Project 2: Visualization of Top 100 Richest People in the World

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Project Overview

The project aims to visualize the demographic information and net worth of the top 100 richest people in the world, and the GDP of countries in the world to study the relationship between personal net worth and the GDP of the country. The goal of the visualization is to reflect any potential insights about the distribution of richest people in the world and if any nationality stands out unexpectedly.

Data Description

Two datasets are visualized in this project, and both datasets are from Kaggle. The first dataset contains data and other information about the top 100 richest people in the world. Variables include the rank of each individual (from 1 to 100), the name of the person, individual net worth (in $billion), birthday, age, and nationality. For the purpose of usability and clarity, less relevant demographics information such as age and birthday is not included in the project. The second dataset contains GDP of all countries from 1990 to 2018. The variables in this dataset are country name, country code, and gdp values for each country from 1990 to 2018. In order to capture the most up-to-date and accurate relationship that the project aims to study, only gdp value in 2018 is kept and all the other year's values are filtered out in this case. This GDP dataset is incomplete and does not have a valid GDP value for certain countries and regions on the map. Therefore, to avoid blank space on the map visualization, the team added missing data back to the dataset by searching for the missing GDP value of corresponding countries and regions from the World Bank website. Finally, an additional topoJSON file of the world map from this source is used in the project to outline the countries' borders and coordinates.

Visual Design Rationale

Map:

Given the objectives of the project and geographic information (nationality, country abbreviation, etc.) provided in the datasets, we decided to use projection to map the topojson datapoints onto a world map to show the distribution of the 100 richest people in the world. The data mark for each country is the natural and realistic polygon with borderline to match the real-life map shapes. The visual channels used in this map are varying area, color hue, unaligned horizontal position and unaligned vertical position of the polygons. We designed a legend for GDP value of the countries and used .scaleQuantile() to display the ranking of each country in the GDP color scale with 5 visually efficient colors considering varying hue and saturation for creating a sequential colorscale. We also decided to give a dark gray stroke line for each of the countries to better help the viewers distinguish the country border without being too distracting.

Bar Chart:

The data mark for the bar chart visualization is the rectangles on the graph. We used varying vertical and horizontal aligned positions of rectangles as the visual channels. The higher/taller a bar is, the higher personal net worth the individual has. The bars are horizontally aligned based on their personal net worth ranking from rank 1 to 50. The trade-off in this bar chart design is that in order to present each data value efficiently and avoid narrow rectangles in the given size constraint, we are not able to include all 100 people in the list. Therefore, only the top richest 50 people are visualized in this bar chart. We also present the bar chart and individual rectangles with the same color scale as the map to reflect the potential relationships between personal net worth and their country's GDP. The shared color scale in both graphs also make the story more consistent and highlight the story behind these visualizations. Since the range of data is relatively small, we decided to use a linear scale to present personal net worth scale and ranking.

Interaction Design Rationale

Map:

After brainstorming and sketching different interaction design ideas, we decided to apply the hover over effect and zoom in interactions to this visualization. The width of the country borderline stroke will be magnified and changed to yellow when the mouse is hovering on a country. By increasing the width and rendering the stroke with a high contrast color, we can effectively make the country stand out from the rest of the map. Once the mouse exits the country, the borderline stroke will return to default. While the user is hovering on the country, the labels of the country name and the number of richest people (from the top 100 list) will show up right underneath the country to deliver important information and insights that this visualization is trying to convey about this country. During the implementation of this visualization, we found that the label will be cut off at the bottom of the graph when it is too long. Therefore, for those countries that are close to the bottom (when cy > 4/5 chart height) we decided to place their labels at a higher position to ensure that the viewers are able to see the full label. Underneath the map, there is a separate section named "Richest 100" people from this country that will automatically change its content to match the hovering interaction. It will display the full list of the richest people in the country activated by mouse hovering interaction, if any. Finally, since we are using a world map and many smaller countries and regions are harder to get selected or hovered by mouse, we decided to add another interaction to help the users zoom in and out to see the details of the map. When the map is zoomed in, the user can also drag the map around to see countries' information and the tooltip in more detail. We also set the viewport frame so that the user won't drag the map too much away from the canvas and lose track of the location. The affordance of the two interactions are usable and effective and they both have a high discoverability.

Bar Chart:

When the mouse is hovering on a bar on the graph, the specific bar will change from its original color state to yellow to contrast with the rest of the bars that are not selected. Meanwhile, the width of the rectangle bar will also increase as the mouse is hovering on it to further emphasize the interaction that is being activated. Once the mouse exits the bar, the width and color of the rectangle bar will return to default. Both the color scale of the bars and the hovered over color-change match with the map visualization to make everything consistent. While the user is hovering on the individual bar, the name of the represented individual, his/her country of origins, personal net worth, and net worth ranking will show up together on the panel located at the top right corner of the chart to deliver important demographic information about this specific representation and the net worth ranking standing of this individual. The affordance of the hovering interaction is usable and effective and has a high discoverability.

The Story

Supported by the final results of the visualizations, the team has found interesting insights about the relationship between GDP value of the country and the number of richest 100 people in the country. The first map visualization that presents the world map with GDP and the list of the top 100 richest people shows that in 2018, the country that has the highest number of richest people is the United States. Based on the label that shows up after interacting with the United States, we learned that 37 people from the richest 100 list are from the United States. By matching the country's dark purple color to the color legend, we also confirmed that the GDP value of the United States was among the highest in the world at that time. However, for other countries whose GDP value was in the same tier as the United States, such as Canada, Australia, and the United Kingdom, there are only two to three people able to accumulate a personal net worth that is high enough to be placed on the rank. On the other hand, countries like China, Russia, and India, although their GDP value was not as high as other developed countries in 2018, have surprisingly more richest people than many other countries. This finding contradicts our initial hypothesis that countries with higher GDP will have more people whose net worth is high enough to be ranked among the top 100 richest people in the world.

To further investigate the consistency between insights conveyed by the two visualizations, we looked at the second bar chart visualization and compared our finding with the map visualization. The bar chart visualizes the top 50 richest people from the original top 100 list given the limitation of space as explained in the previous sections. Among the purple and dark purple rectangle bars with various heights, there are two bars that stand out from the rest. The two bars have a light violet color indicating that the GDP value of their country is lower than that of other people's country. After hovering and reading the labels for the bars, we found that these two people are from India and they rank in the third (just behind Elon Musk and Jeff Bezos!) and

twelfth place respectively. This finding is consistent with the result of the map that there are some countries with lower GDP value but more people on the richest 100 list.

Overall the two visualizations showed that while the country that has the highest GDP value indeed has the highest number of richest people, some developing countries (India and China) with relatively lower GDP value unexpectedly have more people whose individual net worth is ranked among the top 100 in the world than many other developed and high GDP countries.

Team Contribution

- Kehui Guo
    - Brainstormed ideas and collected the dataset (~2 hours)
    - Data cleaning: add GDP information for missing data, revise country names and abbreviations to match data among topoJSON, GDP, and people data files (~3 hours)
    - Data visualization: created map visualization with zoomed in and hover over (~3 hours), add color styling for bar chart (~2 hours)
    - Proofread the write up (~1 hour)
- Zixian Jia
    - Brainstormed ideas and collected the dataset (~1.5 hours)
    - Data Visualization: added hover interactive functions and zoom factor on hover panels (~2.5 hours)
    - Styling: styled the project HTML page as well as visualizations (~ 5 hours)
- Yan Zhu
    - Brainstormed ideas and collected the dataset (~2 hours)
    - Helped adjusted the style and interaction of the graphs (~1 hours)
    - Completed the write up (~ 6 hours)
- Hanna Tormey
    - Added billionaire counter to map visualization hover interaction(~1 hour)
    - Created bar chart visualization including hover over interaction (~5 hours)
    - Brainstorm ideas and proofread write up (~ 2 hours)