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DATA VISUALISATION

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7.1 INTRODUCTION

Data visualisation flourished in the realm of maps, showing landmarks, cities, roads, and services, mostly before the 17th century. The data visualisation was never simpler with new technologies. Graphing data provides a high-speed shortcut for interpretation and collaboration. During the industrial revolution, many of the new visualisation methods were invented and the field took great strides towards the middle of the 19th century. It would have been odd and foreign to anyone 200 years ago, what would appear basic and natural today, such as a bar chart or line chart.

At the beginning of Year 1600-1699 which known as the "Measurement and Theory" century, Christopher Scheiner [67] introduced the idea that Tufte would later call the "micro multiple" principle to demonstrate, over time, the changing sunspots' configuration. Seven sunspot groups are identified by the letters A–F on the upper left. The 37 smaller, labelled left-to-right and top-to-bottom images also identify these groups. During the 1660s, the systematic compilation and study of social data started in many European countries, to tell the state about income, population, agricultural property, tax, and so on [68], and for economic purposes, such as insurance and living tables [69]. In 1669, the first graph of an ongoing distribution function was used by Yang et al. [70] to generate roughly the initial statements in probability theory around 1654 along with the principle of teamwork systems. The first Bavarian tract derived from observational data was seen in the mid-1680s and was related to a theoretical curve of the barometric pressure at altitude [71].

According to Grossman [72], William Playfair designed a new graphic form in the year of 1700-1799 which contributes to today data visualisation by using various visual shapes such as rings, pies, and rows. Some of the most famous plots that William Playfair is known to be the (line, bar, circle, and pie charts) [73]. During this era, a variety of statistical map forms were devised, including histograms, time series sketches, contour plots, scatterplots, and more. Playfair used three parallel series of periods to display the price of wheat, pay, and

ruling king for a total of two and fifty years between 1565 and 1820, and this graph claimed that in recent years employees had changed [74].

In the first half of the 19th century, there was an exponential increase in mathematical graphics and thematic mapping at a pace not equalled until the current period due to fertilisation provided by past advances in architecture and techniques. All modern data show formats are invented with mathematical graphics: bar charts, pie charts, histograms, line charts and time series charts, contour graphs, dispersion charts, etc [75]. In thematic mapping, a broad variety of new types of symbolism were added, from single maps to detailed atlases, representing data on a wide range of problems. During this time, natural and physical phenomena (magnet, temperature, tides etc.) were also routinely studied in science journals [76]. In 1850-1900, known as the statistical graphic era, many modern graphical types were invented and applied to new fields of inquiry, especially in the social sphere, using graphical displays to interpret complex data and phenomena. The use of divided circle diagrams on maps was introduced by Rendgen [77]. Later, he introduced the use of flow lines on width charts to display movement and transport globally relative to the volumes. In his iconic depiction of the fate of the Napoleon and Hannibal armies, in what Tufte called "the best graphic ever produced," the flow map was brought to its highest degree by almost the end of his life.

Even under the formal and numerical influence, data visualisation began to rise in the mid-1960s from dormancy. Three major developments have largely stimulated this:

1. In the United States, in an important paper The Future of Data Analysis, John W. Tukey [78] has called for data analysis to be recognised as a legitimate branch of mathematical statistics. It has soon started the invention of a broad spectrum of new, simple, and effective graphic displays under the rubber of "Exploratory Data Analysis". The status of Tukey as a statistician was almost as influential as his visual inventions and the reach of his casual, robust, and graphical data analyses approach. Although not published until 1977, Tukey's EDA chapters were circulated widely as they appeared in 1970-1973. They became interesting and respectable again in the analysis of graphic data.
2. The monumental Semiology Graphique [79] was published in France by Jacques Bertin. Some people thought it would be possible to arrange the visual and perceptual elements of the graphs based on their characteristics and relationships in the results, as Mendeleev had already done with the chemical electro-specific organisation. In an overlapping yet different direction, Jean-Paul Benzécri's [80] exploratory and graphic approach to multidimensional data presented an alternate visual perspective on the topic of statistics by French and other European statistics.
3. However, during the sleepy "Dark Ages" [81] of graphics, the talents of hand-drawn maps and graphics have been dry (although almost every figure of Tukey's EDA has, by intention, been drawn by hand). Computer data treatment started in 1957 with the development of FORTRAN, the first high-level programming language. By the end of the 1960s, broad-scale university mainframe computers were able to create new and outdated graphic types through computer programs.