- Data visualization is the graphic representation of data.
- It involves producing images that communicate relationships among the represented data to viewers of the images
- This communication is achieved through the use of a systematic mapping between graphic marks and data values in the creation of the visualization.

Data Visualization

➤ This mapping establishes how data values will be represented visually, determining how and to what extent a property of a graphic mark, such as size or colour, will change to reflect change in the value of a datum.

➤ Data visualization aims to communicate data clearly and effectively through graphical representation. Data visualization has been used extensively in many applications for Eg. Business, health care, education etc.

➤ More popularly, data visualization techniques are used to discover data relationships that are otherwise not easily observable by looking at the raw data.

Data Visualization

Data Science Process
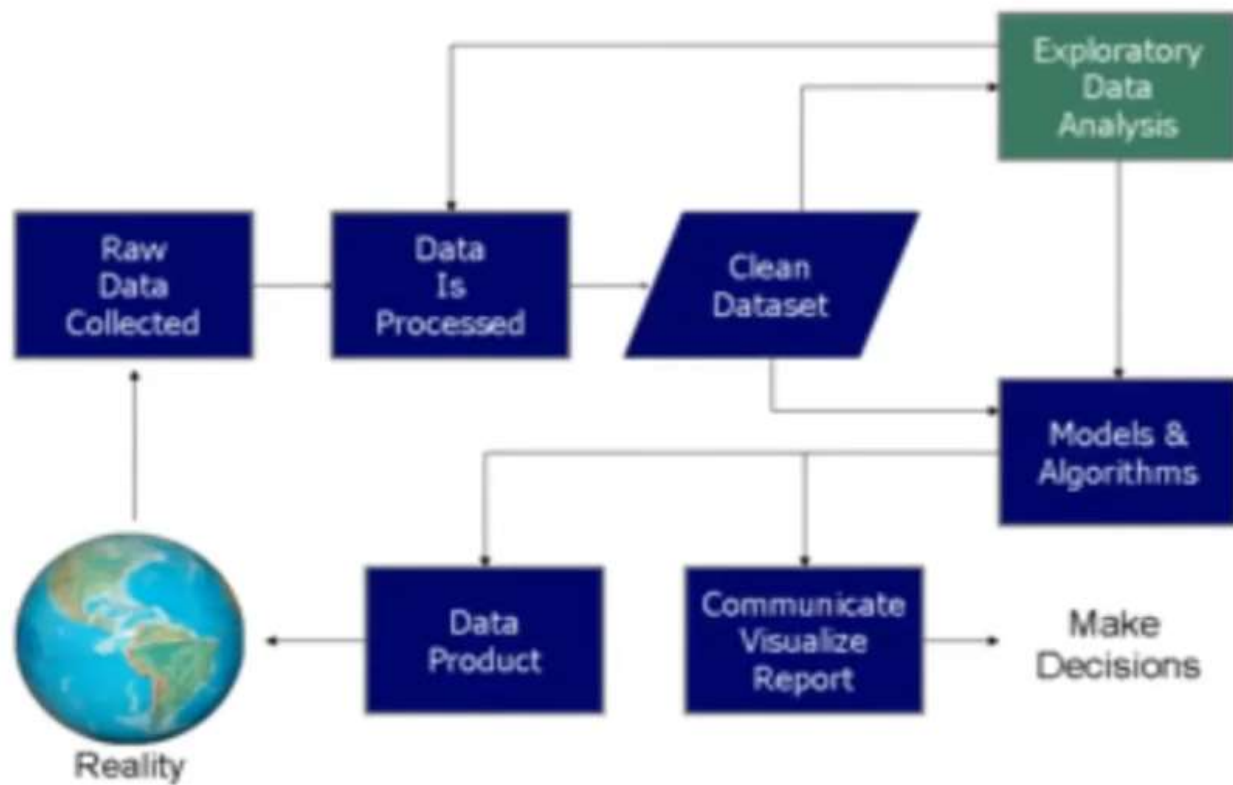
Data Visualization techniques

- ➢ Pixel oriented visualization techniques
- ➢ Geometric Projection visualization techniques
- ➢ Icon based visualization techniques
- ➢ Hierarchical visualization techniques (i.e. subspaces)

Pixel oriented visualization techniques

➢ A simple way to visualize the value of a dimension is to use a pixel where the colour of the pixel reflects the dimension's value.

➢ For a data set of m dimensions pixel oriented techniques create m windows on the screen, one for each dimension.

➢ The m dimension values of a record are mapped to m pixels at the corresponding position in the windows.

Pixel oriented visualization techniques

➤ The colour of the pixel reflects other corresponding values.

➤ Inside a window, the data values are arranged in some global order shared by all windows.

Case Study

➤ All Electronics maintains a customer information table, which consists of 4 dimensions: income, credit_limit, transaction_volume and age.

➤ We analyse the correlation between income and other attributes by visualization.

➤ We sort all customers in income in ascending order and use this order to layout the customer data in the 4 visualization windows as shown in fig.

Pixel oriented visualization techniques
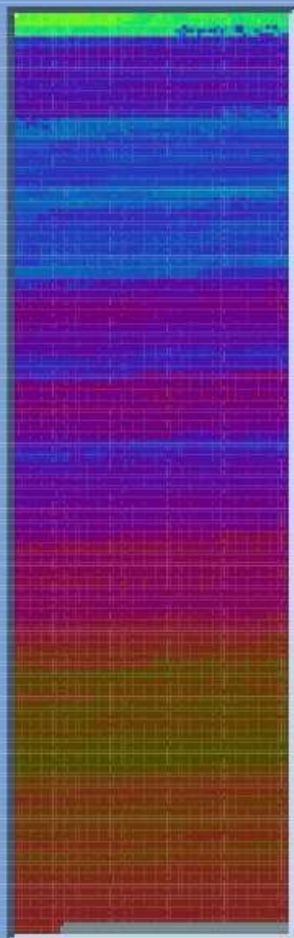

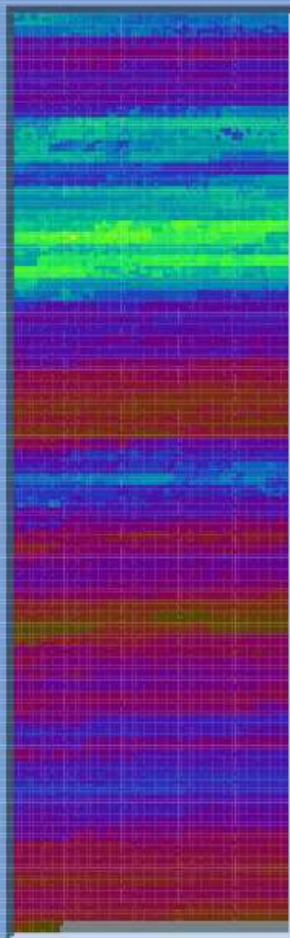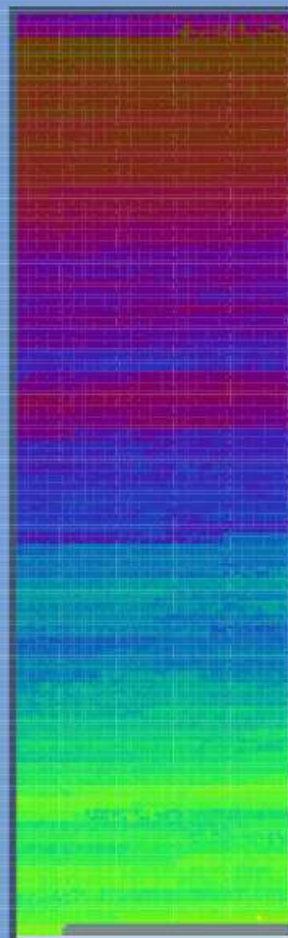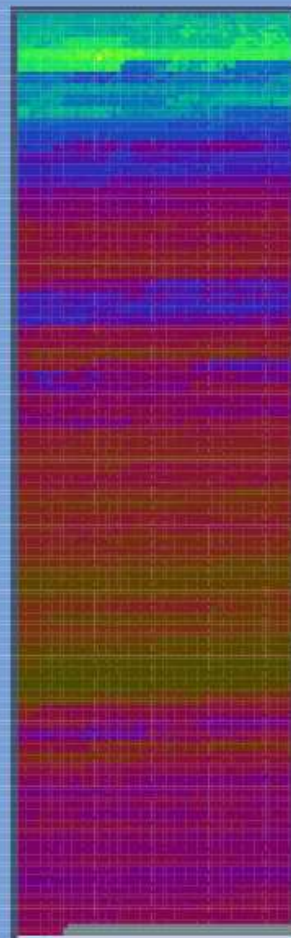Income   credit_limit   transaction_volume   age

Pixel oriented visualization techniques

➤ The pixel colours are chosen so that the smaller the value, the lighter the shading.

➤ Using pixel based visualization we can easily observe that credit_limit increases as income increases customer whose income is in the middle range are more likely to purchase more from All Electronics, these is no clear correlation between income and age.

Geometric Projection visualization techniques

➢ A drawback of pixel-oriented visualization techniques is that they cannot help us much in understanding the distribution of data in a multidimensional space.

➢ Geometric projection techniques help users find interesting projections of multidimensional data sets.

➢ A scatter plot displays 2-D data point using Cartesian co-ordinates. A third dimension can be added using different colours of shapes to represent different data points.

Geometric Projection visualization techniques

Example

➢ Where x and y are two spatial attributes and the third dimension is represented by different shapes

➢ Through this visualization, we can see that points of types "+" &"X" tend to be collocated.

Geometric Projection visualization techniques
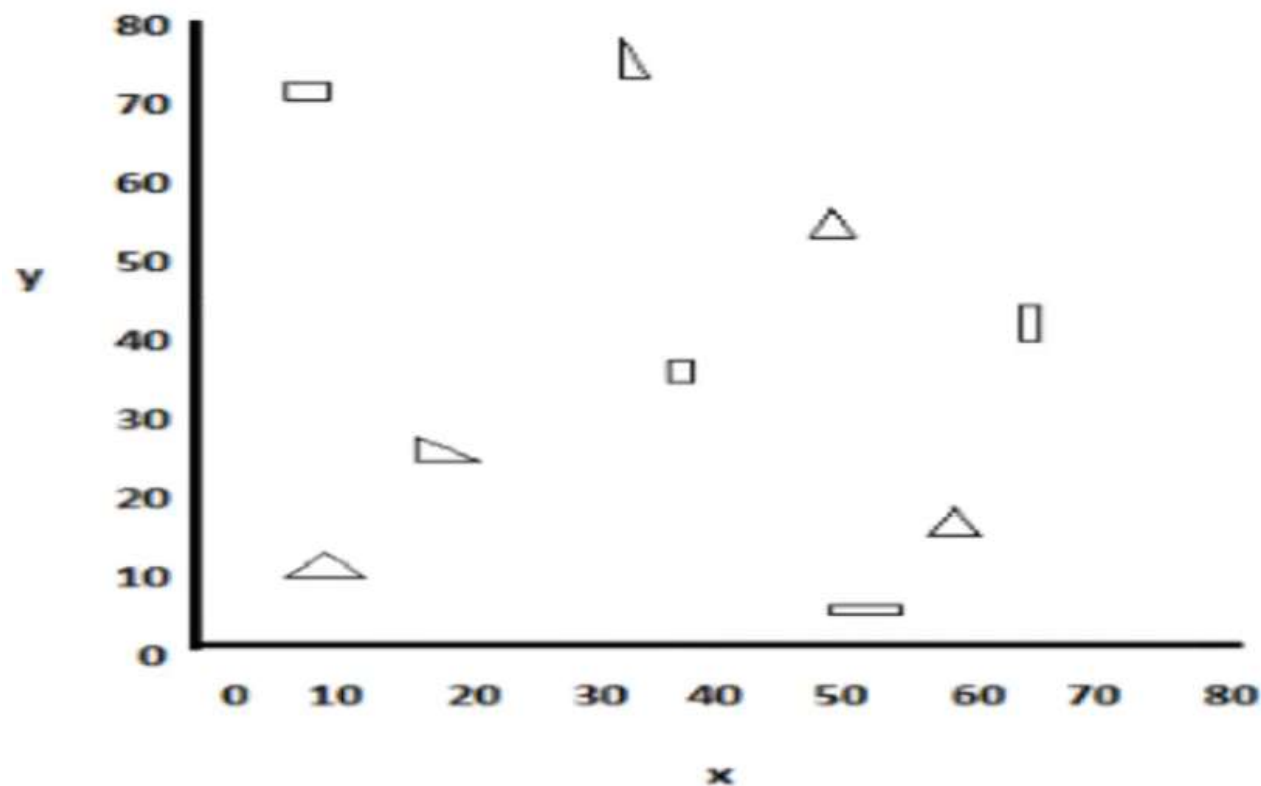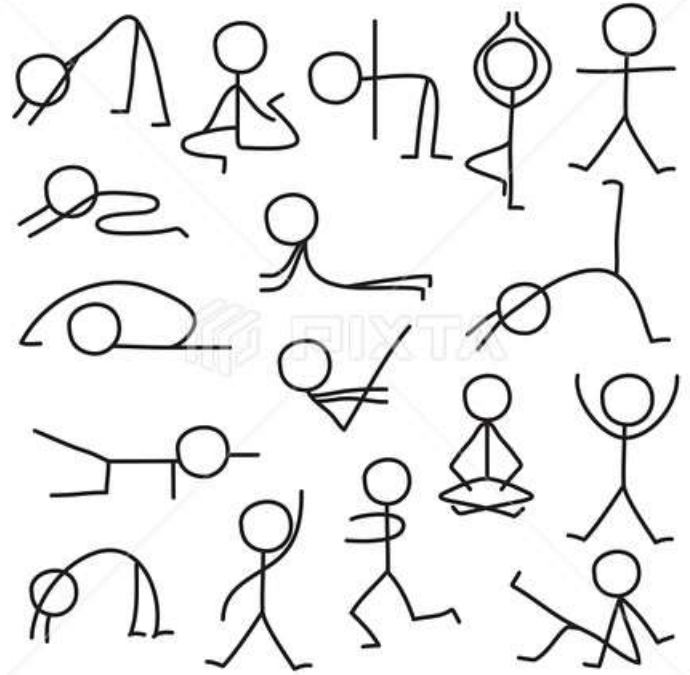
Icon based visualization techniques

➢ It uses small icons to represent multidimensional data values

➢ 2 popular icon based techniques:-

• **A.Chern off faces:**

➢ They display multidimensional data of up to 18 variables as a cartoon human face.

# Icon based visualization techniques

B. Stick figures:

➢ It maps multidimensional data to five –piece stick figure, where each figure has 4 limbs and a body.

➢ Dimensions are mapped to the display axes and the remaining dimensions are mapped to the angle and/ or length of the limbs.

Hierarchical visualization techniques (i.e. subspaces)

➢ The subspaces are visualized in a hierarchical manner. So it's important to show how one set of data values compares to another one or more data value sets.

➢ A **dendrogram** is an illustration of a hierarchical clustering of various data sets, helping to understand their relations in an instant.

Hierarchical visualization techniques (i.e. subspaces)

Sales Orders By Countries
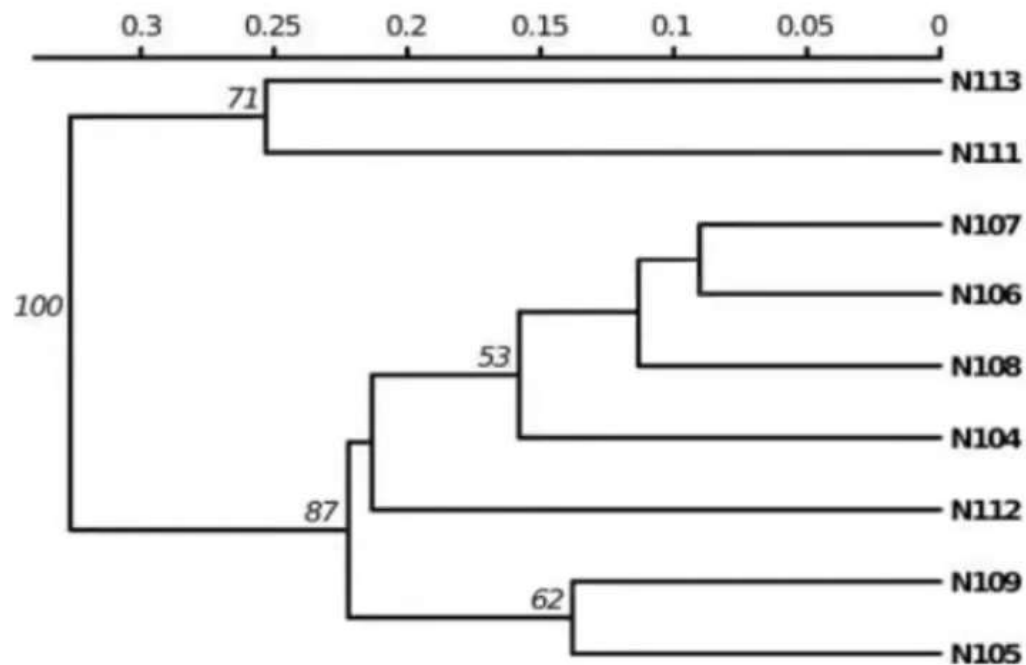
Visualizing Complex Data and Relations

➢ Ever-growing volume of data and its importance for business make data visualization an essential part of many companies' business strategies.

Data Visualization Choices

➢ **Audience, Content, Context, Dynamics, Purpose**

Data visualization techniques

➢ Charts(Line, Bar, Pie)

➢ Plots(Scatter)

➢ Maps(Geographical Maps)