MASTER OF COMPUTER APPLICATIONS

SEMESTER 1

DATA VISUALIZATION

Unit 1

Introduction to Data Visualization

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1. INTRODUCTION

Data visualisation emerges as an essential technique in modern information analysis, offering a graphical avenue for conveying complex data and insights. Through the expert utilisation of visual elements such as charts, graphs, and maps, data visualisation tools become the channel that transforms raw data into a visually straightforward narrative. This approach offers a potent means of rendering trends, outliers, and patterns observable, thus empowering users to quickly grasp the details of data.

In conclusion, data visualisation is not merely an auxiliary component of data analysis; it's a transformative approach that complements information and perception. It empowers individuals across a spectrum of technical expertise to derive meaning from complex datasets, accelerating decision-making processes and fostering a more comprehensive understanding of data-driven narratives. In the era of Big Data, where information overload is a pressing concern, data visualisation emerges as a vital navigational tool, guiding us through the intricacies of data and transforming them into insights that fuel progress and innovation.

1.1 Learning objectives

At the end of this topic, the students will be able to:

- *Recall fundamental concepts of data visualisation, including terminology, data types and common graphical representations.*
- *Explain the relationship between data visualisation and effective communication. Compare and contrast different visualisation techniques, discussing their strengths and weaknesses in conveying specific types of information.*
- *Showcase proficiency in selecting suitable visualisation formats according to the data's characteristics and the communication objectives.*
- *Justify the choice of visualisation methods by explaining how they enhance understanding of specific insights.*
- *Critique existing data visualisations regarding their accuracy, clarity, and potential biases.*

2. DEFINITION

The strength of data visualisation lies not merely in its ability to present data but in its capacity to deliver it comprehensibly, even to those lacking technical expertise. These tools are invaluable in bridging the comprehension gap between technical and non-technical audiences by merging visual representation with data. This is particularly outstanding in a contemporary landscape dominated by the proliferation of Big Data, where the volume and complexity of information can quickly become overwhelming.

The efficacy of data visualisation becomes especially noticeable in the context of Big Data. As organisations and businesses face vast amounts of data generated daily, data visualisation technologies are indispensable in navigating this information overflow. These tools can cleanse extensive datasets into coherent visual depictions, revealing insights that might otherwise remain covered. This capability enhances decision-making by allowing decision-makers to collect actionable insights from an overwhelming sea of data points.

Furthermore, data visualisation tools serve as a bridge that connects analysts and decision-makers with non-technical stakeholders. The visual clarity of charts and graphs circumvents the need for exhaustive technical explanations, enabling professionals to communicate their findings persuasively and briefly. This capability extends the utility of data visualisation beyond internal operations, making it an influential tool for stakeholder engagement and transparent communication.

3. IMPORTANCE OF DATA VISUALISATION

The importance of data visualisation is simple: it helps people see, interact with, and better understand data. Whether simple or complex, the proper visualisation can bring everyone on the same page, regardless of their level of expertise. It's hard to think of a professional industry that doesn't benefit from making data more understandable. Every STEM field benefits from understanding data, as do fields in government, finance, marketing, history, consumer goods, service industries, education, sports, and so on. While we'll always talk negatively about data visualisation, there are practical, real-life applications that are undeniable. And, since visualisation is so prolific, it's also one of the most helpful professional skills to develop.

Let's break down and elaborate on the importance of data visualisation:

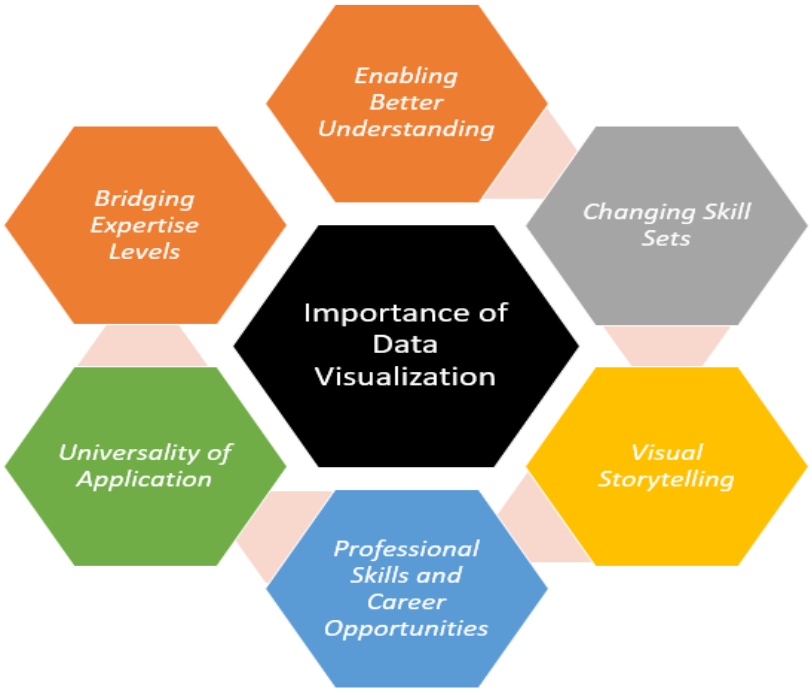

Fig 1.1. Importance of data visualisation

3.1. Enabling Better Understanding

Data visualisation simplifies complex data by presenting it in visual formats that are easier to comprehend. It allows individuals to see patterns, trends, and relationships that might not

be immediately apparent in raw data. Visualisations bridge data and human cognition, helping people gain insights and draw conclusions more effectively.

3.2. Bridging Expertise Levels

Effective data visualisation brings together individuals with varying levels of expertise. Whether someone is a data analyst, a manager, or someone with limited technical knowledge, well-designed visualisations enable everyone to access and understand the information. This democratisation of data understanding enhances collaboration and communication within teams and organisations.

3.3. Universality of Application

The utility of data visualisation extends across diverse industries and fields. Data visualisation finds application everywhere, from science, technology, engineering, and mathematics (STEM) disciplines to areas like government, finance, marketing, history, consumer goods, education, and sports. The ability to make data more understandable and actionable is universally valuable.

3.4. Professional Skills and Career Opportunities

In today's data-driven world, the skill of data visualisation is highly sought after. Professionals who can effectively create and communicate insights through visuals hold a significant advantage. Being able to present data-driven insights in straightforward, compelling ways enhances decision-making and storytelling, opening up opportunities for career growth.

3.5. Rise of the Citizen Data Scientist

The concept of the "citizen data scientist" refers to individuals who may not have formal data analysis training but possess the ability to use data for informed decision-making. Data visualisation plays a crucial role in this context, enabling individuals to interpret and communicate data without being experts in statistical analysis.

3.6. Changing Skill Sets

As industries evolve and become more data-centric, the skill sets required for success change. Professionals are expected to use data to inform their decisions and to communicate

those insights to others. Data visualisation is at the intersection of analytical skills and visual storytelling, making it an increasingly valuable skill in various fields.

3.7. Visual Storytelling

Data visualisation bridges the gap between traditional technical analysis and creative storytelling. It allows professionals to analyse data and present it in a way that tells a compelling narrative. Visuals can evoke emotions and engage audiences, making data more memorable and persuasive.

Data visualisation is more than just creating charts and graphs; it's about translating data into actionable insights that can drive informed decisions and effective communication. It's a skill that empowers professionals to bridge gaps, break down complex information, and enable others to make sense of data meaningfully.

4. APPLICATIONS OF DATA VISUALISATION

Data visualisation simplifies comprehension and enhances effectiveness. The human mind grasps visual information more swiftly than textual or tabular data. Furthermore, this principle applies to a broad audience. For instance, an individual can effortlessly recall dialogues and scenes from the movie "Sholay," even after years of watching it. In contrast, recollecting complex engineering subjects proves to be challenging.

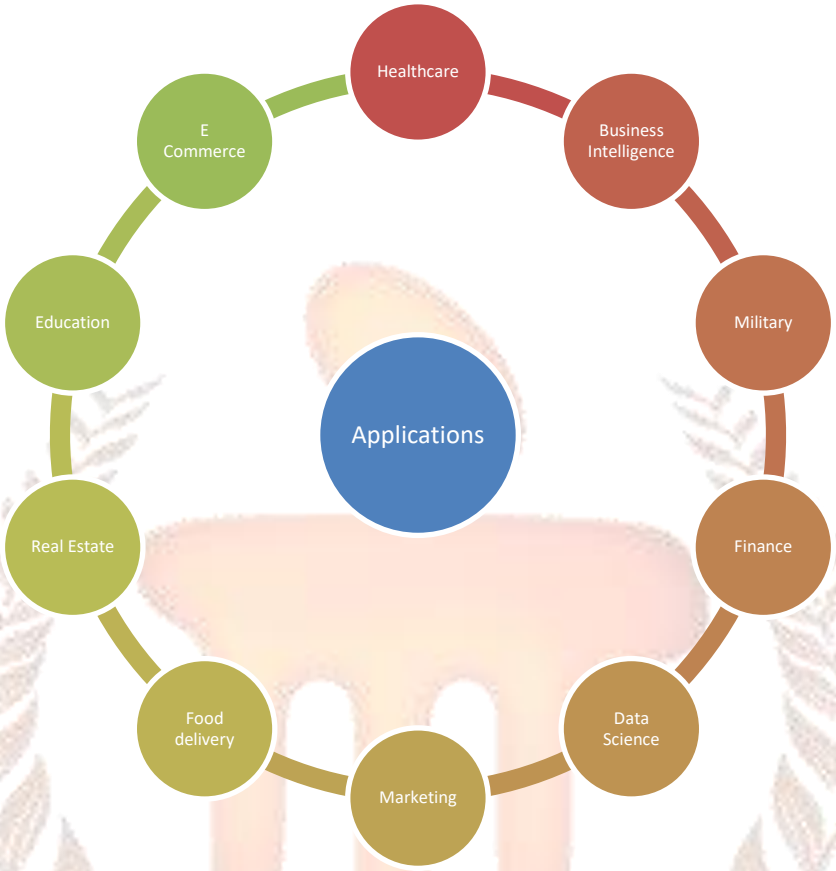

Fig1.2. Applications of Data Visualisation

4.1. Healthcare Industries

In healthcare, data visualisation goes beyond simply presenting information. It helps medical professionals quickly grasp a patient's medical history, facilitating better diagnosis and treatment. A patient's health dashboard can display critical information like medical conditions, medication history, allergies, and test results in an easy-to-understand visual format. In emergencies, doctors can rapidly assess patient conditions and make critical decisions based on visualised data, saving precious time and potentially lives. Data visualisation also aids in identifying trends over time, such as changes in vital signs or responses to treatments, leading to more effective care management.

4.2. Business Intelligence

Business intelligence heavily relies on data visualisation to turn raw data into actionable insights. Cloud connectivity enables the processing large datasets from diverse sources, leading to quicker and more informed decision-making. Integrated tools help consolidate

data from various systems, providing a holistic view of an organisation's operations. Analytical and business intelligence tools allow users to interact with data, perform queries, and extract meaningful patterns. Visualisation helps users identify trends, correlations, and anomalies, leading to informed strategies and decision-making.

4.3. Military

In military applications, data visualisation is vital for situational awareness and strategic planning. Military operations generate vast data from sensors, satellites, and intelligence reports. Visualisations help commanders and analysts quickly understand complex scenarios, such as troop movements, weather conditions, and enemy activities. Dynamic data visualisation tools assist tactical decision-making by depicting geographic and environmental data, aiding mission success. Additionally, visualising historical data supports trend analysis, allowing for more accurate predictions and strategic planning.

4.4. Finance Industries

Data visualisation is a game-changer in finance, where accurate insights drive effective investment decisions. Visualising customer behaviour helps financial institutions understand spending patterns, preferences, and trends. This information aids in tailoring products and services to customer needs. For investment analysis, data visualisation enables professionals to track market trends, assess portfolio performance, and identify potential risks. Visualising data also simplifies the communication of financial information to clients and stakeholders, making complex data more understandable and actionable.

4.5. Data Science

Visualisation is a powerful tool for exploring, understanding, and communicating complex data relationships in data science. Data scientists use programming languages like Python to create visualisations that reveal insights and patterns hidden within data. Visualisations help researchers identify correlations, outliers, and trends, enabling data-driven decision-making. These visual representations assist in presenting findings to both technical and non-technical audiences, fostering effective communication and collaboration.

4.6. Marketing

Data visualisation empowers marketers to extract valuable insights from a sea of information. Marketing analytics involves analysing data from various sources to understand consumer behaviour, campaign effectiveness, and market trends. Visualisations provide a clear overview of key metrics, making it easier to identify successful strategies and areas for improvement. Interactive charts and graphs help marketers quickly communicate their findings, enabling informed decision-making and enhancing stakeholder communication.

4.7. Food Delivery Apps

Data visualisation enhances the efficiency and quality of food delivery services. By incorporating location data and real-time information, apps can provide accurate estimates of delivery times. Customer feedback, reviews, and ratings can be visually represented to improve service quality. These visual insights assist in optimising delivery routes, managing resources, and maintaining customer satisfaction.

4.8. Real Estate Business

In the real estate industry, data visualisation aids in showcasing property information and market trends to clients. Interactive maps display property locations, comparative prices, and historical sales data. This allows real estate professionals to guide clients through informed decisions based on precise visual representations. Trends such as property price fluctuations and market demand can be easily communicated through visualisations, helping buyers and sellers make strategic choices.

4.9. Education

Data visualisation transforms education by presenting student performance data in meaningful ways. Educators can monitor students' progress, identify struggling students, and implement timely interventions. Visual dashboards provide educators with actionable insights, enabling personalised instruction and support. Interactive visuals allow educators to engage students with data-driven content, making learning more engaging and facilitating data-informed decision-making at all levels of education.

4.10. E-commerce

In the e-commerce sector, data visualisation helps businesses understand customer preferences, monitor sales trends, and optimise user experiences. Visualising data from online transactions, customer behaviour, and website interactions enables businesses to personalise recommendations, streamline user journeys, and improve conversion rates. By identifying patterns in purchase behaviour, businesses can tailor marketing strategies, offer relevant products, and enhance customer satisfaction.

In all these applications, data visualisation empowers professionals to make data-driven decisions, communicate insights effectively, and uncover valuable patterns and trends within complex datasets. Visualisations enhance understanding, foster collaboration, and drive improvements across various industries.

5. TYPES OF DATA VISUALISATION

5.1. Comparison Visualisation: It is a valuable method within data visualisation that highlights differences and similarities between data points. This type of visualisation is particularly useful when you want to emphasise variations in data sets, making it easier to spot trends, disparities, or commonalities.

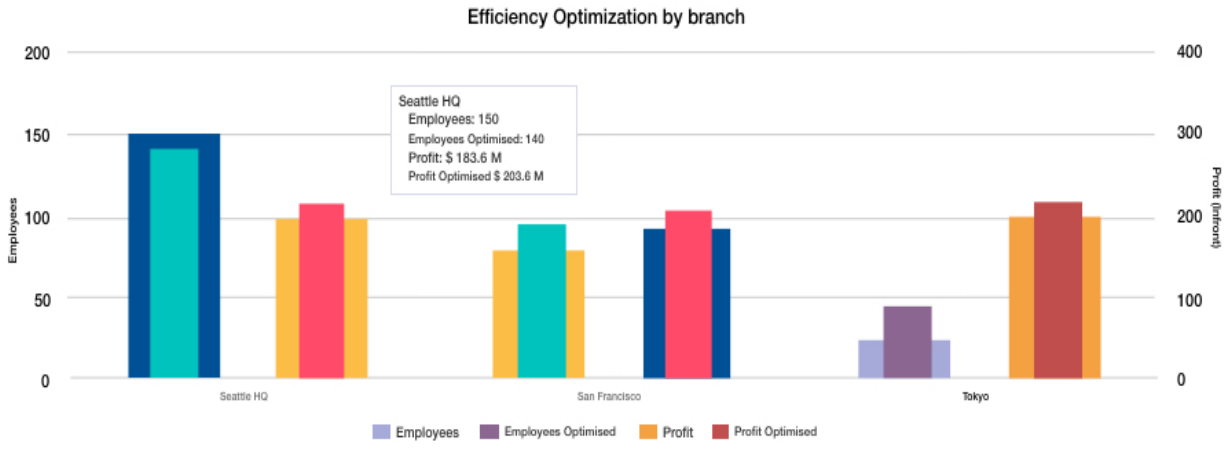

Fig 1.3. Example of Bar Graph

One common form of comparison visualisation is Bar and Column Charts. Above is an example of a bar graph; these charts utilise rectangular bars to represent categorical data,

where the length or height of each bar corresponds to the value it represents. Vertical bars are used in column charts, while horizontal bars are employed in bar charts. These visualisations offer a straightforward way to compare values across different categories, making it easy to identify which categories have higher or lower values.

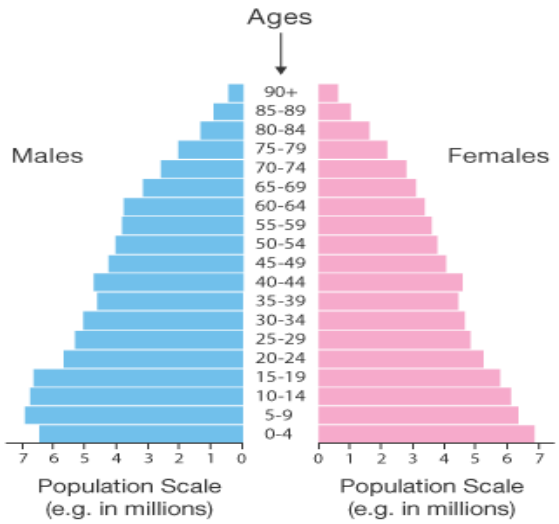

Fig 1.4. Example of Population Pyramids

Population Pyramids are another example of comparison visualisation as given above. These pyramids graphically represent the distribution of people across age groups and genders in a population. By depicting the relative sizes of different age groups as well as gender ratios, population pyramids provide insights into demographic patterns. For instance, a population pyramid with a broad base and narrowing top suggests a youthful population, while a more evenly distributed pyramid indicates a balanced age distribution.

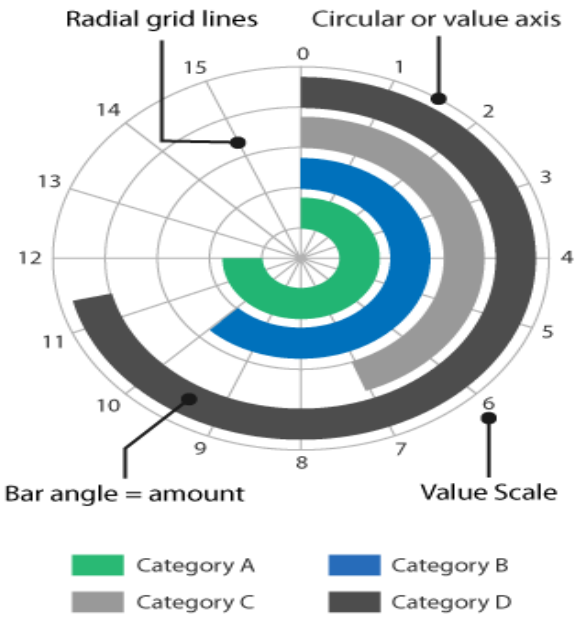

Fig 1.5. Example of Radial Chart

A Radial Chart, or a circle bar chart, presents data in a circular format using bars that radiate from a central point. Figure 1.5 shows an example of a radial chart with radial grid lines, a circular axis, value scale and bar angles for representation. It's essentially a variation of a bar chart that uses a polar coordinate system instead of a Cartesian one. This chart type is particularly effective for comparing multiple categories or data points in a visually engaging manner. While traditional bar charts are often easier to interpret for direct comparisons, radial charts can offer an aesthetically pleasing way to showcase data relationships and proportions.

In summary, comparison visualisation techniques such as Bar and Column Charts, Population Pyramids, and Radial Charts effectively present differences and similarities between values, facilitating a clearer understanding of data variations and trends.

5.2. Pattern Visualisations: Pattern Visualisations play a pivotal role in data visualisation by spotlighting discernible patterns, trends, and relationships within datasets, making complex data more understandable and actionable.

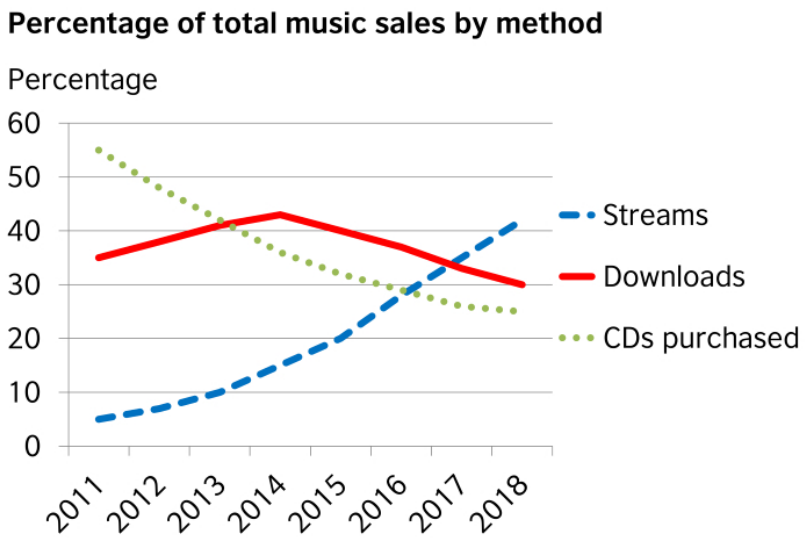

Fig 1.6. Example of a line graph

A Line Graph is a fundamental pattern visualisation employing data points connected by lines to showcase trends or changes over a specified period. It is particularly effective for illustrating continuous data fluctuations, such as stock prices over a year. Figure 1.6 shows the line graph of streams, downloads and CDs purchased from 2011 to 2018.

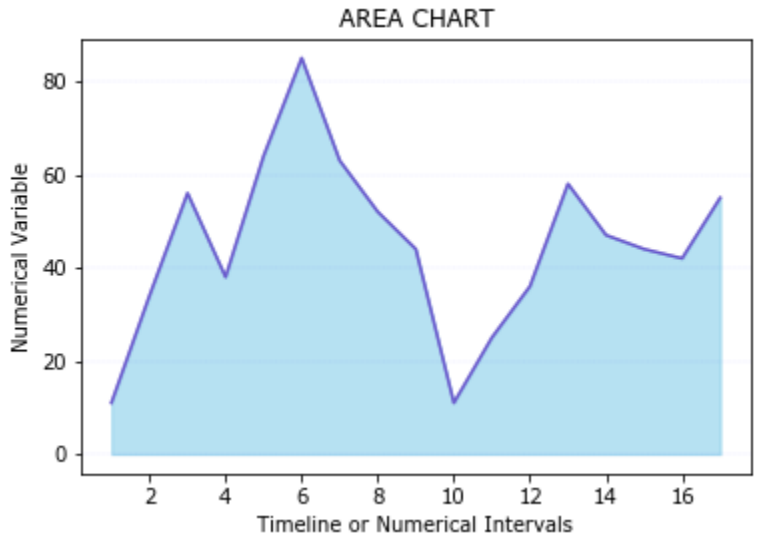

Fig 1.7. Example of area chart

An Area Chart is closely related to line graphs but adds a dimension by filling the area under the lines. This emphasises trends over time and highlights the range of values between the

lines, making it helpful in depicting cumulative data or stacked proportions, as shown in Figure 1.7.

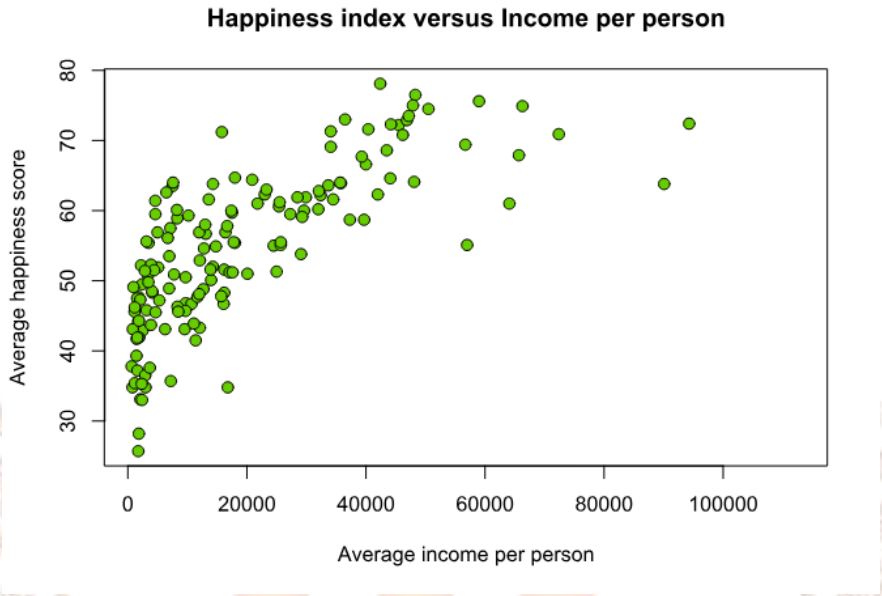

Fig 1.8. Example of scatter plots

Scatter Plots are invaluable for spotting relationships and correlations between two variables. They utilise points on a graph, each representing a data value from both variables. Scatter plots are particularly useful when identifying clustering or dispersion patterns in data. An example of a scatter plot is given in Figure 1.8.

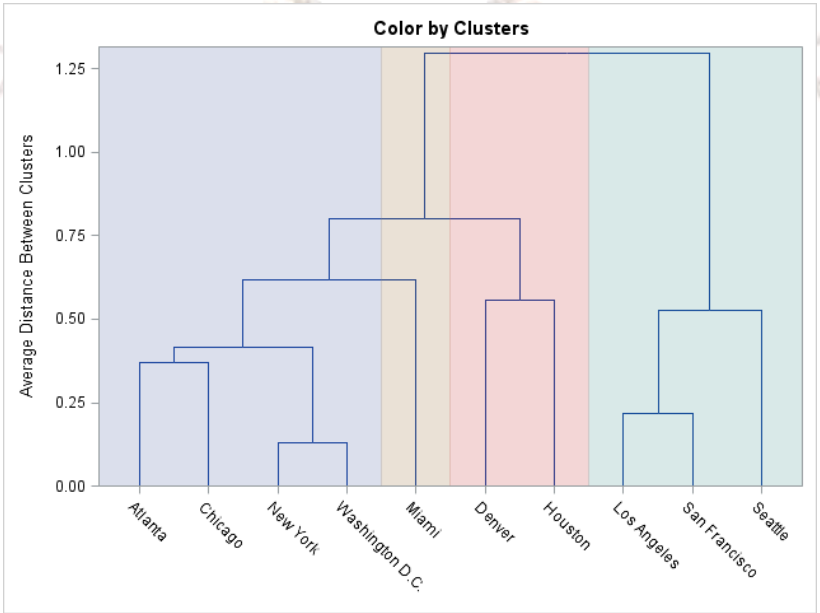

Fig 1.9. Example of dendrograms

Dendrograms are a specific type of pattern visualisation used to represent hierarchical relationships. These tree-like diagrams are often employed in fields like biology, showing how elements cluster together based on similarities or distances. In data analysis, dendrograms can assist in visualising groupings in hierarchical clustering.

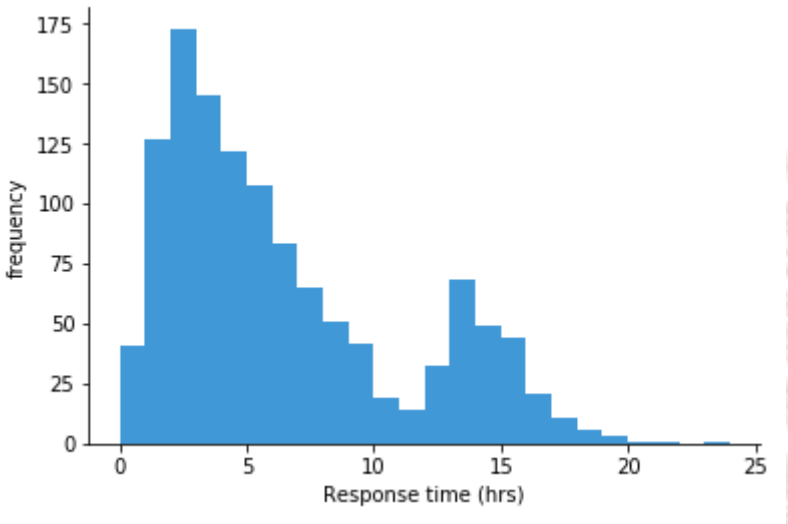

Fig 1.10. Example of Histograms

Histograms provide an excellent means to visualise the distribution of numerical data. By dividing the data into " bins " intervals and counting the number of data points falling into each bin, histograms display the frequency of data values across a range. This visualisation is beneficial when you want to understand the frequency distribution of a dataset, identifying modes, outliers, and overall shape. Figure 1.10 is an example of a histogram.

In conclusion, pattern visualisations, including Line Graphs, Area Charts, Scatter Plots, Dendrograms, and Histograms, contribute significantly to uncovering trends, correlations, and structures within data, enabling more informed decision-making and insights.

5.3. Candlestick Visualisation: Changes Visualisations are a critical subset of data visualisation that emphasises variations and fluctuations in data over time, providing valuable insights into trends and patterns that are especially relevant in financial and market analysis.

Fig 1.11. Example of a candle stick chart

A Candlestick Chart is a powerful tool used primarily in financial markets to display the price movements of a security, such as a stock, over a specified period. It's an essential visualisation for traders, investors, and analysts as it provides comprehensive information about the trading activity during a specific time frame. Figure 1.11 is an example of a candle stick chart.

Here's how a Candlestick Chart works:

1. **Time Period:** The chart is divided into time periods, such as days, weeks, or hours.
2. **Candlestick Elements:** Each time period is represented by a "candlestick." Each candlestick has several components:
   - **Opening Price:** The price at which the security started trading during the time period.
   - **Closing Price:** The price at which the security finished trading during the time period.
   - **High Price:** The highest price reached during the time period.
   - **Low Price:** The lowest price reached during the time period.
3. **Candlestick Shape:** The shape of the candlestick is determined by the relationship between the opening and closing prices.
   - **Bullish Candlestick:** If the closing price is higher than the opening price, the candlestick is often coloured green or white. This suggests positive price movement.
   - **Bearish Candlestick:** If the opening price is higher than the closing price, the candlestick is typically red or black. This indicates negative price movement.
4. **Wick and Shadow:** The lines extending above and below the rectangular body of the candlestick are known as "wicks" or "shadows." They represent the range between the high and low prices during the time period.

Candlestick charts allow analysts to quickly assess the price action, identify trends, and gauge market sentiment. Patterns formed by candlesticks can provide valuable information about potential trend reversals or continuation.

In summary, the Candlestick Chart is an essential visualisation tool in financial analysis, providing a clear and concise way to depict the fluctuations in the price of a security over time, enabling traders and investors to make informed decisions.

5.4. Relationship Visualisations: They are an integral part of data visualisation, illustrating the connections, associations, and interdependencies among data points. These visualisations provide insights into complex relationships that might not be immediately evident from raw data.

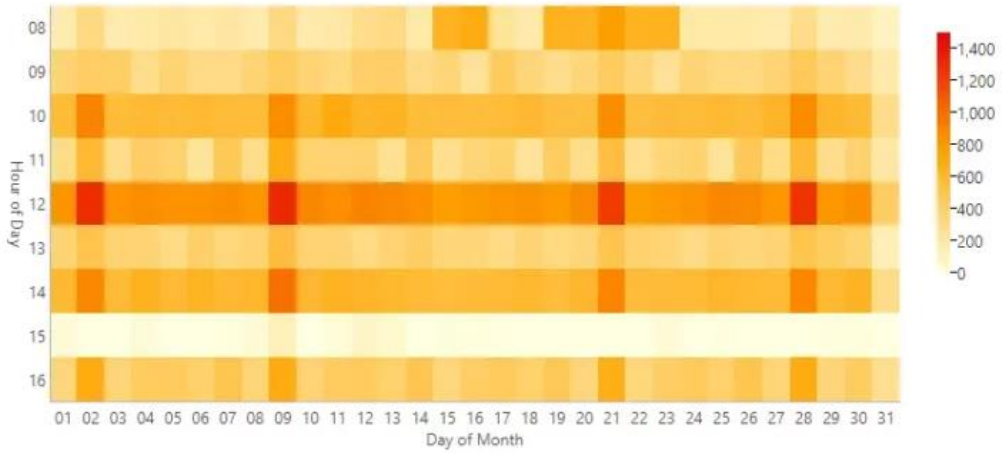

Fig 1.12. Example of a heat map

A **Heat Map** is a widely used visualisation that employs colour gradients to represent data values within a matrix or table. A heat map enables viewers to quickly identify patterns and trends by assigning colours to different data values. This type of visualisation is often utilised to analyse data distributions, correlations, and variations. For instance, in a financial context, a heat map could show the performance of different stocks over time, helping analysts pinpoint which stocks are performing well and which are underperforming. Figure 1.12 is an example of a heat map.

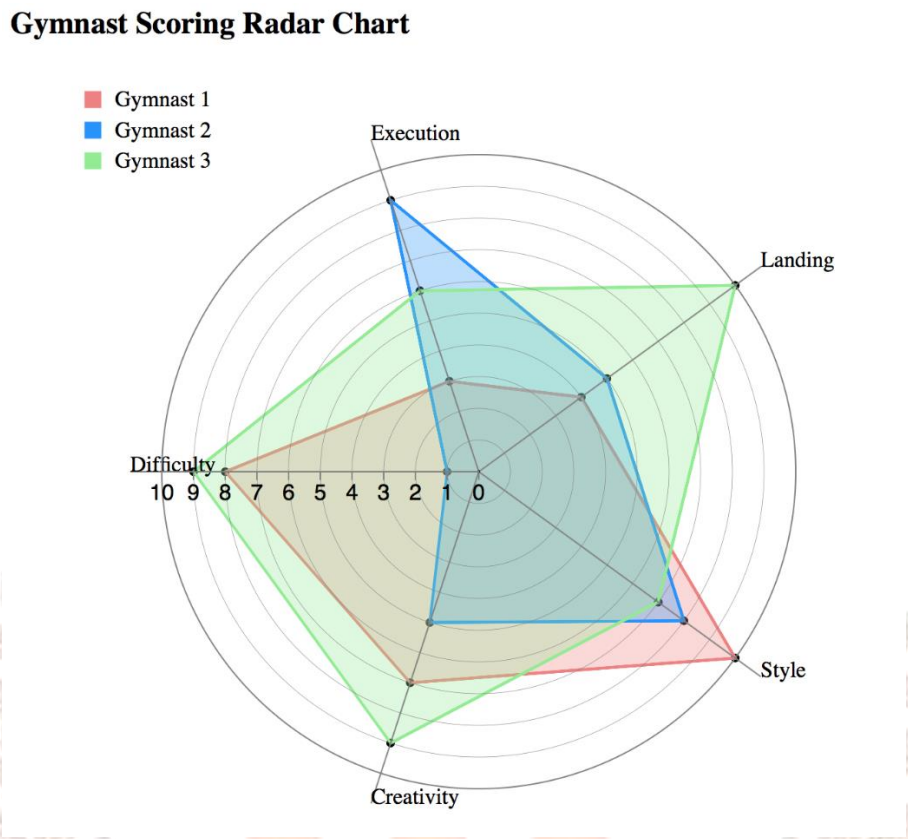

Fig 1.13. Radar chart

A **Radar Chart**, also known as a spider chart, displays multiple quantitative variables on axes radiating from a common centre point, creating a polygonal shape. This chart is handy when comparing multiple items across various dimensions. It allows analysts to assess the strengths and weaknesses of different entities, making it popular in fields like performance evaluations and competitive analyses. Figure 1.13 is an example of a radar chart.

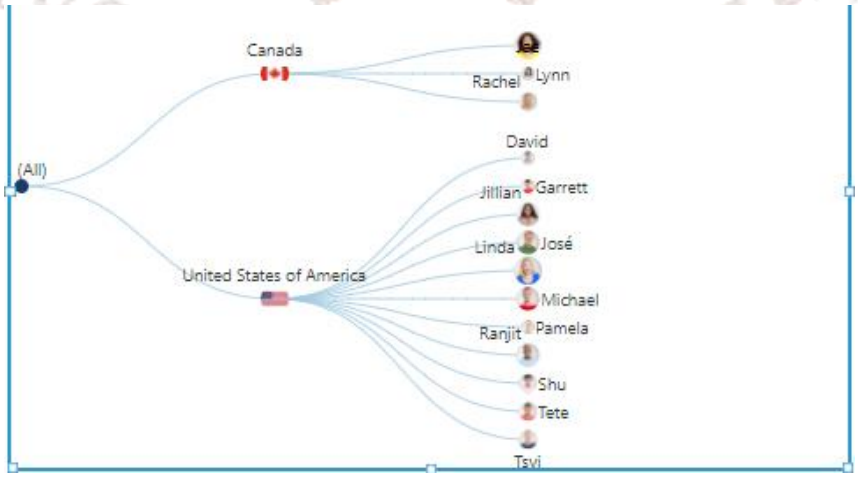

Fig 1.14. Tree Diagram

As shown in Figure 1.14, a **Tree Diagram** graphically represents hierarchical relationships between items or events. It is often used to depict decision trees, organisational structures, and classification schemes. Each "node" represents an item or event, and the branching lines show how items are connected hierarchically. Tree diagrams help understand the flow of decisions or processes, aiding in making informed choices or analysing the structure of complex systems.

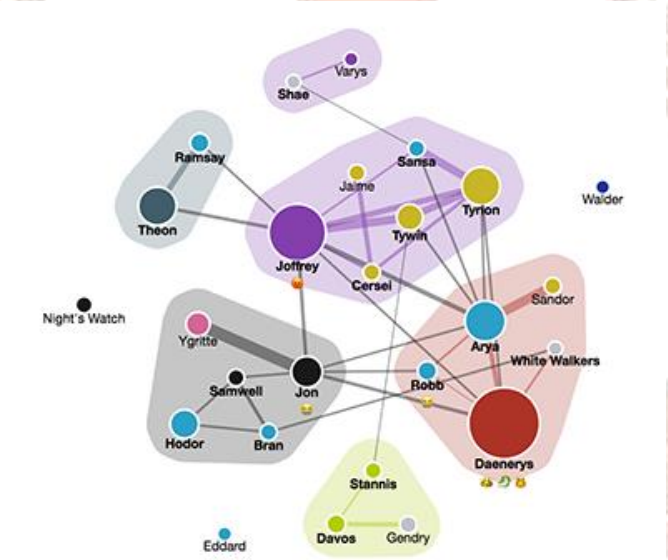

Fig 1.15. Network Diagram

A **Network Diagram,** as shown above in Figure 1.15, portrays connections between nodes, illustrating the relationships in a network or system. It is widely used in computer science, social network analysis, and project management. Each node represents an entity, and lines or edges between nodes signify connections or interactions. Network diagrams are particularly valuable when exploring intricate systems' dependencies, vulnerabilities, or communication paths.

In summary, Relationship Visualisations such as Heat Maps, Radar Charts, Tree Diagrams, and Network Diagrams are essential tools for unveiling intricate connections within data, enabling better decision-making, insights, and understanding of complex relationships.

5.5. Proportions Visualisations: they are crucial for conveying the relative sizes and distributions of different components within a dataset, allowing viewers to grasp the proportionate significance of each element quickly.

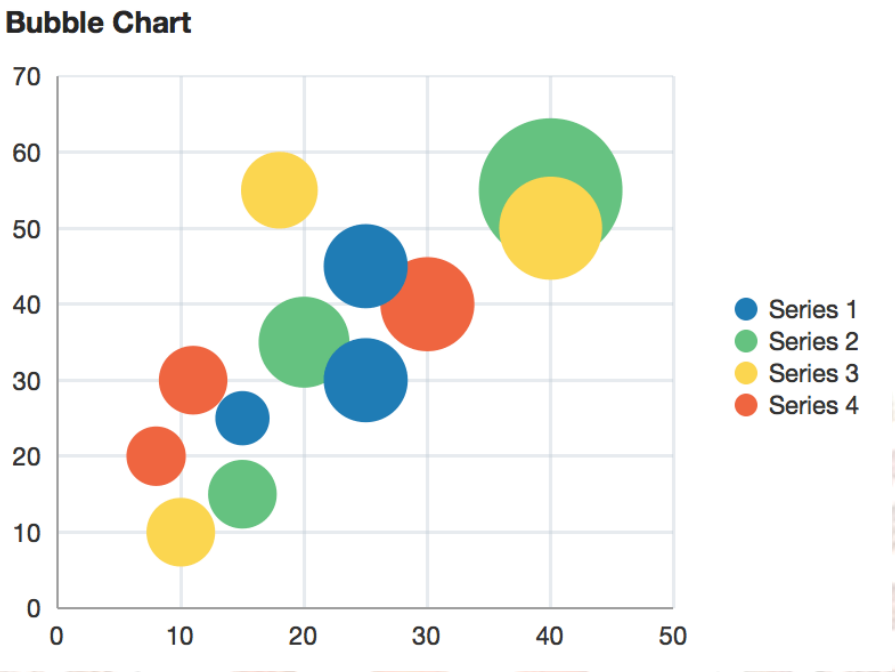

Fig 1.16. Example of a Bubble Chart

A. **Bubble Chart:** A versatile visualisation that uses circles to represent data in three dimensions. Each circle represents a data point, and two variables determine its position on the chart, while the size of the circle represents a third variable. This makes bubble charts effective for comparing data sets that have multiple dimensions. For instance, a bubble chart could be used to show the relationship between countries (X-axis), GDP (Y-axis), and population (bubble size), providing a comprehensive view of the economic and demographic landscape. Figure 1.16 is an example of a bubble chart.

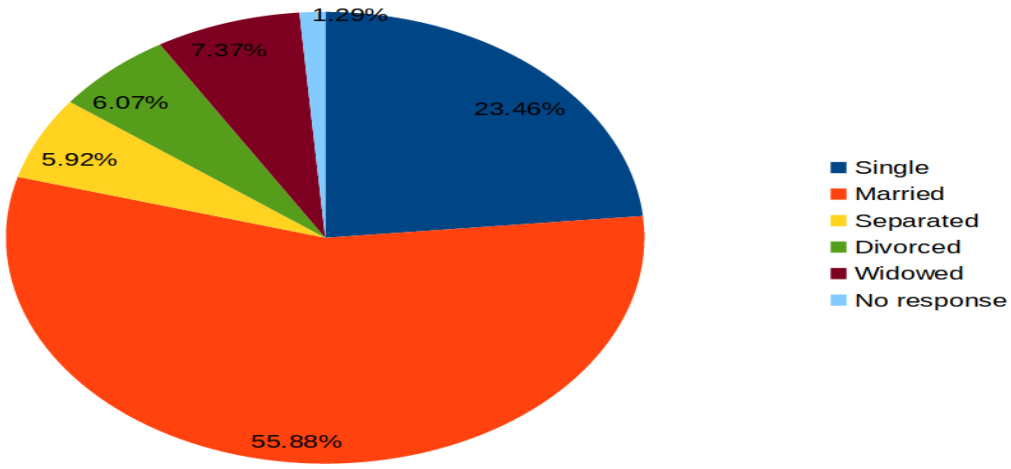

Fig 1.17. Pie Chart Example

B. **Pie Chart:** A pie chart is a classic visualisation that portrays proportions within a whole. It's composed of slices representing different categories or components, with the size of each slice corresponding to the proportion it holds within the total. Pie charts are particularly useful when showing the composition of a dataset, such as the distribution of sales across different product categories in a business. Figure 1.17 is an example of a pie chart.

Fig 1.18. Example of a Donut Chart

C. **Donut Chart:** a pie chart variant with a hole in the centre. While similar to the pie chart, the donut chart adds an extra dimension to display additional information within the centre hole. This can show related data, percentages, or annotations, enhancing the chart's informational value. Figure 1.18 is an example of a donut chart.

In summary, Proportions Visualizations, including Bubble Charts, Pie Charts, and Donut Charts, are essential for effectively conveying the relative sizes and distributions of data components, making them invaluable tools for making data-driven decisions and sharing information.

5.6. Range Visualisations: are essential for representing the spread or variation of data, providing insights into the range between upper and lower limits of a dataset.

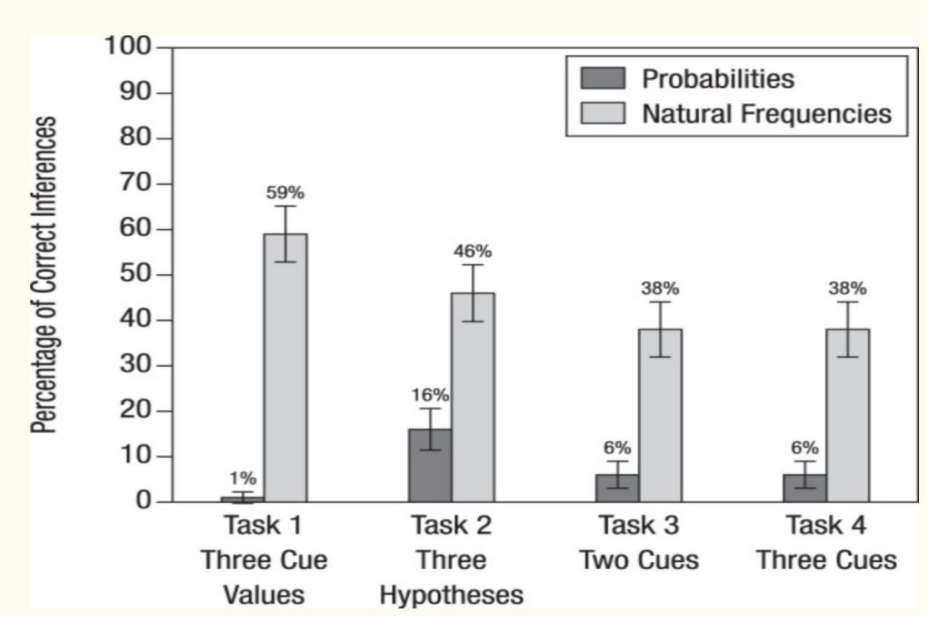

Fig 1.19. Example of an error bar.

A. **Error Bar** is a graphical representation that illustrates the variability or uncertainty of data points. It's commonly used to indicate measurement errors, standard deviations, or confidence intervals. Error bars consist of lines that extend vertically or horizontally from each data point, indicating the possible range within which the actual value might lie. By displaying the dispersion of data, error bars help viewers understand the reliability and accuracy of the data points on a graph.

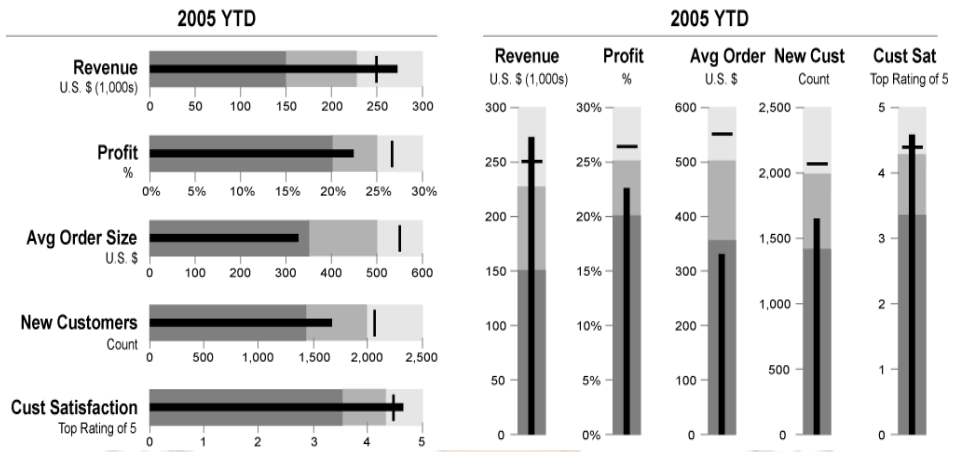

Fig 1.20. Example of a Bullet Graph

B. **Bullet Graph** visualisation allows for comparing one value against another value within a specified qualitative range. It's often used to depict performance metrics or goal attainment. A bullet graph consists of a horizontal bar representing the data value, accompanied by reference lines indicating a target value, a satisfactory range, and a poor range. Bullet graphs enable a quick assessment of how a data point compares to a desired or acceptable range, making them practical tools for performance analysis. Figure 1.20 above is an example of a bullet graph.

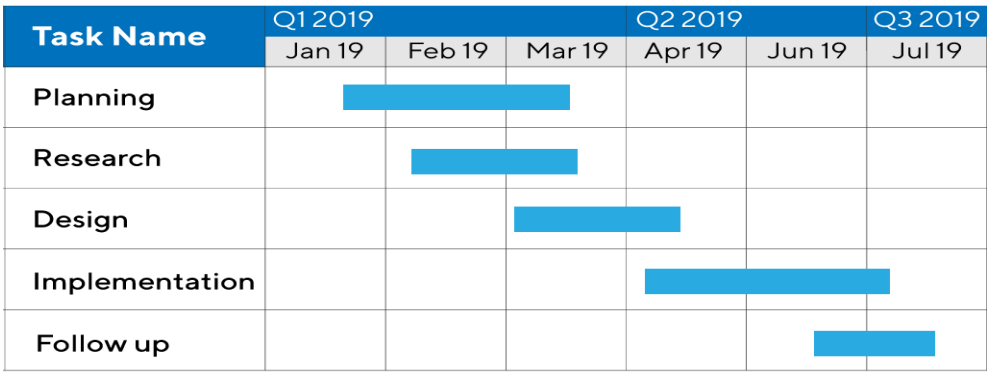

Fig 1.21. Example of a Gantt Chart

C. **Gantt Chart** is a powerful tool for displaying the schedule of activities and tasks over time. It's beneficial in project management to visualise project timelines, task dependencies, and milestones. As shown in Figure 1.21 above, Gantt charts consist of horizontal bars representing individual tasks or activities, with their length indicating

the duration. The bars are positioned along a time axis, allowing viewers to understand task sequencing, overlaps, and overall project progress. Gantt charts provide a clear overview of project schedules and help managers allocate resources efficiently.

In conclusion, Range Visualizations, including Error Bars, Bullet Graphs, and Gantt Charts, are crucial for understanding data variability, comparing values within specified ranges, and visualising timelines and task schedules, enhancing decision-making and project management processes.

5.7. Geographical Visualisations are crucial in representing data about specific geographic locations, providing valuable insights into spatial patterns and distributions.

Fig 1.22. Bubble Map

A. **Bubble Map** utilises circles to represent data values across a geographic area. Each circle's size means a particular data metric, such as population, revenue, or frequency of occurrence. Bubble maps effectively visualise data that varies across regions and allow viewers to quickly grasp the distribution and significance of values within different geographic contexts. For example, a bubble map can display the population size of cities across a country, with larger circles indicating higher population densities. Figure 1.22 is an example of a bubble map.

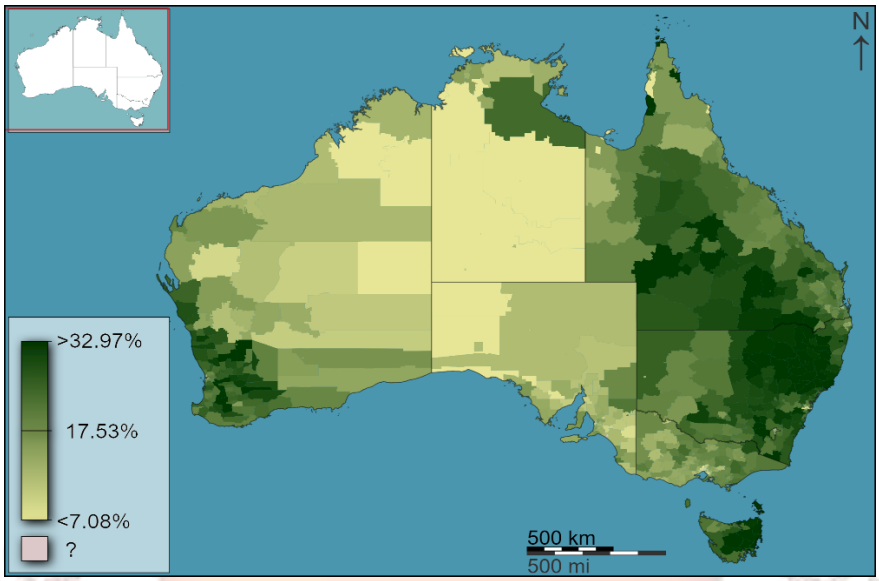

Fig 1.23. Choropleth Map

B. **Choropleth Map** is a type of geographical visualisation that uses colour shading to represent data values within specific geographic regions, such as countries, states, or districts. Different shades of colour represent different data values, allowing viewers to identify variations and trends quickly. Choropleth maps are commonly used to visualise population density, election results, or other data that can be aggregated by region. For instance, a choropleth map can use colour intensity to showcase state unemployment rates. Figure 1.23 is an example.

Both bubble maps and choropleth maps are powerful tools for revealing spatial insights in data, making them indispensable for decision-making, policy analysis, and understanding regional trends. They enable viewers to identify patterns, disparities, and relationships that might not be apparent through numerical or tabular data representations alone.

5.8. Conceptual Visualisations are instrumental in depicting abstract concepts, processes, and relationships visually and understandably, facilitating better understanding and communication.

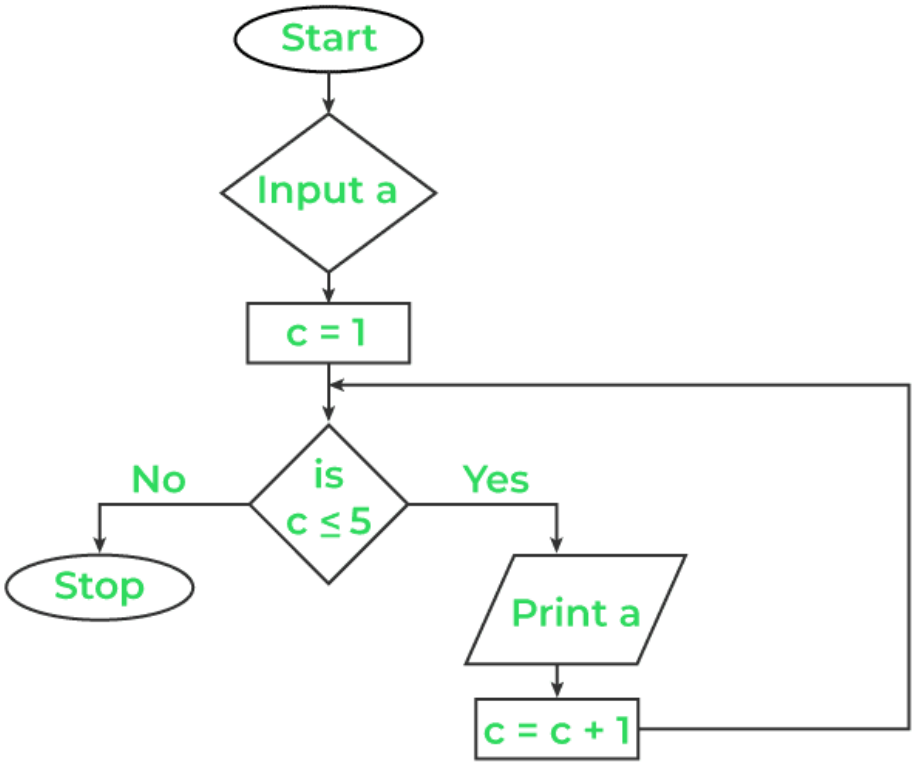

Fig 1.24. Flow Chart

A. **Flowchart** is a graphical representation that illustrates a process's sequence of steps, decisions, or actions. It uses various shapes and symbols to depict elements such as tasks, decisions, connectors, and endpoints. Flowcharts provide a clear visual guide to understanding how a process works, allowing viewers to follow the logical flow and identify potential bottlenecks or decision points. They are widely used in process documentation, problem-solving, and decision-making to outline complex workflows or procedures. Figure 1.24 is an example of a flowchart.

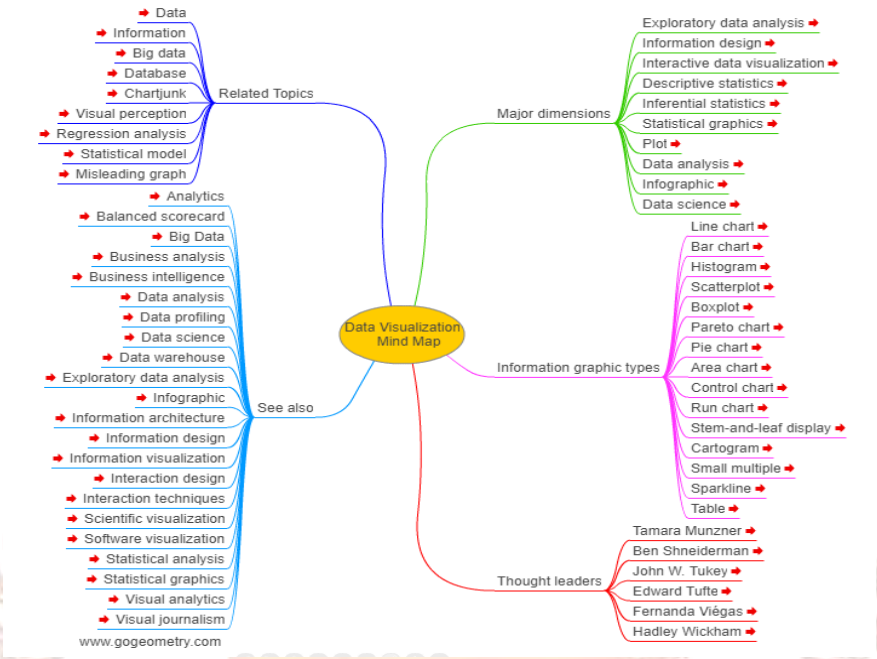

Fig 1.25. Mind map

B. **Mind Map** visualises ideas, concepts, or information in a hierarchical and interconnected structure. It starts with a central idea or theme and branches into subtopics or related concepts. Each branch can further expand into sub-branches, creating a visually organised and interconnected map of ideas. Mind maps are adequate for brainstorming, managing thoughts, planning projects, and understanding relationships between elements. They stimulate creativity and aid in capturing a broad overview and the finer details of complex subjects. Figure 1.25 above is an example of a mind map.

In essence, Conceptual Visualisations, including Flowcharts and Mind Maps, provide a visual framework for understanding processes, concepts, and relationships, making them valuable tools for communication, problem-solving, and knowledge representation.

5.9. Planning and Calendar Visualisations: are essential tools for organising and displaying events, activities, and data over specific time periods, providing a clear overview of schedules and timelines.

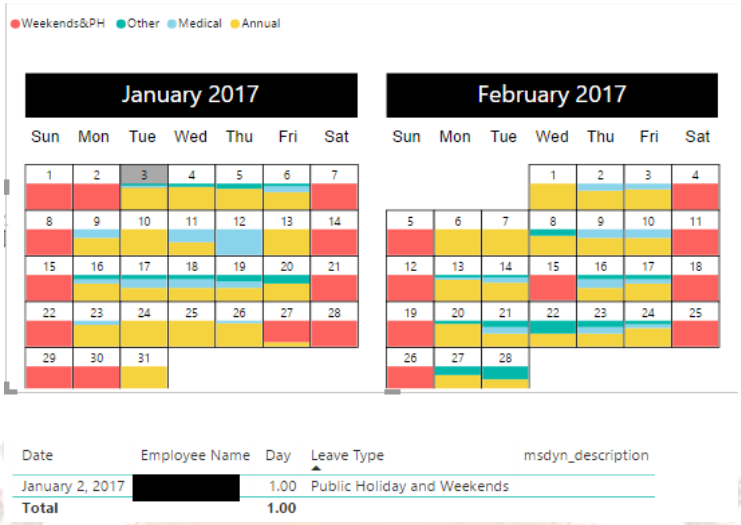

Fig 1.26. Calendar

A. **Calendar** is a visual representation of time that organises events, tasks, and activities according to days, weeks, months, or years. It allows individuals or organisations to plan and manage their schedules effectively. Calendars are widely used for tracking appointments, deadlines, meetings, and other time-bound activities. They provide a straightforward way to visualise the distribution of events and ensure efficient time management. Figure 1.26 is an example of a calendar.

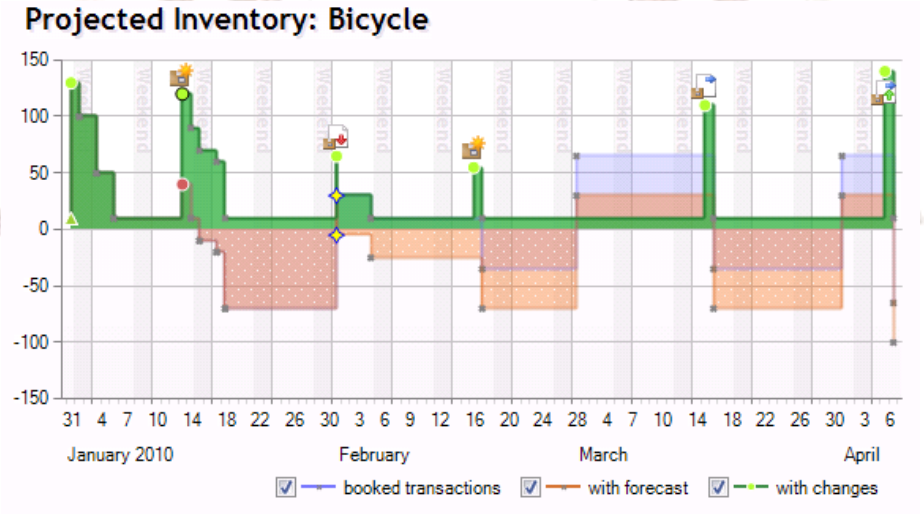

Fig 1.27. Example of a Timeline

B. **Timeline** is a graphical representation that illustrates the chronological sequence of events or milestones. Timelines display events along a linear axis, often with labelled

points indicating dates or time intervals. They can be horizontal or vertical, depending on the preferred orientation. Timelines are commonly used in history to showcase historical events, in project management to highlight project milestones, and in storytelling to depict the progression of a narrative over time. Figure 1.27 is an example of a timeline graphical representation.

Calendars and timelines offer valuable insights into the temporal aspects of data and events. Calendars emphasise the organisation of activities within specific timeframes, while timelines focus on the sequence and relationships between events. These visualisations enhance planning, tracking, and understanding of time-related information.

6. SUMMARY

The chapter on data visualisation explores the significance, applications, and types of this powerful technique for representing information visually. Data visualisation is pivotal in transforming complex data sets into understandable visuals, aiding in quicker insights and informed decision-making.

The applications of data visualisation are diverse and far-reaching. It helps doctors comprehend patient histories rapidly, leading to improved emergency care. In business intelligence, cloud-connected analytics facilitate data-driven decision-making. Military applications involve rapidly delivering accurate information for informed action, while finance industries benefit from visualising customer behaviour and investment strategies.

The chapter delves into the different types of data visualisations. Comparison visualisations, such as bar charts and population pyramids, showcase value variations. Pattern visualisations, like line graphs and scatter plots, reveal trends and relationships in data. Changes in visualisations, like candlestick charts, focus on displaying changes over time, particularly in financial analysis.

The chapter discusses conceptual visualisations like flowcharts and mind maps representing abstract concepts and processes. It explores planning and calendar visualisations, including calendars and timelines, which provide insights into scheduling and temporal relationships.

In summary, the chapter underscores the pivotal role of data visualisation in transforming complex data into actionable insights across various domains. It highlights its applications and showcases the diversity of visualisation types that contribute to better understanding, informed decision-making, and effective communication of data-driven information.

7. QUESTIONS

Self-Assessment Questions

SELF-ASSESSMENT QUESTIONS – 1

1. _____ is the purpose of data visualisation.
2. Data visualisation do _____for different expertise levels.
3. Data visualisation combines with technical analysis through _____.
4. Data visualisation turns raw data into business intelligence through_____.
5. Data visualisation assists data scientists through _____.
6. Identify what information does data visualisation provide to help military commanders understand the situation quickly.
   a) Financial data
   b) Troop movements
   c) Consumer behaviour
   d) Political trends
7. How does data visualisation impact real estate professionals?
   a) Managing food delivery
   b) Showcasing property information
   c) Analysing customer reviews
   d) Monitoring financial markets

8. Candlestick Chart displays _____.
9. _____is the primary purpose of a Mind Map.
10. Data visualisation aid in identifying emergencies through _____.

Terminal Questions

1. Discuss the role of data visualisation in shaping professional skills and career opportunities.
2. Explain the concept of the "citizen data scientist" and the role of data visualisation in this context.
3. Discuss the crucial role of data visualisation in military applications.
4. Explain how data visualisation enhances data science processes.
5. Explain how data visualisation impacts the field of Business Intelligence.
6. Explain the concept and utility of a Bubble Map in data visualisation.

8. ANSWERS

Self-Assessment Answers

1. Better Understanding
2. Bridge
3. Storytelling
4. Insights
5. Exploration
6. Troop Movements
7. Showcasing Property Information
8. Movements
9. Representing Interconnected ideas
10. Conditions

Terminal Question Answers

1. Refer section 1.4
2. Refer section 1.4
3. Refer section 1.5
4. Refer section 1.5
5. Refer section 1.6
6. Refer section 1.6