Assignment 1

Specific instructions for Assignment 1:

- The deadline is on 15 March 2023 at 23:59, Finnish time.
- The maximum number of points from this assignment is 15.
- This assignment has four exercises that must all be completed to obtain full points.
- The datasets given for Exercises 3 and 4 are in the CSV format, where the lines present rows of a table and the numbers for each column in a row are separated by commas.

General instructions:

- The general grading criteria are available on the MyCourses web page.
- Students should complete the assignment individually, but discussions with others are encouraged. but discussions with others are encouraged. However, your final solution must be your own. Please read the *Aalto University Code of Academic Integrity and Handling Violations Thereof* for further details.
- The language of the reports should be English.
- Policy for late submissions: The score is reduced by three points per day after the deadline. (However, you cannot get negative points for an assignment.)
- If you have a pressing reason that causes you to miss the deadline, you can send an email to the lecturers (cs-e4840@aalto.fi) to request an extension without the late submission penalty. The reason must be such that it would entitle you to be absent from work (e.g., illness) and verifiable (e.g., doctor's certificate). The extension must be requested before the deadline.
- The submitted report should be in a single Portable Document Format (PDF) file. If you are using software such as Word, then export the final document as PDF. If you have several PDFs, then please merge them into one before submitting the assignment.
- Do not attach any source code.
- State your name and your student ID clearly in the report.
- Number your answers by the number of the questions, and keep the order.

Exercise 1 (3 points)

Figures 1 and 2 show published visualisations of different issues. Your task is to:

(a) Analyze the visualization in Figure 1, starting from Tufte's principles. List at least four items that contradict these good-design principles.

Figure 1. Statistics of the early Covid-19 outbreak in Ecuador (March 2020).

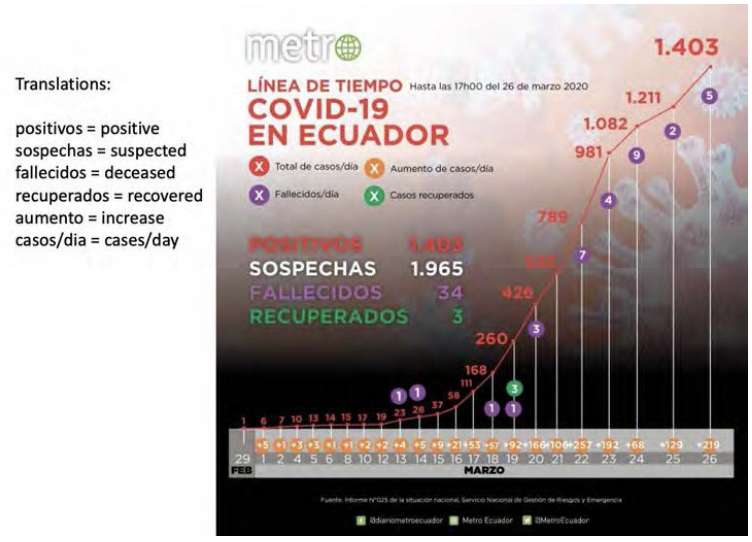
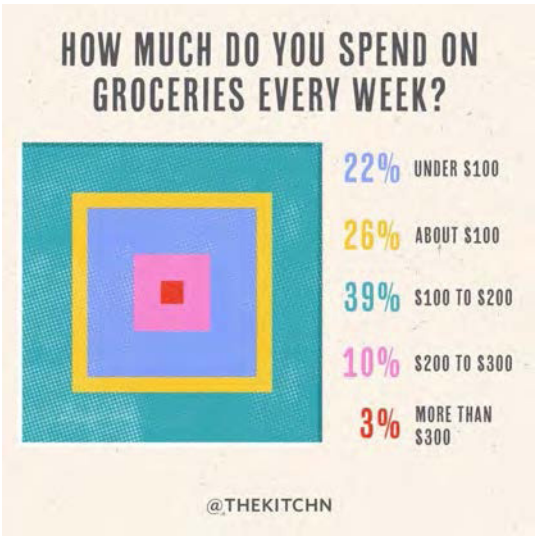


Figure 2. Grocery expenditure according to a survey.



(b) Suggest an improved visualization for Figure 2, using the data shown in the figure, and explain your design choices. For a full mark, you should provide an image (e.g., drawing, even by hand) and explain why your proposal is better than the original.

Exercise 2 (2 points)

Look for an example of a visualization that you find particularly beautiful or disturbingly bad in a recent issue (published on or after June 2021) of a high-profile scientific journal (*Nature*, *Science*, etc.) or mainstream media (CNN / Helsingin Sanomat / Tilastokeskus.). Try to explain what makes it appealing, purposeful, horrible, etc. The journals are accessible from within Aalto.

Specify precisely the visualization you have selected. If you provide a link, it must be functional and unambiguous (otherwise, you get zero points). It is safer to insert the picture in your report.

Exercise 3 (7 points)

(a) Satoshi is running a crypto business. It is very turbulent with fake media is spreading rumors of bubbles and pyramid schemes. Your goal is to help Satoshi convince the public that bitcoin has performed better than the S&P 500. Use the provided data (BTCvsSP500.csv), which contains the daily closing prices in US dollars for the bitcoin and S&P 500 index, respectively, to make your case. You can every trick in your book: chartjunk, optical illusions, "creative" layout, use only part of the data. You can use any plotting software available (R, Matlab, Python, Excel, OpenOffice, gnuplot etc.).

(b) Warren is a passive investor irritated by the whole bitcoin fuzz. Use the same data to make the opposite case. Again, you can use every creative trick imaginable.

(c) Use the notion of Lie factor (see slides of Lecture 2 or Tufte's book, page 57–58) to measure whether the above plots are underestimating or overestimating the relative performance of the two financial instruments.

(d) Jorma is a student at Aalto University. He is impartial because he has no money, bitcoins, or S&P 500 ETFs. He decides to start a blog of graphical designs of important topical datasets. Help Jorma and follow the principles of Tufte as closely as possible, and create a plot for the relative performances of the bitcoin and S&P 500. Justify your choices, and describe how/whether you can improve your visualization even more.

Exercise 4 (3 points)

Visualize the Olive dataset, available at the MyCourses page. This dataset contains 572 olive oil samples from three different regions of Italy. For each sample, the normalized concentrations of eight fatty acids are given. The first variable indicates the row name, the second region, the third the area, and the remaining columns provide the fatty acid concentrations. All numbers are separated by a comma, and the first row gives the column labels. Select at least four features, and create small multiples (trellis), a visualization with scatterplots of each pair of features, arranged as a matrix; see an example of such arrangement for the Iris dataset (see Wikipedia's "Iris Flower data set"). Indicate with different colors the three regions. Try to show the difference between the regions, and maximize the data-ink ratio, within reason.