A Glimpse of Data Visualization: Tools and Techniques

Dr.P.Dhanalakshmi,
Assistant Professor,
Department of Computer Science,
Sri Ramakrishna College of Arts & Science for Women,
Coimbatore, India

Abstract: *Every field revolves around data in some way or the other. Data Visualization plays a vital role to read and analyse the data. This can be achieved by transformation of data into a graphical form, such as Tree map, Heatmap, Dashboards etc. Today's emergence of extremely dynamic data visualisation is definitely a result of advances in processing and display technology. Modern data visualisation has been significantly influenced by computer science. The selection of the appropriate data visualisation tool is essential. This paper serves as an overview of data visualisation tools and techniques.*

Keywords: *Data Visualization, Tools, Techniques*

1. INTRODUCTION

Data visualisation has a long and rich history that predates the invention of contemporary computers in terms of its form, logic, and syntax [1]. Data visualisation is a graphic portrayal of data, prototype outputs that is available to the end-user. Visualizations should be useful in such a way to analyse the data. Visualizations and tables allow the data to be more accessible to others and more understandable if done correctly [2]. It is a good technique for staff members or business owners to clearly deliver facts to non-technical audiences. Main advantage of data visualization is to exchange and explore in an easier and understandable way.

The visualization tool allows the user to select the data to be converted into graphical form. Data visualization technique allows the user to choose the chart type that suits the type of data to be visualized. The data is represented by different types of charts [3]. Computer-based visualisations are systems that provide a visual representation of datasets designed to aid people in performing tasks more effectively. Instead of substituting humans with computational decision-making systems, visualisation is effective when human capabilities need to be supplemented. Data Visualization acts as an external representation to effectively replace cognition with perception [4].

2. CATEGORIES OF VISUALIZATION

Different forms of data visualisation exist. The choice of data visualisation technique for the decision makers becomes a serious obstacle. The user should be knowledgeable about the various data visualisation techniques available in order to choose the appropriate type.

Accuracy, clarity, empowerment, and simplicity are the primary features of data visualisation. In addition to traditional visualisations like the switch table, pie chart, line chart, and bar chart there are several visualisation tools which are discussed subsequently. Data visualization depends on the designer, reader and the data used. This can be done in different

ways. An effective data visualisation should accurately depict the data and be simple to comprehend. It must be set up such that quick and correct decisions are made. The various types of data visualisation are the planar data visualization, volumetric data visualization and temporal data visualisation [5]. Interactive data visualization is a development of real-time analytics that enables users make the most of the analytical capabilities with the help of dashboards. A visualization system should perform a data reduction, transform and project the original dataset on a screen [6]. The descriptions of a handful of the unusual charts are presented in table2.1.

Multi-layer pie chart	These visual representations are useful for infographics and other visual displays of complex data.
Box-and-whisker Plots	These graphs show the ranges of the measured variables. outliers, the median, the mode, and where the majority of the data points fit within the "box".
Scatter Plot	This is used to examine the relationships between variables is the scatter plot. The data is represented on the graph as dots at the point where its two values overlap.
Funnel Chart	A funnel chart's main purpose is to show a sequential process from top to bottom.
Radar Chart	A radar chart is a visual representation of multivariate data that uses at least three quantitative variables in a two-dimensional chart.
Area Chart	This is similar to line chart but the difference is that the region between the line's baseline and its values has been coloured. The semi-transparent colour fill makes it simple to read the overlapped parts.
Geospatial Map	A data map can be employed for variety of things, notably detailed geographical analysis.
Radial Wheel	This data widget is useful for many kinds of visual projects. It can be used for blogs, social media posts, infographics, statistical reports, and other projects.
Circuit diagram	A form of a flowchart that illustrates ideas like technical circuits, network configurations, and other technical connections is a circuit diagram
Timelines	These are graphic representations of events that have occurred or will occur over a certain period of time.
Mind map	This helps brainstorm, organize ideas and connect in order of hierarchy.
Choropleth map	A geographical representation of statistical information broken down by region is called a choropleth map.
Heat Map	Displays the level of instances as colour in two dimensions.
Treemap	A chart style that uses layered rectangles to display many, linked variables. [7]

Table 2.1

3. DATA VISUALIZATION TOOLS

Converting the data in the graphical format with the help of precise software is the fundamental need of modern business. Visualization tool is an integral part of the data visualization technology. Healthcare, Business Intelligence, Military, Finance, Data Science, Marketing, Real estate, Education, E-Commerce and many other applications use visualizations. They make decisions such as predicting market developments, identification of the problem, analysing customer purchase trends, accurate data analysis, exploring hidden patterns etc. Example of specific applications are: 1. Visual analysis of eye movements during micro-stories reading, to explore relationships among characteristics and to discover hidden relations that help to understand the cognitive process involved [8]. 2. An interactive web-based tool for visualizing hierarchical data [9]. 3. Evaluate the effectiveness of the security measures undertaken to protect a distributed system using Tableau [10]. The cognitive processing of candidates during reading tests: Evidence from eye-tracking [11]. Hence, understanding popular tools and their advantages is therefore crucial. Tableau is a tool used for complex visualization and simplification of complex data. It is a highly scalable and easily deployable [10]. According to Forbes 2022 Microsoft Power BI is on of the best Data Visualization tool and used for rich, dynamic data representations from a number of sources [12]. Enable creation and maintenance of data reports and dashboards and can safely exchange them between applications. Some open-source tools are listed below [13] in table 3.1.

Candela	An open-source collection of Python-based web visualisation components, has an emphasis on rich visualisations for data science scenarios.
Chartbuilder	A clear user experience is made possible by simple buttons and settings that consistently shows how visualisations appear on desktop and mobile browsers.
Google Data Studio	A Google Charts plugin, offers additional functions to build comprehensive reports using analytics.
Tableau Public	A free online tool for creating, exploring, and sharing data visualisations.[14]
Dygraphs	Digraphs can work with big data sets and generate fully interactive data representations.
R Shiny	Interactive web applications are built using R Shiny that can be put on a website, embed in R Markdown papers, or use in dashboards.
Google Charts	One of the greatest free data visualisation tools at the moment, boasting a user-friendly interface and dynamic data connectivity features.
High charts	This supports the majority of widely used languages, and offers a foundation for optionally additional coding customizations. It does offer adjustable licencing price, which is a drawback.
Klipfolio	Provides the option to customise your dashboard by adding original HTML scripts. Gives access to real-time data tracking the status of one's engagements.
Plotly	Plotly, an open-source tool offers strong tools for both data scientists and analysts to integrate their data visualisation online

	and produce interactive visualisation tools that allow users to develop their own insights on the fly.
Datawrapper	It offers coding-free data visualisation.
Microsoft Power BI	It is recognised as a pioneer in the development of systems for business information and analytics. Despite being a free platform for data visualisation, it is loaded with options for team collaboration, like interactive reports and shared dashboards.
RAWGraphs	RAW Graphs' web application lets to add data and modify charts and can then be exported as raster PNG pictures providing a lot of customization and presentation options, ensuring its security and safety.
Geckoboard	Geckoboard is a member of a series of interactive visualisation tools that enable non-programmers to generate stunning, potent, and dynamic data visualisations.
Leaflet	It is simple to learn for novice coders and works well across all platforms because to its legible source code and documentation. It is a component of a collection of free data visualisation tools with community support.
Zoho Analytics	Zoho Analytics, excels at producing stunning visualisations and intelligent dashboards in a matter of minutes.
iDashboards	iDashboards additionally promotes its user-friendly layout.
Domo	Domo uses artificial intelligence techniques to expand the use of its core technologies and prepare and visualise code in a group context.
FusionCharts	FusionCharts allows for a higher level of customisation to build beautiful web & mobile dashboards.
Infogram	Infogram is a highly-customizable dashboard in the manner of Microsoft Word that is compatible with Excel and the majority of other visualisation tools. Its drag-and-drop markdown menu design also makes it possible to generate strong reports, which raises the bar for data storytelling.
PivotTable.js	Users may now quickly browse data using a drag-and-drop interface. It is a cutting-edge approach for data storytelling.[15]

Table 3.1

4. FEATURES OF DATA VISUALIZATION TOOLS

Although there are many tools for data visualisation, the best ones generally share a few traits. The convenience of usage comes first. They can output several forms of maps, graphs, and charts. Cost effectiveness is also essential. Massive data sets can be handled by the top tools. A good tool should be justified by better features, decision-making ability, superior customer service, real time analytics. [16]

5. CONCLUSION & FUTURE SCOPE

For the analysis and interpretation of massive and complicated data, data visualisation has emerged as a powerful and widely utilised tool. Businesses require data visualisation to assist them in swiftly identifying data trends, which would be challenging without it.

Consequently, it is important to choose the appropriate tool for the right domain. Data visualization is a crucial component of data science. It is a way we share our insights with others through dashboards, scientific papers/posters, and more [2]. Selecting a visualisation tool is quite important and depends on the goal, content, layout, and design. This paper gives a Glimpse of Data Visualization tools ,this can be extended by examining a particular dataset using the mentioned tools in order to determine the best tool for analysis.

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