

Data Visualization- Techniques and its applications

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Abstract - Data visualization includes introducing data in graphical or pictorial structure, which makes the data straightforward. Data visualization is a totally new and promising discipline in software program engineering. Its employments PC realistic impacts to uncover the examples, patterns, connections out of datasets. It assists with clarifying realities and decide blueprints. It will profit any field of study that requires inventive methods of introducing huge, complex data. The coming of PC illustrations has molded current visualization. This paper presents a short prologue to data visualization.

Key Words: Data Visualization,

1. INTRODUCTION

There has been the requirement for showing monstrous measures of data in a manner that is effectively open and justifiable. Associations create data consistently. Subsequently, the measure of data accessible on the Web has expanded significantly. It is hard for clients to picture, investigate, and utilize this tremendous data. The capacity to picture data is pivotal to logical examination. Today, PCs can be utilized to measure a lot of data. Data visualization is worried about the plan, improvement, and utilization of PC produced graphical portrayal of the data. It gives viable data portrayal of data starting from various sources. This empowers leaders to see examination in visual structure and makes it simple for them to sort out the data. It assists them with finding designs, appreciate data, and structure an assessment. Data visualization is additionally viewed as data visualization or logical visualization. Human creatures have consistently utilized visualizations to make messages or data toward the end on schedule. What cannot be contacted, smelled or tasted can be addressed outwardly [1].

Visualization is the graphical show of data, with the objective of furnishing the watcher with a subjective comprehension of the data substance. It is additionally the way toward changing items, ideas, and numbers into a structure that is apparent to the natural eyes. At the point when we say "data", we may allude to data, cycles, relations, or ideas. Here, we limit it to data.

Data visualization is tied in with getting proportions and connections among numbers. Not tied in with understanding individual numbers, but rather about comprehension the examples, patterns, and connections that exist in gatherings of numbers [4]. From the reason behind client

understanding, it might include recognition, estimation, and correlation, and is improved by means of intelligent strategies and giving the data from various perspectives and with numerous strategies.

2. WHY DATA VISUALIZATION IS IMPORTANT?

It is difficult to think about an expert industry that does not profit with making data more reasonable. Each STEM field profits by getting data—thus do fields in government, finance, advertising, history, customer products, administration ventures, training, sports, etc.

While we will generally wax beautifully about data visualization (you are on the Tableau site, overall) there are functional, genuine applications that are evident. Furthermore, since visualization is so productive, it is additionally quite possibly the most helpful expert abilities to create. The better you will be able to pass away your focuses outwardly, notwithstanding whether or not in an exceedingly dashboard or a slide deck, the higher you can use that data.

The idea of the resident data scientist is on the ascent. The areas of competence change to suit a data-driven world. It is progressively important for experts to have the option to utilize data to settle on choices and use visuals to recount accounts of when data advises the who, what, when, where, and how. While conventional instruction ordinarily defines an unmistakable boundary between inventive narrating and specialized investigation, the cutting-edge proficient world additionally values the individuals who can cross between the two: Data visualization is at the heart of testing and visual narration.

Something else we should make reference to is that: data visualization is not logical visualization. Logical visualization utilizes activity, reenactment, and modern PC illustrations to make visual models of constructions and handled that cannot in any case be seen, or seen in adequate detail. While data visualization is a way that present and show data in a manner that energizes proper understanding, determination, and affiliation. It uses human abilities for design acknowledgment and pattern investigation, and endeavors the capacity of individuals to extricate a lot of data in a brief timeframe from visuals introduced in a normalized design. The flow of Data visualization is given in the Figure 1.

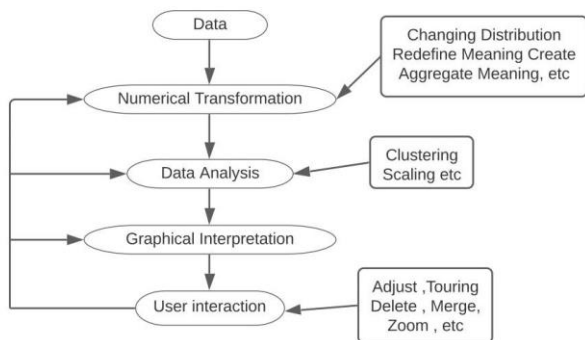


Fig 1: Flow of data visualization.

3. PROS OF GOOD DATA VISUALIZATION

Since our eyes can catch the shadings and examples, in this manner, we can rapidly distinguish the red bit from blue, square from the circle; our way of life is visual, including everything from craftsmanship and ads to TV and films. Thus, Data visualization is another procedure of visual craftsmanship that snatches our advantage and maintains our fundamental spotlight on the message caught with the assistance of eyes. At whatever point we picture a graph; we rapidly recognize the patterns and exceptions present in the dataset.

The essential employments of the Data Visualization strategy are as per the following:

- a) It is an amazing strategy to investigate the data with adequate and interpretable outcomes.
- b) In the data mining process, it goes about as an essential advance in the pre-processing segment.
- c) It upholds the data cleaning process by discovering wrong data and ruined or missing qualities.
- d) It additionally assists with building and select factors, which implies we need to figure out which variable to incorporate and dispose of in the investigation.
- e) In the process of Data Reduction, it likewise assumes a vital part while consolidating the classifications.

4. FACTORS THAT INFLUENCE DATA VISUALIZATION.

1. Audience: Change data portrayal to the particular objective audience. For instance, wellness versatile application clients who peruse their advancement can without much of a stretch work with straightforward visualizations. Then again, if data bits of knowledge are planned for scientists and experienced leaders who routinely work with data, you can and frequently need to go past basic diagrams.
2. Content. The form of data you are coping with will determine the strategies. For instance, in case now is the ideal time series measurements, you will utilize line outlines to show the elements much of the time. To show the connection between two components, disperse plots are regularly utilized. Thus, bar diagrams function admirably for near examination.
3. Context. You can utilize various data visualization approaches and read data relying upon the context. To accentuate a specific figure, for instance, huge benefit development, you can utilize the shades of one tone on the graph and feature the most elevated worth with the most splendid one. Despite what is generally expected, to separate components, you can utilize contrast tones.
4. Dynamics. There are different sorts of data, and each type has an alternate pace of progress. For instance, monetary outcomes can be estimated month to month or yearly, while time series and following data are evolving continually. Contingent upon the pace of progress, you may think about powerful portrayal (steaming) or static visualization procedures in data mining.
5. Purpose. The objective of data visualization influences the manner in which it is carried out. To make an unpredictable examination, visualizations are aggregated into dynamic and controllable dashboards that work as visual data investigation strategies and apparatuses. Notwithstanding, dashboards are not important to show a solitary or intermittent data understanding.

5. DATA VISUALIZATION AND BIG DATA

The expanded notoriety of big data and data investigation projects have made visualization more significant than any time in recent memory. Organizations are progressively utilizing AI to accumulate enormous measures of data that

can be troublesome and moderate to figure out, understand and clarify. Visualization offers a way to speed this up and present data to entrepreneurs and partners in manners they can comprehend. Big data visualization regularly goes past the commonplace strategies utilized in ordinary visualization, for example, pie diagrams, histograms and corporate charts. It rather utilizes more perplexing portrayals, for example, heat guides and fever graphs. Big data visualization requires incredible PC frameworks to gather crude data, measure it and transform it into graphical portrayals that people can use to rapidly draw experiences.

While big data visualization can be useful, it can represent a few detriments to associations. They are as per the following:

1. To benefit from big data visualization instruments, a visualization expert should be employed. This expert should have the option to recognize the best data sets and visualization styles to ensure associations are advancing the utilization of their data.
2. Big data visualization projects frequently require association from IT, just as the executives, since the visualization of big data requires amazing PC equipment, effective capacity frameworks and surprisingly a transition to the cloud.
3. The bits of knowledge given by big data visualization may be just about as precise as the data being imagined. In this manner, it is fundamental to have individuals and cycles set up to administer and control the nature of corporate data, metadata and data sources.

6. VISUALIZATION TECHNIQUES

Visualization is the utilization of PC upheld, visual portrayal of data. In contrast to static data visualization, intuitive data visualization permits clients to indicate the arrangement utilized in showing data. Normal visualization procedures are as displayed in Figure 1 and incorporate [2]:

- 1] Line graph: This shows the connection between things. It very well may be utilized to look at changes over a timeframe.
- 2] Bar chart: This is utilized to analyse amounts of various classes.
- 3] Scatter plot: This is a two-dimensional plot showing variety of two things.

4] Pie chart: This is utilized to look at the pieces of an entirety.

5] Maps: Maps are mainstream approaches to imagine data utilized in various enterprises. They permit to find components on important items and regions — topographical maps, building plans, site formats, and so forth among the most well-known map visualizations are heat maps, dot distribution maps, cartograms.

6] Diagrams & Matrices: Diagrams are normally used to exhibit complex data connections and interfaces and remember different sorts of data for one visualization. They can be progressive, multidimensional, and tree-like. Matrix is one of the high-level data visualization strategies that assist with deciding the relationship between various continually refreshing (steaming) data sets.

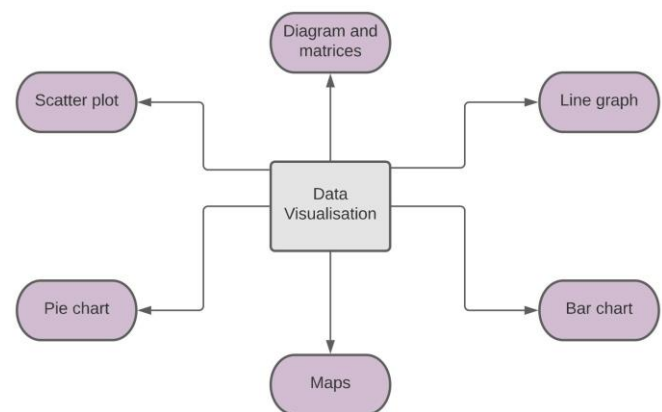


Fig 2: Data visualization techniques

In this way, the organization of graphs and charts can appear as bar chart, pie chart, line graph, and so on it is critical to comprehend which chart or graph to use for your data. Data visualization utilizes PC graphics to show examples, patterns, and relationship among components of the data.

It can produce pie charts, bar charts, scatter plots and different kinds of data graphs with straightforward pull-down menus and mouse clicks. Shadings are painstakingly chosen for particular sorts of visualization. When shading is utilized to address data, we should pick successful tones to separate between data components.

In data visualization, data is preoccupied and summed up. Spatial factors like position, size, and shape address key components in the data. A visualization framework ought to play out a data decrease, change and venture the first dataset on a screen. It ought to imagine brings about the type of

charts and graphs and present outcomes in easy-to-understand way.

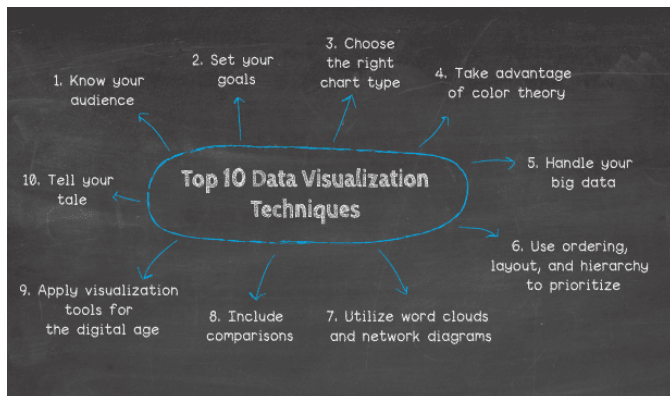


Fig 3: Data Visualization pipeline

6. APPLICATIONS OF DATA VISUALIZATION

Most visualization plans are to help decision-making and fill in as apparatuses that expand discernment. In planning and building a data visualization model, one should be directed by how the visualization will be applied. Data visualization is something other than addressing numbers; it includes choosing and reevaluating the numbers on which the visualization is based [3]. Visualization of data is a significant part of software engineering and has wide scope of utilization regions. A few application-explicit devices have been created to investigate individual datasets in numerous fields of medication and science.

1. **Public Health:** The capacity to investigate and introduce data in a justifiable way is basic to the achievement of public health reconnaissance. Health analysts need helpful and smart instruments to help their work [4]. Security is significant in cloud-based clinical data visualizations. Open any clinical or health magazine today, and you will see a wide range of graphical portrayals. **Renewal Energy:** Calculation of energy utilization contrasted with creation is significant for ideal arrangement [5].
2. **Environmental Science:** As environmental supervisors are needed to settle on decisions dependent on exceptionally complex data, they require visualization. Visualization applications inside applied environmental research are starting to arise [6]. It is alluring to have available to one unique project for showing results.
3. **Fraud Detection:** Data visualization is significant in the beginning phases of fraud examination. Fraud agent may utilize data visualization as a proactive detection approach, utilizing it to see designs that propose fraudulent movement [7].
4. **Library-Decision Making:** Data visualization programming permits curators the adaptability to more readily oversee what's more, present data

gathered from various sources. It gives them the expertise to introduce data in an innovative, convincing way [8]. Visualization of library data features buying decisions, future library needs and objectives. Custodians, as true specialists of data visualization, can help understudies, staff also; analysts envision their data [9].

A few data visualization calculations and related programming have been created. These programming empower clients to decipher data more quickly than any other time. These incorporate Many Eyes from IBM, Smart Money for financial exchange, Insights from Facebook Corporation, and Visual Analytics from SAS, what's more, Thoth from California Institute of Technology, Tableau, and TOPCAT [10, 11]. They make data visualizations simple to decipher and quick to create. Each instrument has its own great highlights and limits. Visualization of enormous scope multidimensional data sets can be joined with new methodologies of cooperating with a PC utilizing the Web application (as a help).

5. CHALLENGES

Huge, time-fluctuating datasets present incredible test for data visualization as a result of the gigantic data volume. Constant data visualization can empower clients to proactively react to issues that emerge. Activity age approach is utilized for intelligent investigation cycle of time-differing data. It pictures worldly occasions by imitating the structure of narrating strategies [12]. Clients vary in their capacity to utilize data visualization and settle on decisions under close time limitations. It is difficult to evaluate the value of a data visualization method. This is the justification having a huge number of visualization calculations and related programming. A large portion of this product enjoy not taken benefit of the multi-contact communications and direct control abilities of the new gadgets. Huge data, organized and unstructured, presents a special arrangement of difficulties for creating visualizations. This is because of the way that we should consider the speed, size, and variety of the data. Another arrangement of issues identified with execution, operability, and level of separation challenge huge data visualization and examination [13]. It is troublesome and tedious to make an enormous recreated data set. It is likewise hard to choose what visual may be the awesome use.

6. CONCLUSIONS

Data visualization is the way toward addressing data in a graphical or pictorial manner in a reasonable and successful way. It has arisen as an incredible and broadly pertinent apparatus for dissecting and deciphering enormous and complex data. It has become a speedy, simple method for passing on ideas in an all-inclusive organization. It should discuss complex thoughts with lucidity, precision, and productivity. These advantages have permitted data visualization to be helpful in numerous fields of study.

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