



DATA VISUALIZATION: CHALLENGES AND TOOLS

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Abstract:

Data is being processed daily as the result of activities of users on the internet. An activity of a single user for instance on a social media platform can generate volumes of data every day. When such users in their millions or even billions generate huge data, the resultant data is called big data. This data is so huge that processing and interpreting it becomes so challenging. Challenges like loss of information as the result of increase in response time can affect data visualization. Representing such huge data in a textual form will not convey all the information needed to be communicated. To convey such information fully and efficiently the data has to be represented in pictorial or graphic format for easier communication and interpretation. This paper explains the challenges of data visualization and the various tools used to visualize big data.

Keywords: Big Data, Challenges, Visualisation, Tools and Pictorial.

Introduction

Data visualization gives researchers, analysts and data scientists an opportunity to interpret and analyze huge volumes of data easier comprehension and usage. This could be achieved through showcasing momentous information in different formation. Interpreting huge data in a textual form won't reveal the intended message or information entirely. Such data must be disseminated and presented in a pictorial form to allow for easier understanding, conveyance and interpretation of data. Users can obtain data and make use of it after analysts and professionals have worked on it. To visualize data skills are needed. Experts and users must be creative and able to simplify data into a visual form so that consumers of such data can significantly comprehend and interpret and analyze it. Data analysts may encounter challenges while trying to visualize or represent data for consumption and interpretation.

The importance of data (Big data) nowadays cannot be over emphasized. So many organizations and industries rely upon big data to make information decision. Big data visualization avail us with the opportunity to recognize current trend and patterns and

also explore them accordingly. To visualize data several tools are used to present these data in a form of chart or diagram. Data visualisation tools make it possible for users and experts alike to represent data in graphic form for easier interpretation and interaction. The essence of data visualisation is to make the data justifiable, understandable and readily available for use and consumption. Relationship between data is captured and made more meaningful when represented in form of diagrams charts or maps.

Relationship between data and their pattern will become more visible and comprehensible when presented in graphic format.

Data visualisation has now presented an excellent opportunity for big data analysts and data scientists to make more money while solving business problems. Industries, Tech companies and government organisations cannot do without data visualisation. To manage organisation or take decision managers needs data that is simplified using various tools and softwares. Such vast data can be used to plan budget and promote business organisations.

Data visualisation.

The process of representing data pictorially to display meaningful and useful data. User creativity determines the beauty and meaning of the data that is presented. To achieve this creativity visualisation tool must be used. Selection of the tool depends on the intent of the user or expert.

The figures below display data depicting different data visualisation styles. Figure 1 shows different time zone in the world. The data is represented in a pictorial form. The figures represent visual format of how data is visualised.

Figure 2 shows different types of chart represented inform of graphic. The figure displays different data for various tasks. Both the figures convey vital information in a meaningful and easier way. Users must first make their choice of which data visualisation tools to use for their tasks.

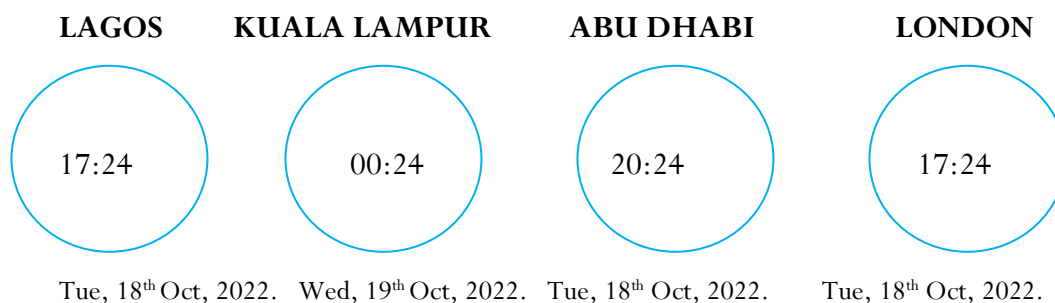


Fig 1: Data Visualisation Depicting World clocks.

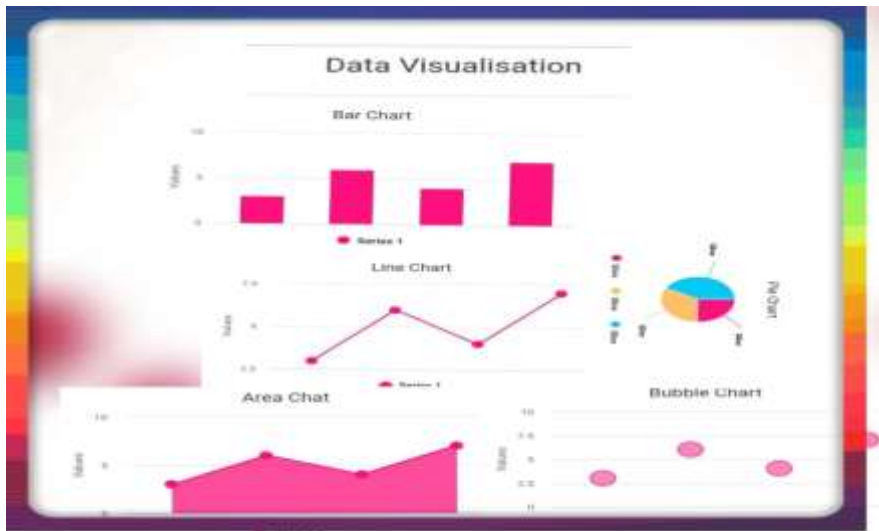


Figure 2: Data visualisation using various charts.

Survey on the concept of data visualisation and its tools.

As the business of big data analysts continue to boom, professionals in that field are bringing new ideas and tools to make their profession more secured and also offer better services to various business organisations and industries. Services of data analysts and professionals are being sought for everyday by organizations and industries to offer better decisions and promote businesses. Customers and consumers of such services supply information to the various organizations through their daily activities. Such information could be used by the business entities to promote their business and offer solutions.

[1] discussed the importance of data visualisation and its tools in their paper. The authors revealed that data visualisation technology could be used to uncover hidden facts and trends. Industries must find ways of visualising data using best tools available in order to offer good services and solve business problems. Without these tools and softwares industries that are involved in huge data cannot interpret their data for better usage and management. Sophisticated tools like Datawrapper, Tableau, and Infogram etc. must be used in order to increase comprehension of data visualisation.

According to [2] summarising information or findings using tables and numbers poses a great danger because any information that may come out from such practice may result to provision of inaccurate or complete information.

Several factors determine the quality of the visualisation output. One has to make his choice first before creating a data visualisation. Such practice could guarantee better and accurate result for interpretation and analysis [3].

Presenting and analysing data is a major task for data analysts and experts. Data visualisation tool is an app that creates the pictorial representation of the data. The essence of the visualisation is to interpret data into a meaningful and plain form for use mostly by business organisations and industries [4].

[5] examined that the momentousness of data visualisation in providing opportunities for users to interpret, interact and explore data presents the opportunity to uncover and understand new trends in data science and big data analytics (BDA). Currently the new trend is called BDA. BDA makes it possible to interpret huge volumes of data into an easier and understandable format.

According to [6] the ever-growing data makes it possible for analysts and professionals to devise new means of analysing big data quickly and efficiently. The authors further stated that big data visualisation brings about a number of opportunities for uncovering new trends and patterns. Visualisation tools must be continuously improved as big data keeps on growing at a rapid rate.

Data visualisation tools

Different types of visualisation tools have been developed to cater for data visualisation needs. Developers and designers of these tools focused on significant feature which is interaction. Every tool must be interactive and user-friendly so that users can work with them freely and easily. There numerous tools developed to handle data visualisation. The most common and important ones are:

Tableau

This is user-friendly software that is used in business for the purpose of visualising data easily and accurately. As with every data visualisation tool, tableau is easily manageable and simple.

Google charts

This is awesome charting software by Google. It supports JavaScript and can be used to embed *HTML/SVG charts into web documents*.

MetricsGraphics

This is also a charting application derived from D3.JS. It is used for time series data representation. It has simple user interface for easy interaction. It allows for easy and quick design without having to use tedious codes.

D3.JS

This is a tool that supports numerous features like HTML, CSS and SVG. Although it is not user friendly because it involves using a lot of coding. However, it is a library that gives birth to so many libraries. Tools like MetricsGraphics are derived from D3.JS.

Sigma

This is a tool for graphic drawing built on WebGL and canvas. Experts that need sophisticated graph drawing tool make use of this tool.

Infogram

It is a tool that has drag-and-drop feature. Inexperienced users can use this tool to design powerful pictorial data representation. It is used for designing marketing reports, social media records, etc.

Datawrapper

This tool can be used to beautify stories by adding new features such as maps and charts. For example, website developers can use Datawrapper to beautify their website pages. Media houses also use it in their newsroom to write and published effective and qualitative stories.

Fusionchart

Web developers use this tool to design website easily because it is a JavaScript based tool. It has simple interface that makes so interactive and easy to use. Codes are readily available for use by designers. This tool can be used even by novice.

Grafana

This is an open source tool for visualising data that allows users to create powerful designs. It supports over 40 data sources via add-ons. It has superior features than many open source visualisation tools.

Sigmajs

This is a customisable purpose visualisation tool that is JavaScript based. It has modest user interface that makes it easier for modest users to make superb designs. Although it is limited to creating only one type of visualisation. However, it is suitable for creating network graphs.

Challenges of Data visualisation

The ever-growing data has posed a great challenge to experts and professionals, who interpret, represent and analyse data. As the data keeps on growing exponentially sophisticated visualisation tools also keep on emergency. The features and capacity of these tools must be increased at a rapid pace. This will make the visualisation tools more capable, interactive and quick to provide solutions easily without delay.

Big data has several types of data from structured to unstructured and semi-structured. To process each of these categories of this data one need to choose the pattern of data carefully so as not to reduce data dimensions which may lead to loss of information. One of the challenges of data visualisation is parallelisation. Such challenge can only be tackled by splitting the issue into individualistic task that can run separately [7].

These new approaches use Hadoop and R language to help process data at the same time without encountering overlapping or over-plotting issue [8]. Other challenges of data

visualisation tools are low capacity in versatility, usability and time taken by the system to respond [9] to overcome this challenge new method have been invented.

Big data visualisation has problem of visual noise that makes it complex to separate objects in datasets. Information loss is another challenge of big data visualisation. It emanates as a result of increase in response time. Problems like high accomplishment requirements, image perception, high rate of image change during visualisation are some challenges that militate against data visualisation.

Conclusion

Big data visualisation remains the surest way to represent or present huge data into a meaningful format for easier communication. Several sophisticated tools are designed to help users and professionals to achieve significant success in presenting huge data for better decision making. This article presents the important tools that are used daily to present data in pictorial or graphic formats. Each of the tools explained focused on user-friendly feature that makes the tool so interactive. Data analysts and professionals are determined to always come up with new tools and software to help business organisations and industries understand new patterns and trends so that they improve their services and satisfy their customers and consumers.

Before making any choice as to which tool would be used. Users have to know their requirements and targets; this way suitable tool can be selected for better result. Big data visualisation challenges become visible as the data keeps on growing daily. New methods are being proposed to help visualise data easily without losing information.

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