Objective

At the end of this checkpoint, you must have a sketch depicting the main aspects of your visualization, which you can then implement.

Requirements

Create a paper-and-pencil sketch of your visualization considering the Task and Data Abstractions you provided in Checkpoint I. You must consider ***at least* three different (but interconnected) visual idioms** in your prototypes. Remember that some tasks should be performed by leveraging synergies between those idioms.

These sketches may be done using prototyping tools, BUT do not worry about the aesthetics at this point. You must focus on choosing the visual encodings for your data types and the idioms for supporting your questions instead. Hand drawings are preferred ***if we can understand the depicted visualization techniques***. Consider **whether the idioms you choose are the most effective for what you want to show** (datatypes, tasks, scalability, etc.) and present adequate justifications for their choice based on those aspects.

One of the sketches **must** show the dashboard where the several idioms are to be used, and the overall layout can be seen. You can show detailed sketches for different interface parts if this will help you explain, but **the overall view is mandatory**. Be careful with your layout, proportions, alignments, etc., as the faculty will evaluate it. Just "drawing a few vis side-by-side" with no care to relative position, size, etc., is on the fast track to a bad grade. It may be particularly interesting to show more than one sketch if you want to show relevant differences in visual representations/states arising due to ***interactivity***.

For each visual idiom, present the **marks** and **channels** you use and the **rationale** behind choosing them. Use the theoretical knowledge you learn in class, based on the task types and data types you chose in Checkpoint I. Moreover, present **alternatives** for your choice and their advantages and drawbacks. Finally, include all the **interaction** techniques the chart supports (hover, click, drag, brush, etc.) and how it should respond visually and internally to user interaction. *Do not forget legends and scales!*

You must discuss the **dimensionality** as well. For instance, consider that you have a categorical and a ratio variable. You could use a bar chart to show a distribution. But what if you have four ratio variables? Should you use a stacked bar chart? Small multiples? Will you consider interaction if the user does not need to see them all at the same time? Will there be animations to show some

evolution? Another relevant example is when you consider temporal dimensions. Linear/cyclic, hierarchic or not, spans or intervals or instants… All these features help you choose the more adequate visual idiom. A similar logic applies to visualize geolocations: what projection will you use? Which frontiers? Be precise. We will discuss with your group the design choices and you must be able to justify them.

You must show us how the several idioms you chose, working *in tandem*, will address your needs. Present how the idioms are **integrated**, e.g., if you click on a mark in the scatterplot, the mark is highlighted in the line chart through a change in the color fill from black to blue. Bottom-line: show how the integration helps the user to complete the tasks and generate insights that go beyond a single visualization. To that end, you must provide a **step-by-step guide to answer each question from Checkpoint I** using your visualization dashboard. Also **mandatory** are **storyboards showing how to answer at least one of the questions from Checkpoint I**. You can choose the questions you think are better for the storyboard, but answering them **must require the combined use of more than one of the visualization idioms** (e.g., finding something in one view, selecting it, causing that item to be highlighted in another view, where you then compare it with others, etc.).

Finally, remember that you do not need (should not) limit yourself to the tasks/questions in Checkpoint I if there are obvious opportunities to explore the data better, given your choice of encodings/idioms. Beware of ***missed opportunities***.

Example

Remember when we chose the scatterplot to visualize the correlation between the wines' prices and ratings? We opted for a scatterplot since it allows us to examine the overall pattern of the data in terms of direction, form, and strength. It also helps us to easily identify outliers. The marks were circles, with the x-axis channel encoding the price and the y-axis channel encoding the rating. However, we added an additional mark: a line to represent the strength of the association. Other alternatives could be a KDE plot (to show the density distribution through a contours) or a hexbin plot (like a heatmap to bin the chart area into hexagonal regions). However, both charts suffer from the lack of the individual marks to demark the relationship between the two variables. Instead, the KDE and the hexbin plots are better to see the frequency with which the individual values appear in areas/bins. You could also use single-variable charts, such as bars or dot plots, to depict the price and the ratings. However, a striking drawback hinders the analysis: the fact that these charts require the marks to be ordered in an axis prevents the user from grasping the correlation visually. More examples? Parallel coordinate plots can help visualize this relationship, but they are overkill for only two variables. The appeal to use parallel coordinate plots is the ability to switch axis positions to view specific relationships more in-depth.

Deliverables

Create a **4-page document using the provided template** and submit it online, until two days before your class (ex: classes on Monday must submit until Friday end of day).

Penalties

- Documents over 4 pages long: **1 grade point penalty per extra page**.
- Document uploaded after the deadline: **0.5 grade points penalty per hour of delay.**
- Document template altered (wider margins, smaller font, etc.): **1 grade point penalty.**
- Small images or with low resolution**: 0.5 grade points penalty.**

Constraints

Think about the visualization idioms you are going to use. Your project needs to contain *at least* three different linked visualization techniques. You do not get extra points for effort if you create more than three idioms. However, sometimes it is better to implement a fourth idiom that helps answering or complementing a data scope/question. Keep that in mind and make sensible decisions that you can justify based on theoretical and practical knowledge. **One visual idiom** must ***not*** be in the following set:

- Area chart (including stacked area).
- Bar chart (including stacked bars).
- Bubble chart.
- Choropleth Map.
- Heatmap.
- Line chart.
- Parallel Coordinates.
- Pie chart.
- Radar chart.
- Scatterplot.
- Simple map with pins on it.
- Treemap.
- Word Cloud.

Tasks to perform during the lab

The professor will provide feedback. The grade will be made known one week later (see below). If you are not receiving feedback, then you must be peer assessing your colleagues' submissions.

Grading

Your work will be graded according to the following parameters:

- **Overall organization (5%)**: carefully craft the dashboard layout. Beware of white space.
- **Visual Idioms and their descriptions (40%)**: carefully present each visual idiom and their features. Discuss alternatives.
- **Interaction (15%)**: describe the interaction of each chart (e.g., hovers, clicks, brush).
- **Integration (15%)**: present the integration between all charts.
- **Articulation with Checkpoint I (10%)**: the visual idioms support the questions from Checkpoint I.
- **Missed opportunities (10%)**: identify opportunities that were not visible in Checkpoint I but now can be achieved, or extensions to your proposal that are obvious (e.g., adding a fill encoding to a scatterplot to depict a third variable).
- **Peer assessment (5%)**: grade your peers' submissions in the class.

An important note on grading for this and all other Checkpoints: always ***justify*** your choices, based on the basic principles you have learned in this course (adequacy of channels to data types, human perception, etc.). Don't just describe what it is, but especially ***why*** it is as it is.

Additional Notes

After you deliver your document, your work will be graded. HOWEVER, this grade **can be improved by up to two grade points** if you correct any faults pointed out by the professor and submit a revised version of the document HIGHLIGHTING THOSE CHANGES up the beginning of the class taking place 7 days after you receive feedback in class. ***Only highlighted changes will be considered.***