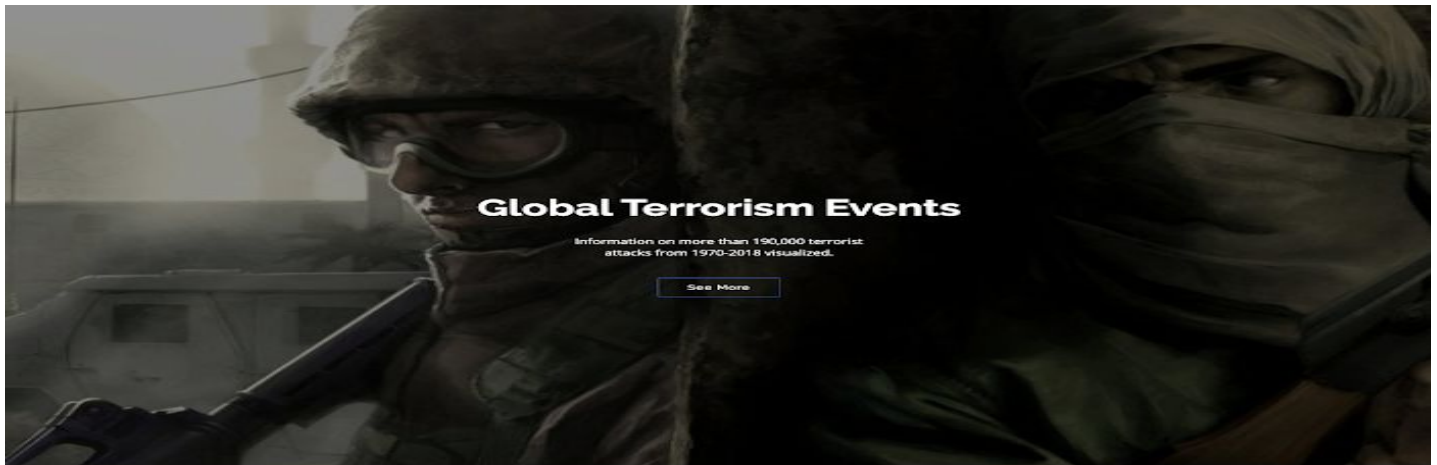


CPSC 436V Milestone 3

1. Overview

High Quality Screenshot: <https://imgur.com/a/fbuwaPi>



Global Terrorism Events

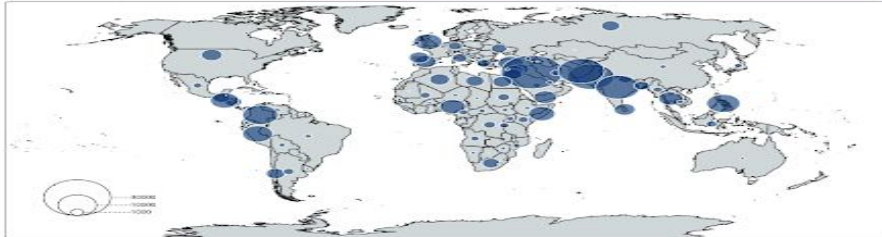
Information on more than 190,000 terrorist attacks from 1970-2018 visualized.

[See More](#)

WORLD VIEW

All global terrorist attacks from 1970 to 2018. Click country for a breakdown of attacks by state and city shown below.

Selected Years: 1970 - 2018



BREAKDOWN OF TERRORIST ATTACKS BY COUNTRY

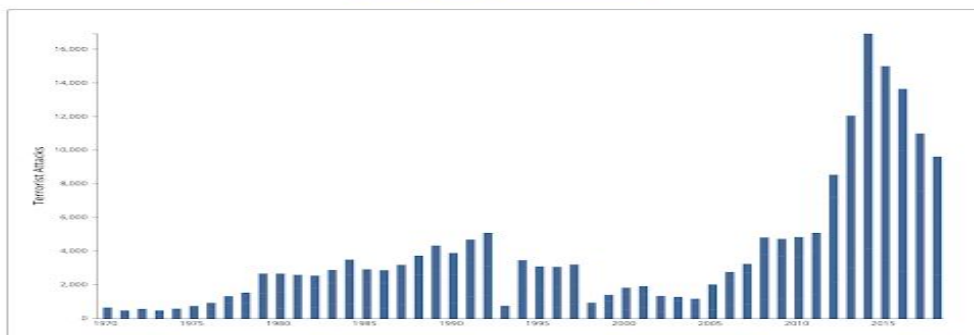
Breakdown of attacks for the selected country and specified year range. Click to zoom.
First level shows the total number of attacks in the country. Second level shows the distribution of attacks between states.
Third level shows the distribution of attacks between cities in their respective state.



GLOBAL TERRORIST ATTACKS BY THE YEARS

Global terrorist attacks broken down by the years. Toggle between Overview and Detailed for more information regarding specific types of attacks.

[OVERVIEW](#) [DETAILED](#)



Global Terrorism Events

Created by Kerry Kwon, Yunzhu Yang, Siddhartha Gupta

Terrorism is a global issue and thousands of people lose their lives a year in terrorist attacks. We would like to conduct an analysis of global terrorist attacks in order to alert the public to those potential hazards and attract more attention to this issue. In particular, we want to identify high-risk areas for terrorist activities.

By analyzing the [Global Terrorism Database](#), we would visualize each countries' terrorist threat level on a global symbol map, which uses size encoding of the total number of attacks that have happened in recent years in each country. We allow users to select the year range and change our visualization accordingly. Additionally, we link each country to a more detailed view which presents the total number of the attacks and the distribution of attacks happened in each of its states and cities. We also have another view to compare the number of terrorist attacks between years and discover trends, in which the number of attacks are grouped by weapon types. Hopefully, it can give some suggestions to the local government that they may need to pay extra attention to some specific attack types and impose restrictions on those related weapons.

2. Data

We used a table dataset ([Global Terrorism Database](#)) which contains approximately 190,000 items and trimmed the dataset down to 17 attributes that are of use to us. The attributes include country_text, country_id, year, month, day, region, province, city, weapon type, etc. Each item represents an attack that happened in the past years around the world with their locations, date, related weapon types. There are 205 countries, 2778 provinces and 39620 cities in this dataset. The cardinality is less than a dozen of the weapon types. The date starts from 1971-01-01 to 2018-12-31.

Preprocessing Pipeline

- We use filters to select the data of the specific country and the year range chosen by the users.
- Then, d3.nest was applied to implement a nested structure and roll up the attacks to count the number of attacks.
- After that, d3.hierarchy was applied to make the processed data into 3 levels (the attacks happened in the chosen country, the attacks happened in each province of the country, the attacks happened in the cities of each province).

3. Goals and Tasks

- Domain-specific goals:
 - Our project intends to show the distribution of the number of terrorist attacks globally and discover trends using historical data.

- Abstract language goals:
 - Discover the distribution
 - Present trends
 - Compare values between years

4. Visualization

Our project consisted of 3 different visualization components.

View 1: Symbol Map of Global Terrorist Attacks

The goal of View 1 is to allow users to identify countries in the world that are hot spots for terrorist attacks. All ~190,000 terrorist attacks throughout 1970 to 2018 are displayed initially and the data is aggregated by country. To allow for more flexibility, we gave users the option to filter the attacks by any year range within 1970 to 2018 by using a double-ended slider. Hovering over a country will display a tooltip showing the corresponding country's name and number of attacks in that year range. Furthermore, a click on a country in View 1 will trigger an update to View 2. The selected country will be shown in View 2 breaking down the number of attacks in that country by the states and cities.

Given that our goal is to identify countries prone to terrorist attacks and our dataset contained geographical information, a map was naturally chosen. Originally, we were planning to use a choropleth map but decided not to because they can be misleading due to the "Lie Factor." So, we settled on using a symbol map as the symbol can represent our aggregated data and allowed us to keep our original spatial geometry of the world. The area of each circle is proportional to the number of terrorist attacks in that country for the selected year range. We chose to use yellow for selecting a country and blue for our symbol because they're less likely to be affected by colour-blindedness.

WORLD VIEW

All global terrorist attacks from 1970 to 2018. Click country for a breakdown of attacks by state and city shown below.

Selected Years: 1970 - 2018

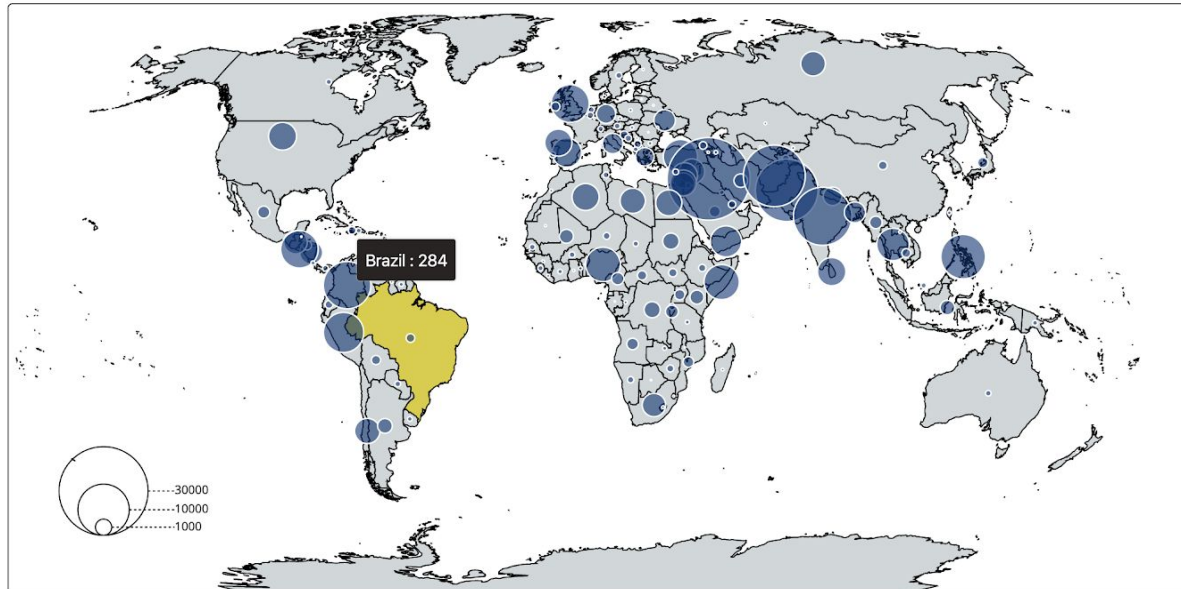


Figure 1. Symbol Map (View 1)

View 2: Icicle Plot of Country's Terrorist Attacks

To provide even more detail on hot spots for terrorist attacks, we wanted to break down a country's attacks by state and city. As previously mentioned, the icicle plot can be updated by selecting a country in the symbol map. Since within a country, there are many states and even more cities, some of the rectangles in the plot are quite small. Therefore, we made the icicle plot zoomable so that users can still look at the less common cities/states if they wished. Clicking on a rectangle will automatically zoom it into focus so users can see the name of the city/state and the percentage of attacks that occurred in the city/state.

The reason we chose to use an icicle plot is that our breakdown of a country (country > state > city) is hierarchical in nature. This made the icicle plot an appealing choice. Furthermore, with an icicle plot, the large rectangles automatically draw the user's attention which is what we want. We want users to be able to quickly identify high-risk states and cities within a country. An icicle plot can support dozens to hundreds of marks which is sufficient for our needs.

BREAKDOWN OF TERRORIST ATTACKS BY COUNTRY

Breakdown of attacks for the selected country and specified year range. Click to zoom.
First level shows the total number of attacks in the country. Second level shows the distribution of attacks between states.
Third level shows the distribution of attacks between cities in their respective state.

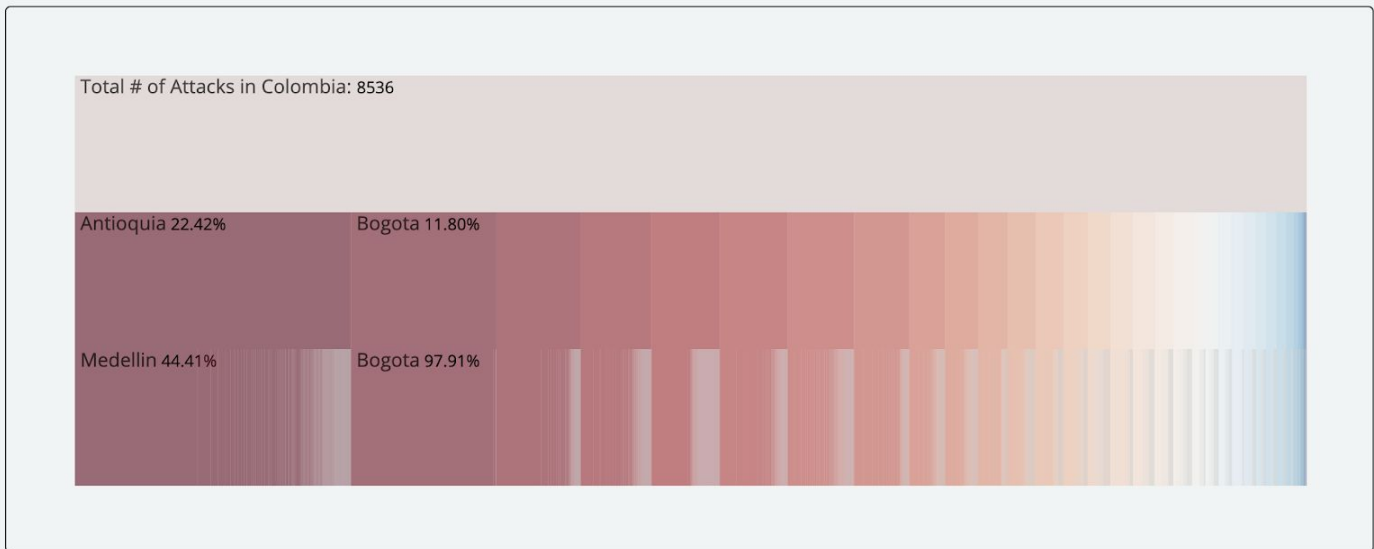


Figure 2. Icicle Plot (View 2)

View 3: Innovative View of Global Terrorist Attacks by the Years

The purpose of View 3 is allow users to compare the number of terrorist attacks between years and identify trends. Users can toggle between an ‘Overview’ bar chart and ‘Detailed’ innovative bar chart variation. Tooltips are enabled on hover for both charts. On the ‘Detailed’ chart, we break down the types of attacks in each year by categorizing them into attacks by assault, bombing or other. Users can interact with our innovative view by selecting or deselecting the different attack categories. E.g. If a user is only interested in attacks by bombing then they could deselect the other categories.

We chose to use a bar chart for our overview chart because a bar chart is perfect for a few dozen items and is easy to compare and lookup values. For our innovative detailed chart, we used custom glyphs to make the visualization more attractive. Since only the first attack type is aligned on a horizontal scale, we made 2 adjustments so it is easier to compare the other 2 attack types across the years. First, we enabled a tooltip that displays the exact number of different attacks per year so users can just read off those numbers. Second, we created a selection window, where users select or deselect different attack categories. Users can then just select 1 attack type if they were interested in comparing the values across the years.

GLOBAL TERRORIST ATTACKS BY THE YEARS

Global terrorist attacks broken down by the years. Toggle between Overview and Detailed for more information regarding specific types of attacks.

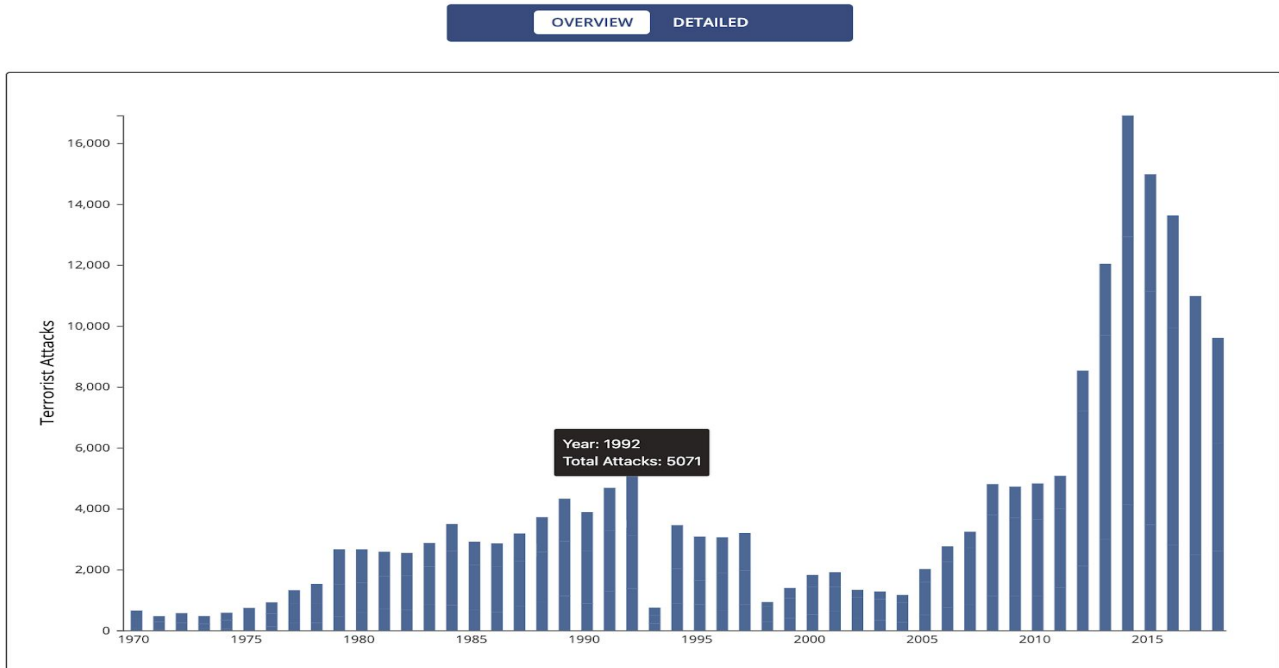


Figure 3. Bar Chart (View 3 - Overview)

GLOBAL TERRORIST ATTACKS BY THE YEARS

Global terrorist attacks broken down by the years. Toggle between Overview and Detailed for more information regarding specific types of attacks.

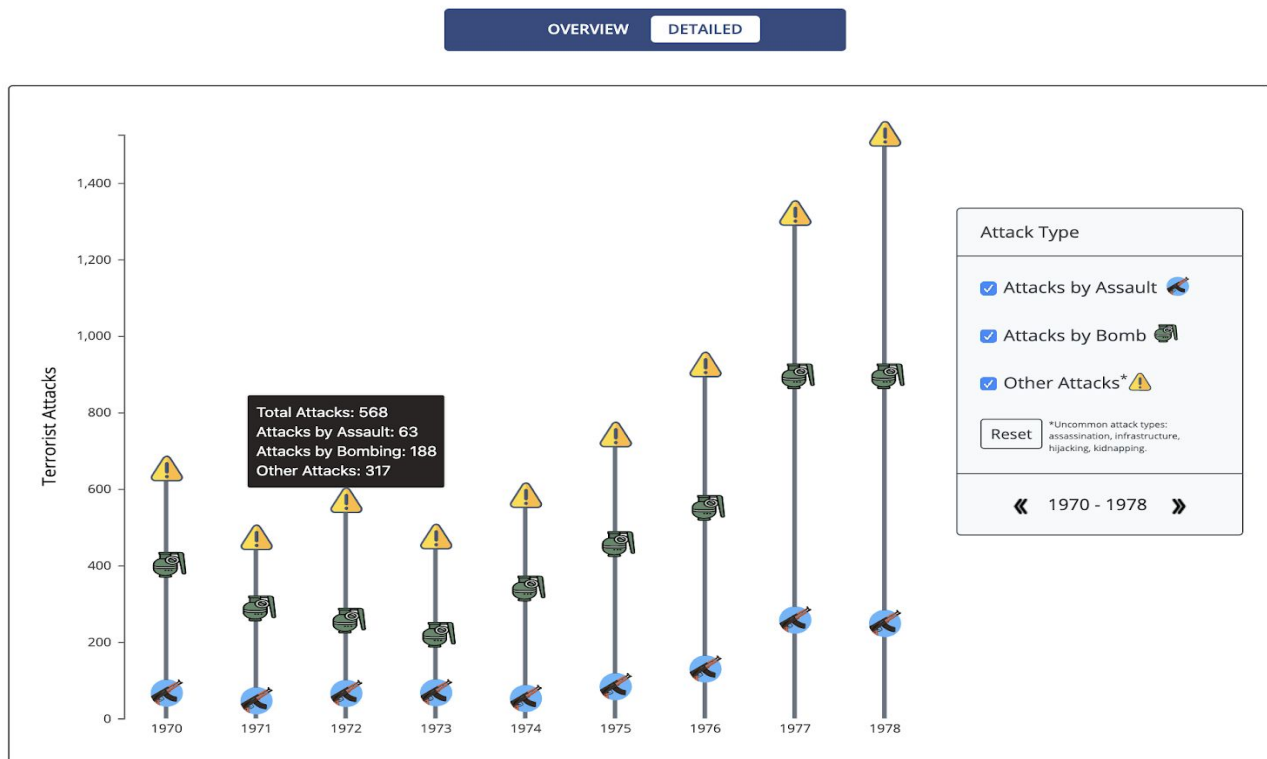


Figure 4. Innovative Chart (View 3 - Detailed)

5. Reflection

In our initial proposal, we chose a Choropleth Map for view 1 to display the number of attacks for each country. However, from Milestone 1, we were told by the TA that this style of representation is only appropriate for the display of proportional or relative data. Instead, we were suggested to use a Symbol Map. We took on this suggestion for Milestone 2. In addition, in our conversation with the TA, we were told that we needed a legend. Henceforth, we placed a Legend on Milestone 3. Moreover, we were also told that we could reduce the lagging of the slider by having a faster algorithm for processing the data; $O(1)$. However, when we tried to design an algorithm it didn't make a huge difference because our slider also updates our icicle plot at the same time, which causes some unavoidable lag. In order to try to reduce the lagging, we moved the rendering of paths up from `render()` to `getData()`. Furthermore, when coding up our map for Milestone 2, we realized that, on occasions the circles overlap each other, this made it hard to distinguish the data of one country from another. In order to fix this issue, we added a tooltip for Milestone 2 containing; name of country and number of attacks. Just as importantly, we realized that it is important to indicate when a country is selected after reviewing our product for Milestone 2. For Milestone 3, we highlighted the country in the map, after it is clicked. If we had more time we would have made the map panable and zoomable. When we select a country with no attacks, an alert shows up which warns the user that a country with no attacks has been selected and a breakdown is unavailable.

In our Milestone 1 proposal, we planned to use a pie chart for View 2. However, the TA warned that the pie chart isn't appropriate because it is not scalable for more than a few dozen states. Therefore, we suggested using an icicle plot for Milestone 2. We appended the proportion of attacks corresponding to each province to the name of each province. For Milestone 2, these values were in decimal. This meant that for some really small values, we were shown a corresponding 0 which was inaccurate. Therefore, for Milestone 2 we chose to use a percentage representation. At times there were white spaces between each bar in Milestone 2. This impeded our understanding of the chart, we fixed this issue for Milestone 3. In addition, there were times where we couldn't see all of the cities. We resolved this issue by making the icicle plot zoomable.

For View 3, we used less attack types for Milestone 2 than we did in Milestone 1. To make this innovative view more complex, we had a smaller combination of multiple updates; range of years and type of weapon. We split the view into 2 panes; Overview and Detailed.

For the interaction phase, originally we thought about having a button to create a pop-up for View 3. However, from the Milestone 2 feedback, we figured out that it would be better to put all the graphs on the same page.

6. Team Assessment

Siddhartha Gupta worked on the Symbol Map visualization (View 1). Yunzhu Yang worked on the Icicle Plot visualization (View 2). Kenny Kwan was responsible for working on the innovative bar chart visualization (View 3). He was also responsible for creating the main web interface. The milestone documents were done collaboratively between the 3 of us.