Assignment 10: Hierarchical Data **(20 points)**

Due: 08.07.2024 10AM

id	city	country	sales (EUR)	supplier
1	Hamburg	Germany	31 338	Samsung
2	Hamburg	Germany	67 999	HP
		…		

Imagine the provided dataset (see ***data.js*** for more details) is part of a sales report for a multinational electronics retailer. The retailer operates in multiple cities (in total 66) within the countries of Germany, Austria, and Switzerland. They track the sales performance of various suppliers (in total 50), such as Samsung, HP, and Apple, to understand market trends, supplier performance, and regional sales dynamics.

Task 1: Theory **(5 points)**

Task 1a) The structure of the provided dataset is currently flat. In order to visualize it hierarchically, we need to convert it into a **hierarchical format**. Think about visualizing the data using a node-link diagram:

i. What would be the **root** node in this scenario?
ii. Which variable could we encode by **node size**?
iii. What could be an appropriate **hierarchical structure** with 3 levels (root→ level 1 → level 2 → level 3)? Explain your choice.
iv. The data contains sales data of one year. Imagine we have data over **multiple years** – how would this change your answers from i. - iii.?

Task 1b) What are **advantages** and **disadvantages** of using a **node-link diagram** to visualize this specific dataset?

Task 2: Programming and Data Analysis

Task 2a) **(10 points)**

Goal of this exercise is to **implement a Treemap** with D3 using the data provided in *data.js*. Your task is to finish the given implementation by following the steps described below. All steps should be implemented inside the *index.js* file.

1. Convert the provided dataset into an appropriate hierarchical format using your structure from Task 1a) iii.
   Hint: You might need d3.group() and d3.hierarchy().
2. Use *d3.treemap()* to initialize the Treemap layout given the data of step 1. Use padding to separate the individual hierarchical levels/rectangles from each other (this is called a containment Treemap; see FinViz for example).
3. Add the rectangles to the *chart* svg. Each rectangle should be colored according to its respective level 1 category (for example: if level 1 corresponds to the variable ‘city’, each color should represent a different city).
4. Add a text element at the upper left corner of each rectangle displaying the respective level 3 category (for example: if level 3 corresponds to ‘city’ and the rectangle

represents a ‘Hamburg’ entry, then ‘Hamburg’ should appear as text in the corner of this rectangle).

5. Add a heading above rectangles belonging to the same level 1 group (as in FinViz for example) and color the label according to your defined color scale from step 3.
6. Add interactivity to the rectangles of the Treemap:
    a. A tooltip should be displayed when hovering over a rectangle. The tooltip should provide information about the underlying data (i.e., city, country, sales, supplier) and should change its position to move alongside the mouse pointer. *Hint: Use the respective div-container in the index.html file with default styling attributes provided in the index.css file. Add event listeners (events are ‘mouseover’, ‘mousemove’ and ‘mouseout’) and adjust the tooltip respectively.*
    b. When hovering over a single rectangle, all other rectangles sharing the same value of the level 3 variable should be highlighted through an opacity of 1, while all others should temporarily become an opacity value of 0.1. *Hint: Add this behavior to the mouseover and mouseout event listeners from a.*

Task 2b) **(5 points)**

Given your implementation of the Treemap, comment on **how suitable** this visualization is to answer the following questions. **Provide an answer** to each question if the visualization is suitable or state **how you would need to adapt** the visualization for this purpose.

i. Which city has the highest cumulated sales? To which country does this city belong to?
ii. Which supplier has the highest cumulated sales? In which city does this supplier generate the most sales?
iii. Which country has the highest cumulated sales? What percentage of total sales does this correspond to?
iv. Are there cities where all sales are generated by a single supplier?
v. Are there country-specific trends, i.e., some supplier(s) operating mainly in a specific country or unusual sales volume of certain suppliers in comparison to other countries?
vi. How many different suppliers generate sales in the city of Graz (Austria) and which of them generates the highest sales?

This is the LAST assignment! Keep that in mind if you are still missing points for reaching the 50% of points for the exam admittance or 90% for the bonus.

Submission: Zipped folder including all files of the programming exercise (index.html, index.js, index.css, data.js) and a PDF/text file with the answers to the theoretical questions.

Please find yourself in Groups of **2 Students**. Only 1 member of the group must submit the exercise in ILIAS.