Data Visualization: Milestone 2

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1 Project Goal

The goal of this data visualization project is to analyze and highlight trends in terrorism using the Global Terrorism Database (GTD) from 1970 to 2020. The visualizations aim to provide insights into the following: the evolution of terrorism over time both globally and regionally, the most active terrorist groups and their preferred attack methods, the countries and regions most affected by terrorism, and the impact of terrorism on human lives (fatalities and injuries). The target audience includes the general public, policymakers, researchers, and students.

2 Visualizations

The final product will feature the following visualizations, ranked by importance:

1. **Interactive world map:** As the central element of our website, the interactive map will showcase historical and geographical data on terrorist attacks. The map will display a month-by-month density-map-style view of the 50 years of terrorist attacks. A slider allows users to navigate through time, with options for "day-by-day", "month-by-month", or "year-by-year" increments. Additionally, the map will visualize countries in which specific terrorist groups have been active. (Figure 1a)
2. **Histograms:** Complementing the map, histograms will present data on the frequency of terrorist attacks in selected countries or by specific groups through the years. Users can pick a country or terrorist group using a drop-down menu. (Figure 1b)
3. **Heatmaps:** To provide a clear view of specific aspects, heatmaps will be included, such as a comparison between the 10 terrorist groups with the most casualties and their most-used weapons. (Figure 1c)
4. **Parallel coordinate plots:** Lastly, we thought that we could create an interesting visual by using parallel coordinates, with the first line containing terrorist groups, the second containing a casualty magnitude[1] and the third containing the countries those attacks were committed in. (Figure 1d)
5. **More chart ideas:** Apart from these four main ideas, we may also include several other graphs, such as line graphs or scatterplots. Examples include a line graph of the 10 countries with the most fatalities and how those fatalities change through time, or a scatterplot on the number of attacks plotted against the number of fatalities for a certain attack type. (Figure 1e)

3 Tools and Lectures

The main tools that will be utilized for creating the visualizations in this project are: D3.js, which is essential for crafting dynamic, interactive visualizations; Leaflet, employed for rendering the interactive world map; and JavaScript, HTML, and CSS, indispensable for constructing the website and incorporating the visualizations into it.

Several lectures from the course syllabus have been identified as particularly relevant for this project. The Introduction to Data Visualization lecture discusses the Gestalt effect, which offers insights into how users perceive visual patterns and elements. The lectures on JavaScript,

[1] where we define the magnitude as casualties for each attack per group, normalized by the maximum amount of casualties from this specific group, creating a scale from 1 to 10

HTML, CSS, and D3.js provide essential knowledge for developing the visual components of the website. The Interactions lecture is significant, as zooming and panning are integral to the interactive map, and it covers how to incorporate these features into the visualizations.

In addition, the lectures on Perception colors, Mark and channels are crucial for guiding the appropriate selection of colors and marks to direct the user's attention to relevant aspects of the data while avoiding bias. The Dos and Don'ts in Viz lecture assists in preventing the misuse of visualizations and ensuring that they are employed effectively. As the core aspect of the website is an interactive map, the Maps lecture offers indispensable tools and considerations for using maps in the project. Lastly, the future lecture on Tabular data is relevant since some of the original data has been reorganized into tabular form for visualization using heatmaps and parallel coordinate plots.

4 Independent Pieces and Core Visualization

The core visualization (Minimal Viable Product) will be the interactive world map, which will display various aspects of terrorism data based on user-selected options. The map will be complemented by additional visualizations and textual context below the map.

Additional ideas that can enhance the visualization but could be dropped without endangering the meaning of the project include:

1. **Extra visualizations** focusing on specific types of terrorist attacks or targets instead of highlighting the attacker. An example could be
2. **Explanatory text or annotations** within the visualizations to guide users through the data and highlight key insights. An example of this for the MVP could be the option to hover over a certain country on the map that is highlighted (i.e. is actively participating in the visualization) in order to display information on why it is currently highlighted, and why it has this specific color gradient.[2]
3. **A help window** that pops up on startup to explain how to use the website, that can always be consulted by pressing the help button, which can be found on the top right of our website.

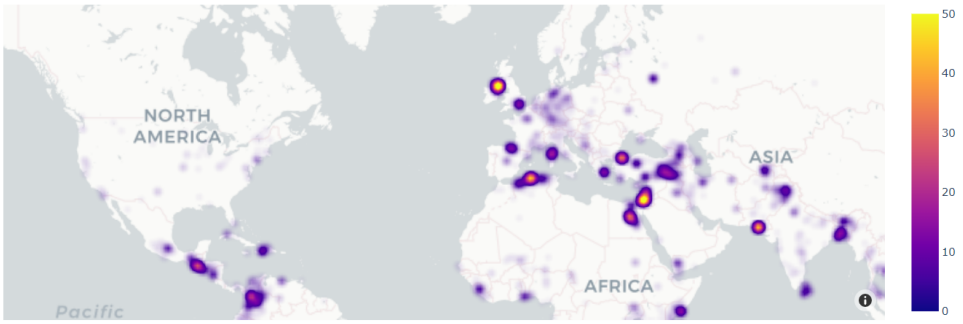
5 Functional Project Prototype Review

By the time of the functional project prototype review, an initial website will be running with the basic skeleton of the visualization/widgets. This website will include:

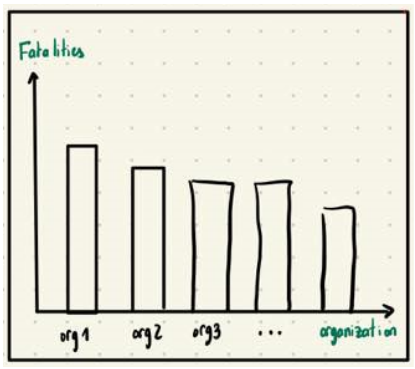
1. **A homepage** containing the interactive world map with basic functionality, such as zooming and panning, currently acting as a placeholder for an interactive map with data visualized upon it.
2. **Buttons or selection options** on the left-hand side of the website for the different categories of the visualizations both on and off the map.
3. **Three principal elements in the header** part of the webpage, a title in the center, the logo of the page (subject to change) on the left that brings the user back to the homepage once pressed, and a help button on the right that displays a window with how-to information on how to use the page.
4. **A simple color scheme based** on black, gray, and white (and variations thereof) to maintain a neutral look.
5. **A responsive layout** designed for desktop users, with all information accessible through scrolling, ensuring a smooth user experience.

[2]For example, if, as mentioned in Section 2, the visualization is around terrorist groups and the attacks they have committed, hovering over a country where the selected group has been active could display information on, for example, the total amount of victims, the total amount of attacks, and the total amount of damages caused from this specific group.

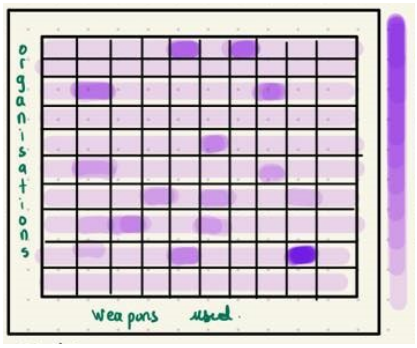
Annex



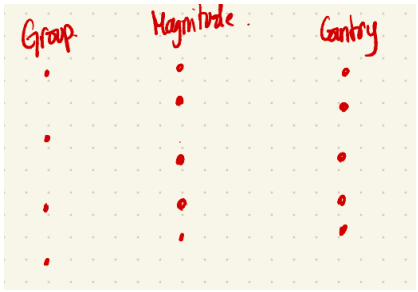
(a) Interactive world map



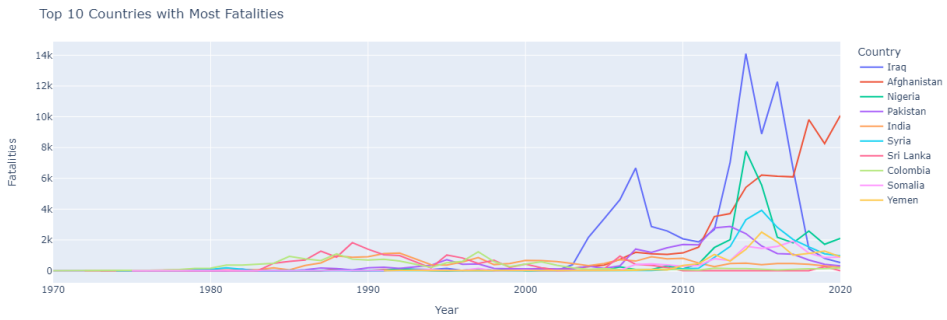
(b) Histograms



(c) Heatmaps



(d) Parallel coordinate plots



(e) More chart ideas

Figure 1: Data visualization ideas