Checkpoint II: Visualization Sketch
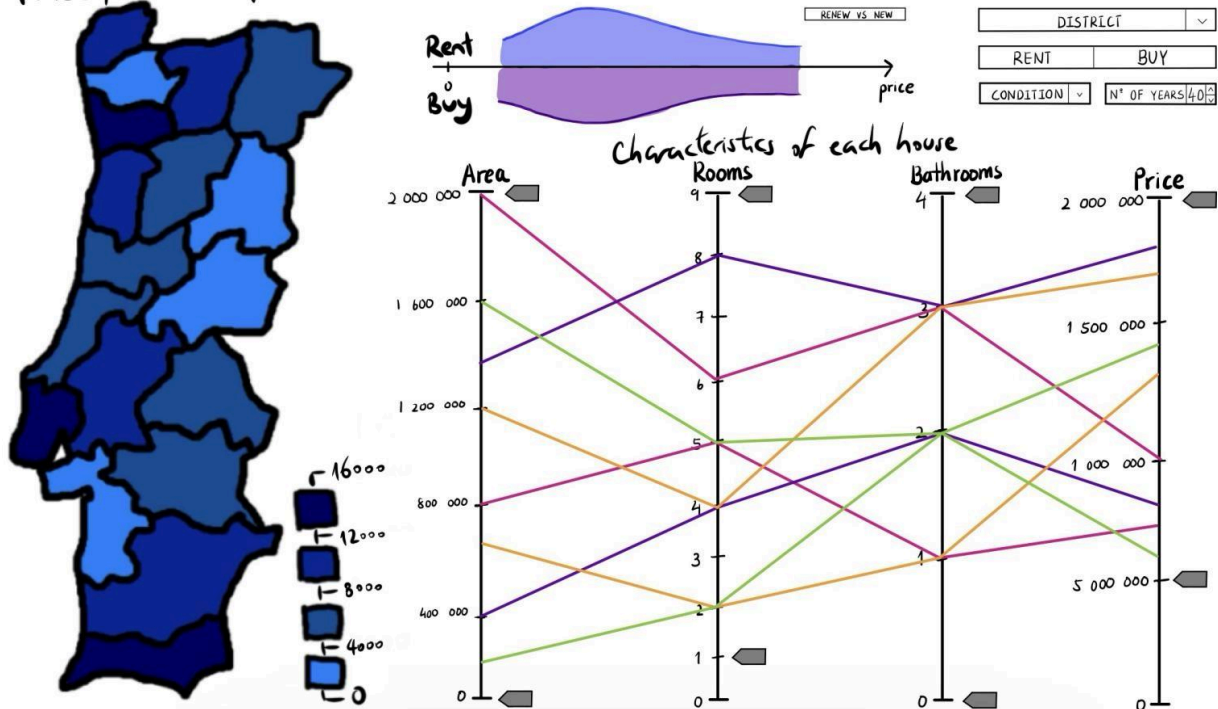
Group: G23
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Dashboard Overview

We have developed an advanced dashboard featuring three types of visualizations: a Parallel Coordinate Chart, a Violin Plot, and a Choropleth Map. An interactive side panel enables users to customize the analysis by selecting map details, and selecting filters .

Charts

Chart #1 - Violin Plot

The Violin Plot is an effective tool for answering questions about the cost-benefit of buying a home.
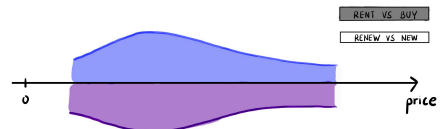
Marks and Channels
- Mark: In the shape of a violin lying down
- Channels: The width along the Price-axis indicates data density, while color differentiates categories.

Rationale
- **Choice**: Distribution of data in a clear and intuitive way, allowing a better understanding of variations and trends.
- **Second option**: The Sankey Diagram is great for showing flows and relationships between categories, but the Violin Plot offers a more detailed view of price distribution.

- **Advantages**: Shows the density of the data, facilitating comparisons between categories and highlighting patterns.
- **Disadvantages**: For those unfamiliar with Violin Plot, the interpretation can be a little more complex than simpler graphs.

Interaction

- Users can select the comparison groups, such as Renew vs New or Rent vs Buy, and the graph will update automatically to reflect the information to the selection made.

Chart #2 - Parallel Coordinates

We opted for a visualization in Parallel Coordinates, as it has a technique that allows multiple variables to be represented simultaneously.

Marks and Channels

- **Mark**: In a line, tracing a path through the axes
- **Channels**: The color to differentiate the lines based on categories, the district
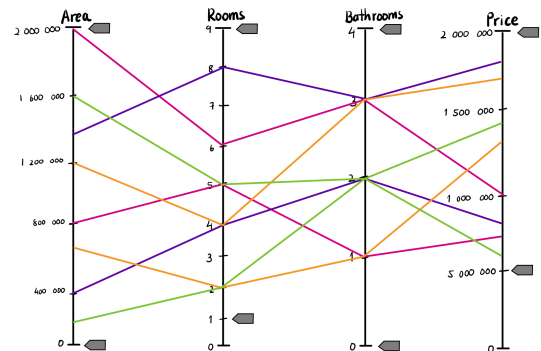
Rationale

- **Choice**: Ability to represent multiple variables simultaneously, which makes it easier to analyze complex data to find the ideal home.
- **Second option**: Radar Plot is effective for comparing several variables visually, but Parallel Coordinates offers a more detailed analysis, highlighting correlations and trends with greater precision.
- **Advantages**: Allows the joint visualization of several variables, facilitating the analysis of complex data, whether numerical or categorical.
- **Disadvantages**: Can be difficult to interpret with many variables, and overlapping lines can compromise clarity.

Interaction

- It allows users to filter lines based on specific criteria, such as a minimum number of rooms or a maximum price, etc.By mouse over a line, you can highlight the corresponding property, making it easier to see.

Chart #3 - Choropleth Map
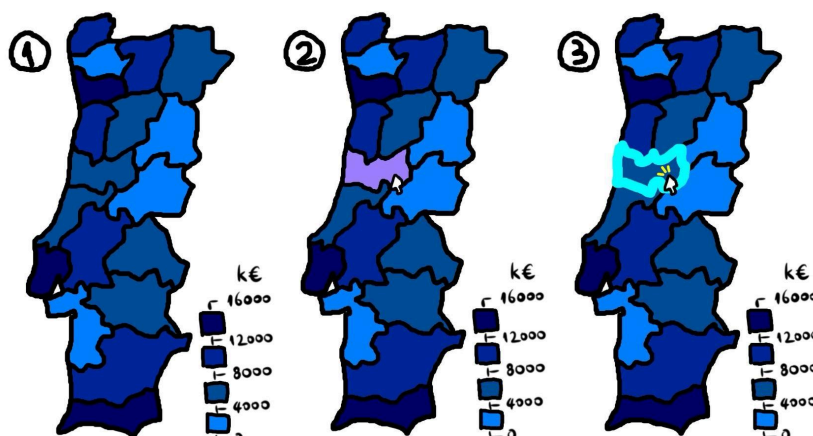
Considering that more than half of our questions are related to geolocation, such as "What is the average area of houses in Porto?", we decided to use Choropleth Map to have a more intuitive and efficient visualization.

(A, B, C, D are just examples)

Marks and Channels
- Mark: 2D, district shaped
- Channels: color, single sequence part spectral scale

Rationale
- We chose the Choropleth Map to show locations and facilitate geographic selection.
- **Second option**: The Bar Chart also shows the value of different districts, but loses the geographical information, which can be valuable for some users.
- **Advantages**: The Choropleth Map is ideal for our topic as it allows users to quickly access relevant information and its familiarity improves usability and data interpretation.
- **Disadvantages**: For those who don't know the locations of Portugal's districts well, it may take longer to find the district on the map. However, since most people know where they want to live, this disadvantage is insignificant.

Interaction
- If the user leaves the cursor on a district without selecting it, the district is highlighted in a different color (step 2).
- Users can select districts by clicking on them. The selected districts are marked by a high-saturation contour line that stands out on the map (step 3)

Chart Integration
- For more efficient and intuitive data analysis, the different graphs in our panel are dynamically integrated, allowing actions taken in one graph to be automatically updated in the others, providing a more complete and interactive view of the information.
- **Interaction on the drop-down**: We have conditions that allow the user to specify their preferences, such as district, number of years they want to stay in the house, condition, etc.
- **Interaction between Choropleth Map and Parallel Coordinates**: In Choropleth Map, when selecting interested districts, the Parallel Coordinates updates to allow the user to filter the characteristics of houses in that area. In Parallel Coordinates, when filtering by characteristics (rooms, price, etc.), the Choropleth Map updates to show data for houses that match those criteria, making it easier to identify areas of interest.
- **Violin Plot integration**: In Violin Plot, when selecting comparison groups, ("new VS renewed" or "buy VS rent"), it shows the distribution of these groups across the selected regions and conditions, allowing for clear comparisons.
- **Visual feedback and interactive highlights**: When hovering over a line in Parallel Coordinates, the corresponding district is highlighted on the Choropleth Map.

Answering the Questions
1. **What is the average area of houses in Porto?**
   Select the area visualization from the dropdown menu on the side. You can get an idea of the average areas by looking at the heatmap in the Porto district or by hovering over this district to view its specific value in a tooltip.
2. **What is the relationship between the number of bedrooms and the average price per square meter of houses in Lisbon?**

Select the Lisbon district either from the Portugal map or from the dropdown menu on the side. Look at the Parallel Coordinate with maximum ranges for the number of bedrooms and price.

3. **Is it more cost-effective to buy a new house or a renovated house?**
Establish the number of years you intend to stay in the house using the input number on the left side of the visualizations. Select the number of bedrooms and bathrooms in the Parallel Coordinate. Choose the "new vs renew" option in the Violin Plot. Analyze the obtained results.

4. **Is it more expensive to buy a house or to rent?**
Establish the number of years you intend to stay in the house using the input number on the left side of the visualizations. Choose the "buy vs rent" option in the Violin Plot. Analyze the obtained results.

5. **What is the ranking of cities based on the average price per square meter for rental houses?**
Deselect houses for sale using the button on the left side (only the button for houses for rent should remain selected). Select all districts from the dropdown menu on the left side. Select the average price per square meter visualization from the dropdown menu on the left side. You can get an idea of the average areas by looking at the heatmap.
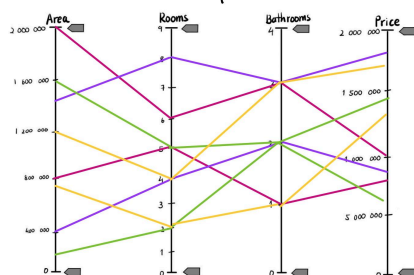
6. **Where am I most likely to find my ideal home knowing that I need at least three bedrooms and two bathrooms and I can spend a maximum of one and a half million euros?**
Set the minimum number of bedrooms to 3 in the Parallel Coordinates. Set the minimum number of bathrooms to 2 in the Parallel Coordinates. Select a price range of one and a half million euros in the Parallel Coordinates. Select the "buy" visualization from the dropdown menu on the left side. Get an idea of the areas by looking at the heatmap.
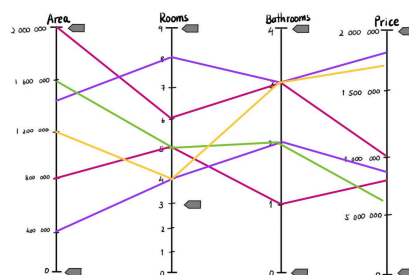
Storyboards

Storyboard to answer the question #6: Where am I most likely to find my ideal home knowing that I need at least three bedrooms and two bathrooms, and I can spend a maximum of one and a half million euros? (Note: the lines in the parallel coordinates view are fictitious so that the changes caused by changing the parameters can be seen; therefore, they do not co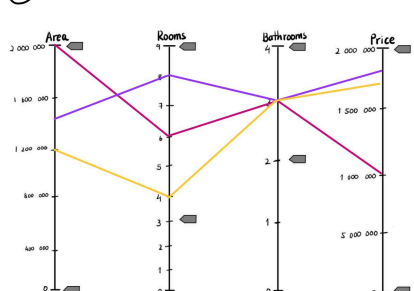rrespond to the values shown in the Choropleth Map)