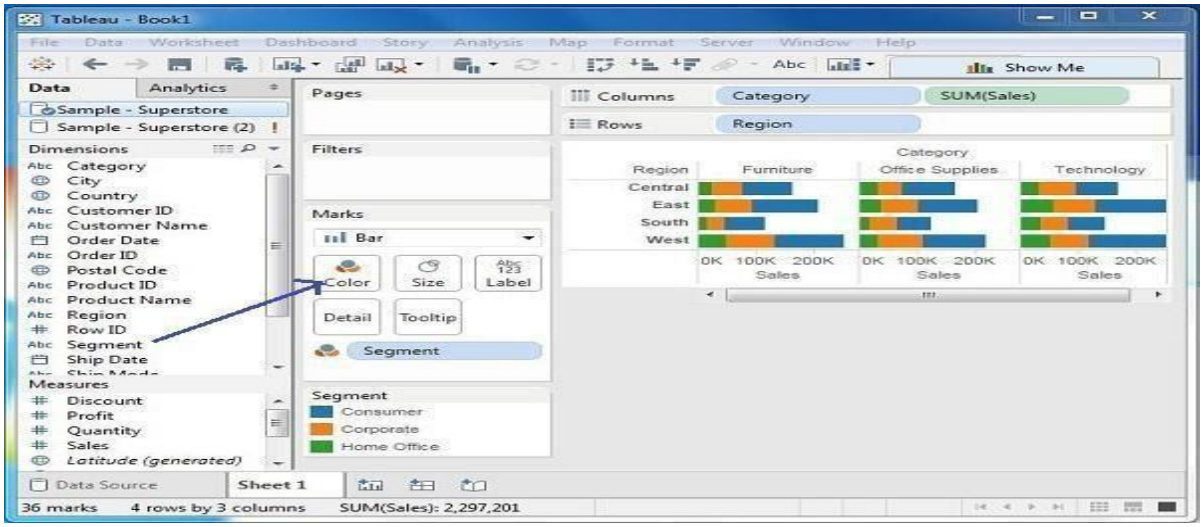
Apply Visualization Technique

In the previous step, you can see that the data is available only as numbers. You have to read and calculate each of the values to judge the performance. However, you can see them as graphs or charts with different colors to make a quicker judgment.

We drag and drop the sum (sales) column from the Marks tab to the Columns shelf. The table showing the numeric values of sales now turns into a bar chart automatically.



You can apply a technique of adding another dimension to the existing data. This will add more colors to the existing bar chart as shown in the following screenshot.

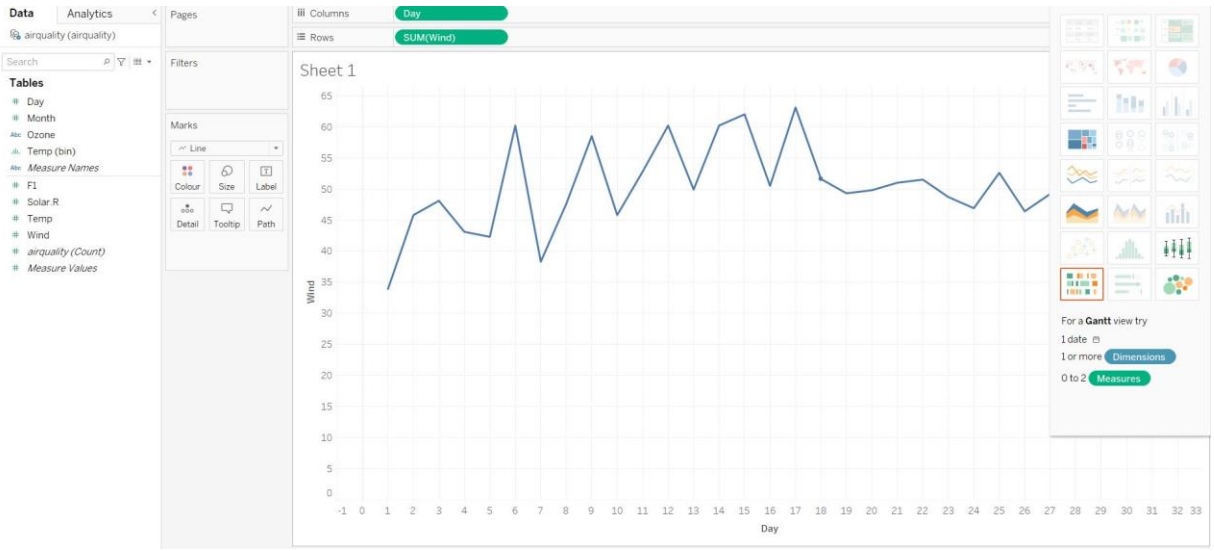


Conclusion: Thus we have learnt how to Visualize the data in different types (1 1D (Linear) Data visualization,2D (Planar) Data Visualization, 3D (Volumetric) Data Visualization, Temporal Data Visualization,Multidimensional Data Visualization, Tree/ Hierarchical Data visualization, Network Data visualization) by using Tableau Software.

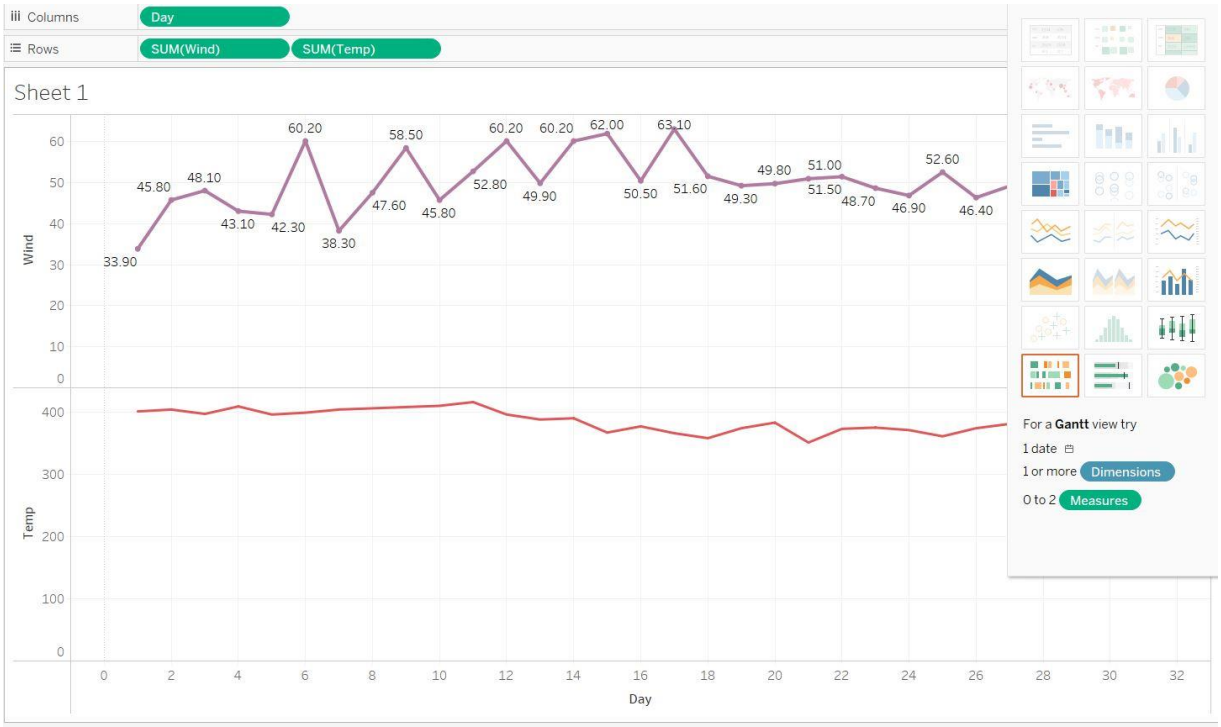
EXECUTION:

DATA SET USED: AIRQUALITY DATASET

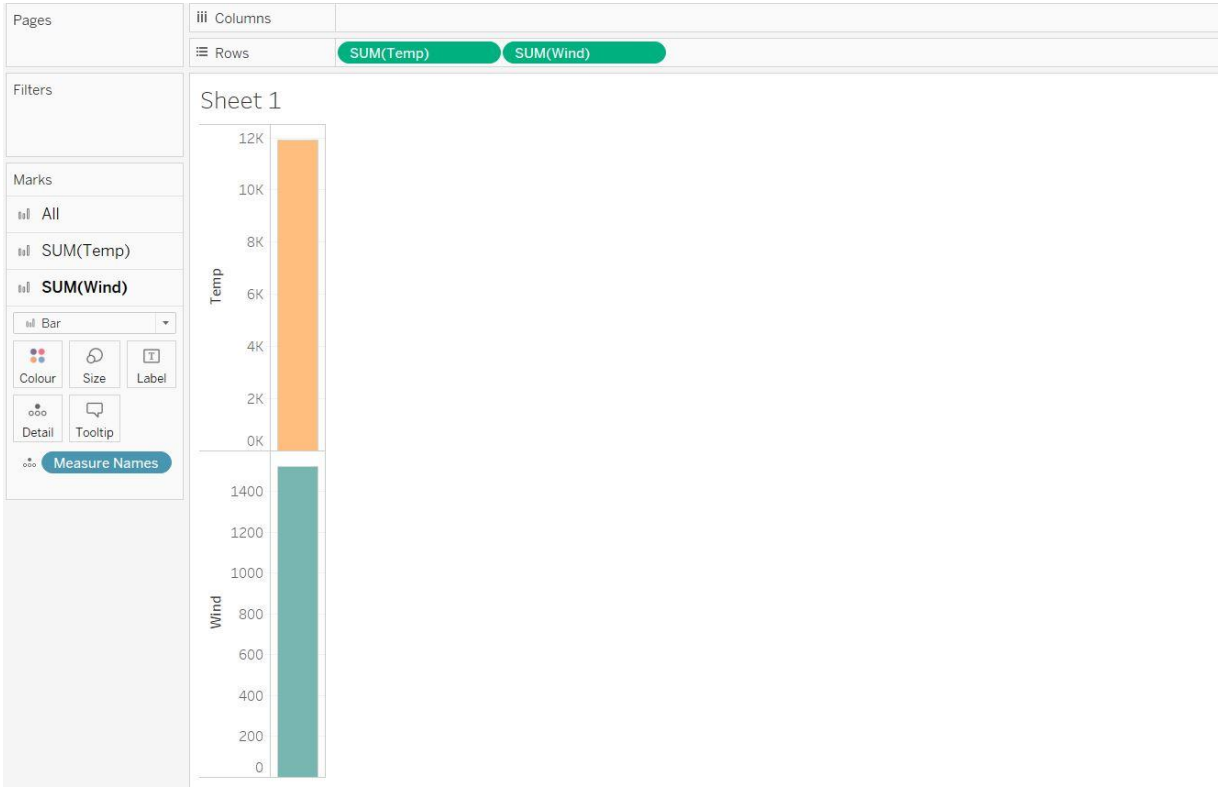
1.LINE GRAPH-



2.LINE GRAPH-(for 2 data field)

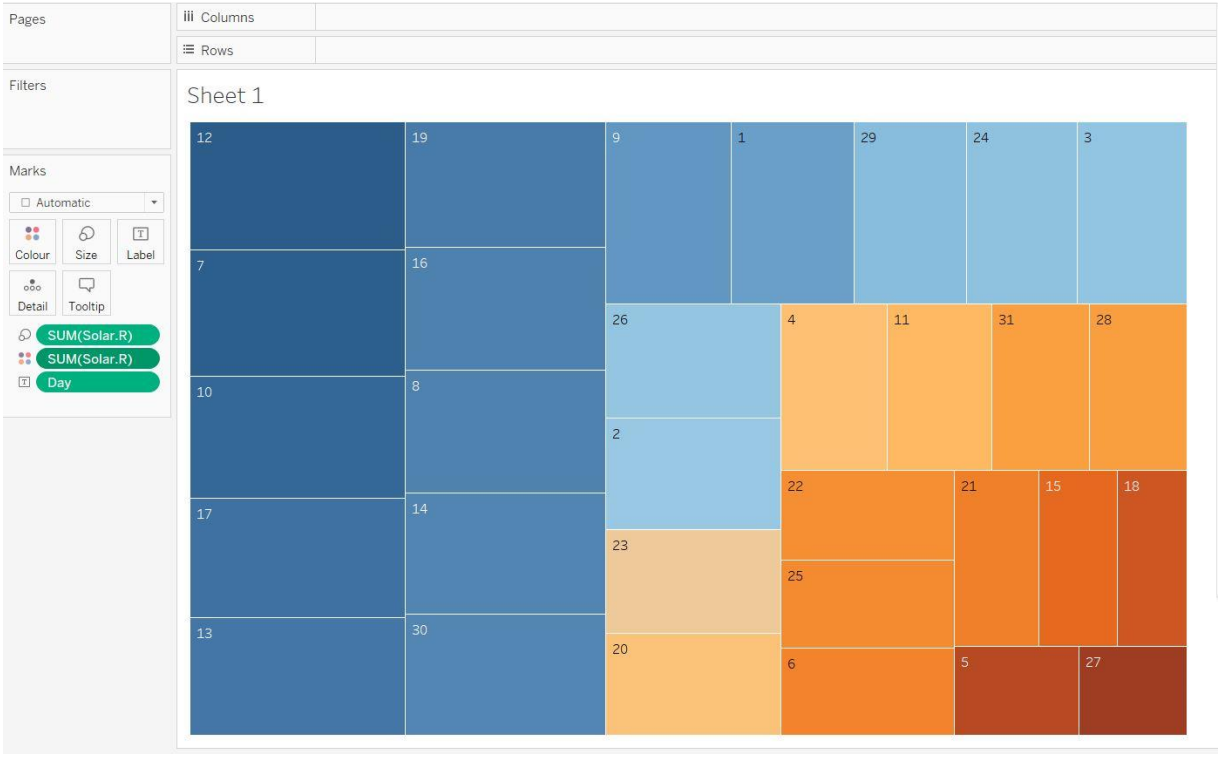


3.BAR GRAPH-(for 2 data field)

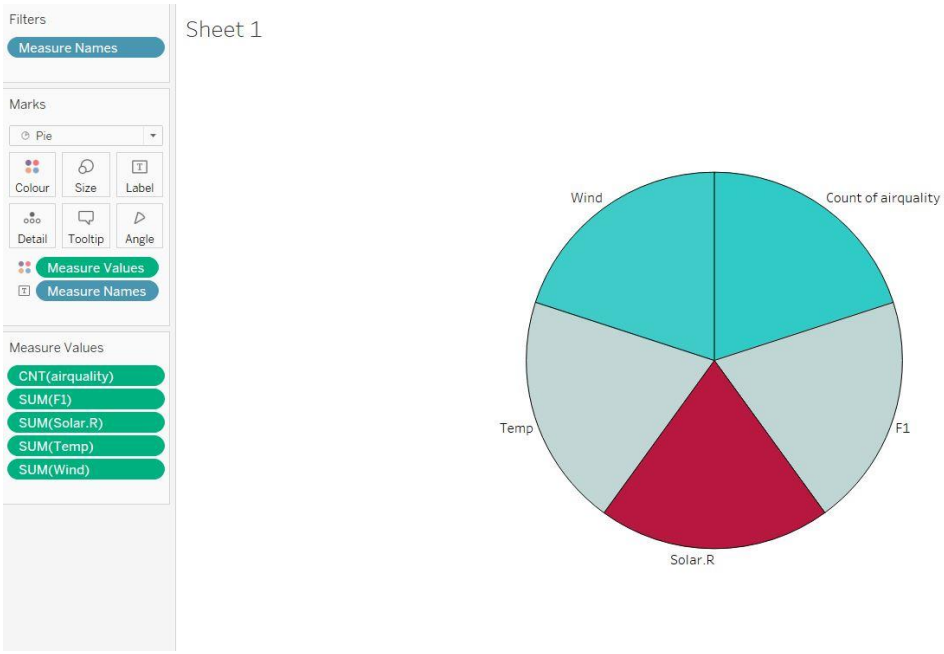


4.BAR GRAPH

5.HIGHLIGHT TABLE-

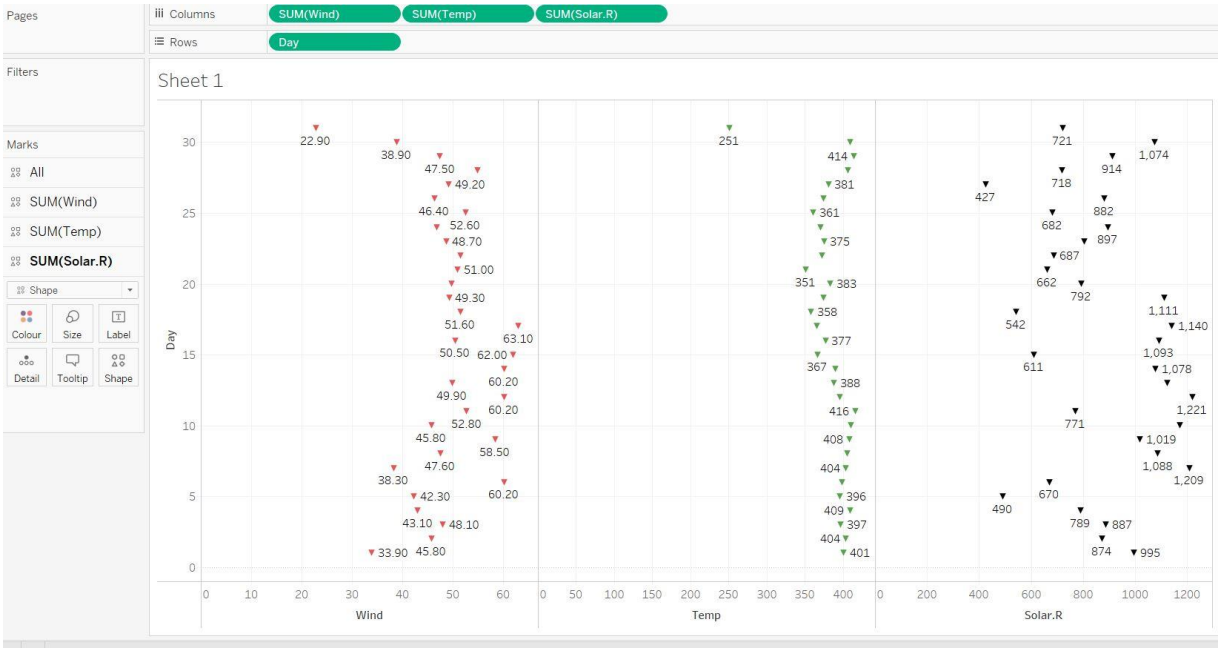


6.PIE CHART-



7.SHAPE-

8.SHAPE-(for 3 data field)



9.AREA -

10.GANTT BAR-

Pages
Columns
Day
Rows
SUM(Wind)
SUM(Solar.R)
Filters
Marks
All
SUM(Wind)
Gantt Bar
Colour
Size
Label
Detail
Tooltip
SUM(Solar.R)
Sheet 1
Wind
60
50
40
30
20
10
0
Solar.R
1200
1000
800
600
400
200
0
0
2
4
6
8
10
12
14
16
18
20
22
24
26
Day