Introduction to Data Visualization

Hasso-Plattner-Institut
Fachgebiet Computergrafische Systeme

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Winter Term 2020/2021 – Assignment Sheet # 1

Objectives

With these assignments you will learn how to

- bind data to DOM objects to create visualizations rendered by a web browser using D3.js,
- create scales and axes for displaying numbers, and
- use color scales and animations in a bar chart and a scatter plot.

For your programming tasks, you will use D3.js together with JavaScript integrated in a HTML file. First install node[1] and a simple web server by typing

- npm install http-server -g

in your command line. In order to load CSV files you need to start a local server by typing

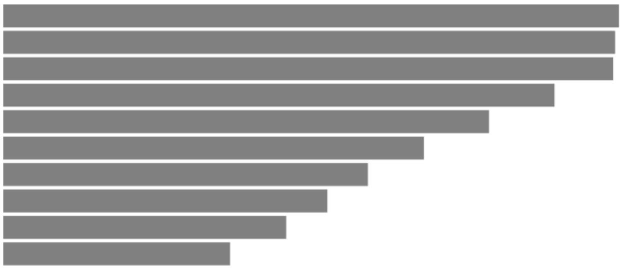
- http-server

in the directory where your files are located. In each subtask you need to modify the provided HTML file, e.g., modify Ex2c.html for Exercise 2 c), pictures below a description demonstrate possible solutions. The sizes of the DOM objects, e.g., the radii of circles or color schemes, should be chosen in an appropriate way but are not restricted to one single possibility. Color schemes can be loaded from colorbrewer[2], for details about D3.js you can refer to its documentation[3]. Your solutions must be uploaded via Moodle till **November 26, 2020, 9am (UTC+1)** as one ZIP file that contains all HTML files. The naming convention for this ZIP file is **sheet1_<Matrikelnummer1>_<Matrikelnummer2>.zip**.

Exercise 1.1: Animated Bar Chart for Market Capitalization Data (10 Points)

The data set *MarketCap.csv* contains the market capitalizations of ten German large-cap companies as of January 6 and November 6, 2020. The goal of this task is to display the market data at the respective timestamp as a horizontal bar chart and then display the change as an animation. We further use the visual color for displaying time-variant data.

a) Show the market capitalization on January 6 of the listed companies. Read the data set using functionalities of D3.js. For visualization, each data point should be assigned a rectangle, whose horizontal spread scales linear with its value. The rectangles should be ordered in decreasing order. (2 Points)

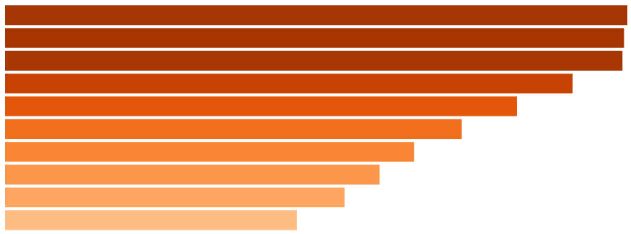


b) In addition to the horizontal spread, the market capitalization as of January 6 is now to be additionally represented by the color of the rectangles. Extend the previous solution by applying a sequential color scheme. (2 Points)

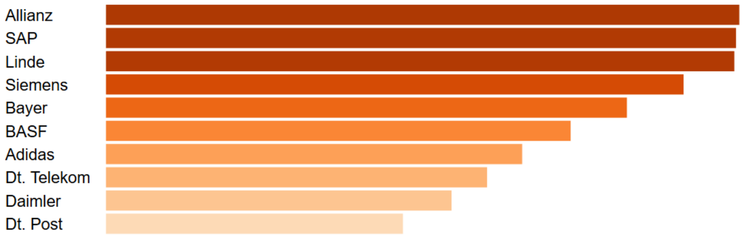
[1] https://nodejs.org/en/

[2] https://colorbrewer2.org/

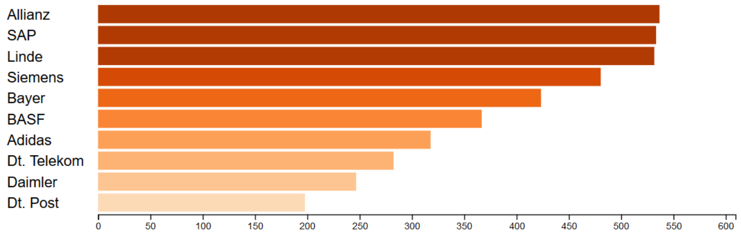
[3] https://github.com/d3/d3/blob/master/API.md



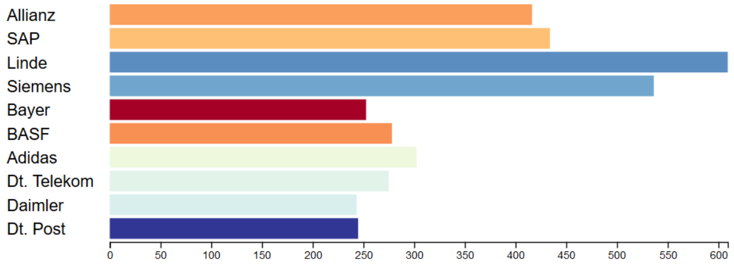
c) It is impossible to interpret a bar chart without identifiers. Extend the previous solution by labeling the rectangles with the associated respective company names. (2 Points)



d) An axis is needed to obtain the value of the market capitalization. Insert a scale at the bottom of the visualization, making sure that the value range is appropriate. (2 Points)



e) Create an animated transition that depicts the change in market capitalization from January, 6 to November, 6 within 5 seconds. Both the width and color of the rectangles should be animated. The color of each rectangle should depict the relative change to the market capitalization of January, 6 using a diverging color scale. (2 Points)

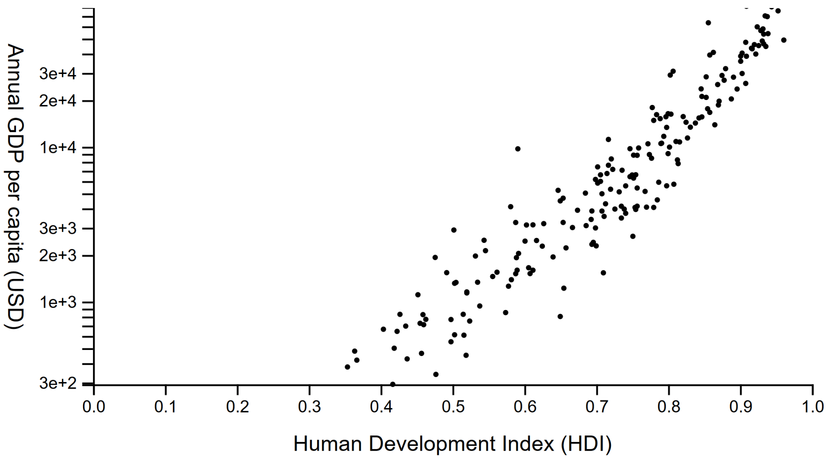


Exercise 1.2: Scatter Plot for Displaying HDI and GDP Correlation (10 Points)

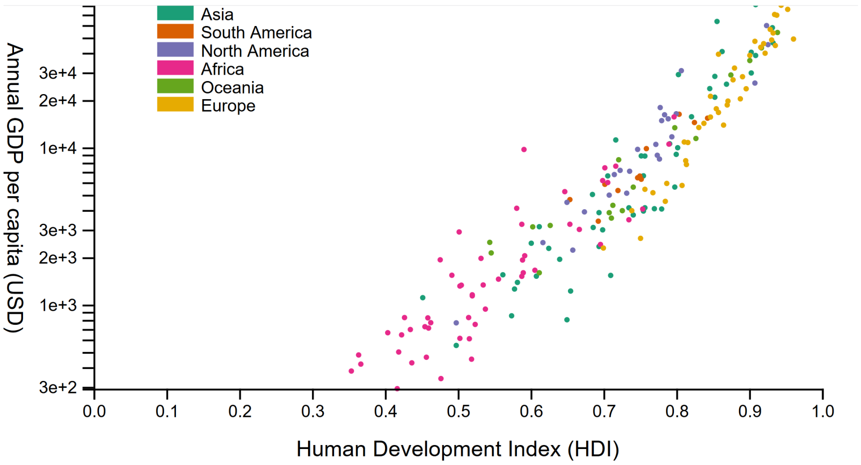
The data set *UnRegionsGdp.csv* is to be visualized by a scatter plot. Each row contains name, the Human Development Index (HDI) and the Gross Domestic Product (GDP) among other data for the year 2017.

a) Each country should be represented by a point in the two-dimensional cartesian coordinate system. The x-coordinate is given by the HDI and the y-coordinate by the GDP. Read the data using D3.js functionality and select only valid data points (HDI $>$ 0 and GDP $>$ 0). (2 Points)

b) Expand the implementation by coordinate axes including labels for both x and y. For an equalization of the y-axis a logarithmic scale should be used. (3 Points)



c) Use a qualitative color scheme to map the continent for each data point. The legend of this representation should be added to the visualization. (5 Points)



Instructions

Pair Programming On these assignments, you are encouraged (not required) to work with a partner provided you practice pair programming. Pair programming „is a practice in which two programmers work side-by-side at one computer, continuously collaborating on the same design, algorithm, code, or test.“ One partner is driving (designing and typing the code) while the other is navigating (reviewing the work, identifying bugs, and asking questions). The two partners switch roles every 30–40 minutes, and on demand, brainstorm.

Violation of Rules A violation of rules results in grading the affected assignments with 0 points.

- Writing code with a partner without following the pair programming instructions listed above (e.g., if one partner does not participate in the process) is a serious violation of the course collaboration policy.
- Plagiarism represents a serious violation of the course policy.