# Global Terrorism by the Numbers: Visualizing Geography, Impact, and Motives – Part IV

Visualization of Complex Data
Prof. Anya Mendenhall
Group Project

By

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October 7, 2023

GitHub Link

## 1.0 Introduction and Background

Terrorism is one of the most pressing issues facing the world today, and its impact can be felt across the globe. Every year, there are thousands of terrorist attacks around the world, which result in countless deaths and injuries. According to the Global Terrorism Database (GTD), more than 170,000 terrorist attacks have occurred since 1970, resulting in more than 1.3 million deaths. The data on global terrorism is vast and complex, making it challenging to comprehend the nature and dynamics of terrorist incidents.

In recent years, data visualization has emerged as a powerful tool for analyzing and understanding large datasets, including those related to terrorism. Data visualization techniques enable researchers to identify patterns and trends that might not be immediately apparent from raw data. By presenting data in a visual format, policymakers and stakeholders can quickly identify key insights and develop strategies to combat terrorism.

Several studies have used data visualization techniques to analyze terrorism-related data. For example, a study published in the Journal of Conflict Resolution used network visualization to explore the structure of terrorist networks. The study found that terrorist groups tend to be decentralized, with a few key actors serving as bridges between different groups. Another study, published in the Journal of Peace Research, used heat maps to visualize patterns in the spatial distribution of terrorist attacks. The study found that terrorism tends to be concentrated in urban areas, particularly in countries with high levels of political instability.

As the world continues to grapple with this pressing issue, the use of data visualization techniques will be increasingly important in uncovering key insights and making informed decisions to promote global security and safety. It is essential to continue investing in the development and application of data visualization techniques to help combat terrorism and promote peace around the world.

**Motivation**

The motivation for choosing a data visualization project on global terrorism is driven by the increasing need for understanding the evolving threat of terrorism in today's world. By analyzing and visualizing the data, we can identify the countries and regions most affected by terrorism, the types of attacks that are common, the perpetrators behind these attacks, and the impact of terrorism on the global community. By presenting the data in an interactive and visually appealing way, we hope to make it easier for people to understand the complexities of this issue.

**Sources**

The Global Terrorism Database (GTD) is the primary source for this project. GTD is a database of terrorist incidents around the world from 1970 to 2019, compiled by the National Consortium for the Study of Terrorism and Responses to Terrorism (START) at the University of Maryland. The GTD contains information on over 190,000 terrorist attacks that have occurred worldwide since 1970.

This database has been used extensively in academic research to explore various aspects of terrorism, including trends in terrorist activity, the characteristics of terrorist groups, and the impact of terrorism on society. We will also use additional sources, including academic articles and news reports, to contextualize and supplement the data from the GTD.

**Context and Relevance**

Terrorism poses a significant threat to global security, and its impact on societies can be devastating. The rise of global terrorism in recent decades has heightened concerns about its impact on economic growth, political stability, and human security. A deeper understanding of the trends and patterns of terrorism is critical to addressing this complex issue. The data visualization project on global terrorism will provide a

comprehensive and interactive visualization of the data that will help policymakers, researchers, and the public to understand the dynamics of terrorism better.

**Questions and Objectives**

The primary objective of this project is to create an interactive data visualization that presents the patterns and trends of terrorism globally. The following are some of the questions we aim to answer with this project:

- How has the frequency of terrorist attacks varied across different regions over time?
- Are there any correlations between the type of target and the type of weapon used in terrorist attacks?
- What are the most common motives behind terrorist attacks, and how have these motives varied over time?
- How effective have counterterrorism measures been in reducing the frequency and severity of terrorist attacks?
- How do the characteristics of terrorist attacks differ between lone wolf attackers and those associated with larger organizations?

**Benefits to Others**

The data visualization project on global terrorism will have several benefits to different stakeholders. First, policymakers can use the insights from the visualization to inform their decisions and strategies related to counterterrorism. Second, researchers and academics can use the data to further their research on terrorism and related topics. Finally, the public can use the visualization to gain a deeper understanding of the global terrorism landscape and its impact on societies.

## 2.0 Dataset & Key Variables

The Global Terrorism dataset, **globalterrorismdb**, used for this project covers the historical data of terrorist attacks around the world from 1970 – 2020. The dataset is an aggregation of data collected from several sources around the world by the National Consortium for the Study of Terrorism and Responses to Terrorism (START) at the University of Maryland, United States of America. The key variable is the *eventid* that is used to identify each event occurrence.

1. The University of Maryland collected the data. It has been funded by the United States National Institute of Justice, United States Department of Homeland Security, Science and Technology Directorate and so on.

2. This dataset is for integrating and synthesizing publicly available, unclassified terrorism source materials. The University of Maryland collected the data. It has been funded by the United States National Institute of Justice, United States Department of Homeland Security, Science and Technology Directorate and so on.

3. This dataset was made prior to 2014. Changes made by 2015, removed the "NIS" region. Changes made by 2016, replaced original 4 target subtypes to following target subtypes: Military Weaponry, Military Aircraft, Military Maritime, and Non-combatant Personnel and applied to the entire dataset. Changes made by 2017, created a new weapon subtype in "Chemical": Explosive. Changes made by 2018, recategorized target subtypes, such as, adding "Electric" to subtype "Gas/ Oil". No substantive changes were made to 2019-2021.

4. Define and describe the variables included in the dataset.
   The dataset includes categorical variables like:

   - *country_txt – the name of the country of the terrorist attack*
   - *city – the name of the city in which the attack occurred*
   - *summary – description of the attack*

- *target1 – the name of the attack's target*
- *attacktype1_txt – description of the attack type*
- *motive – summary of the motive of the attack*
- *weaptype1_txt – summary of the weapon selection used for the attack*
- *dbsource – the source of the data recorded*
- *etc.*

Numerical variables in the dataset include:

- *imonth – occurrence month of the terrorist attack*
- *iday – occurrence date of the terrorist attack*
- *country – country code of the terrorist attack*
- *success – success or failure of the recorded attack*
- *natlty1 – nationality of the terrorist(s) or group*
- *nkill – number of casualties from the attack*
- *nwound – number of wounded from the attack*
- *property – number of property destroyed by the attack*
- *propvalue – the value of property destroyed in the attack (in USD)*
- *etc*

5. This dataset has 214666 cases (observations) and 135 variables. But we just use Year 2020 and 2021, so in these two years, we have 13398 observations.

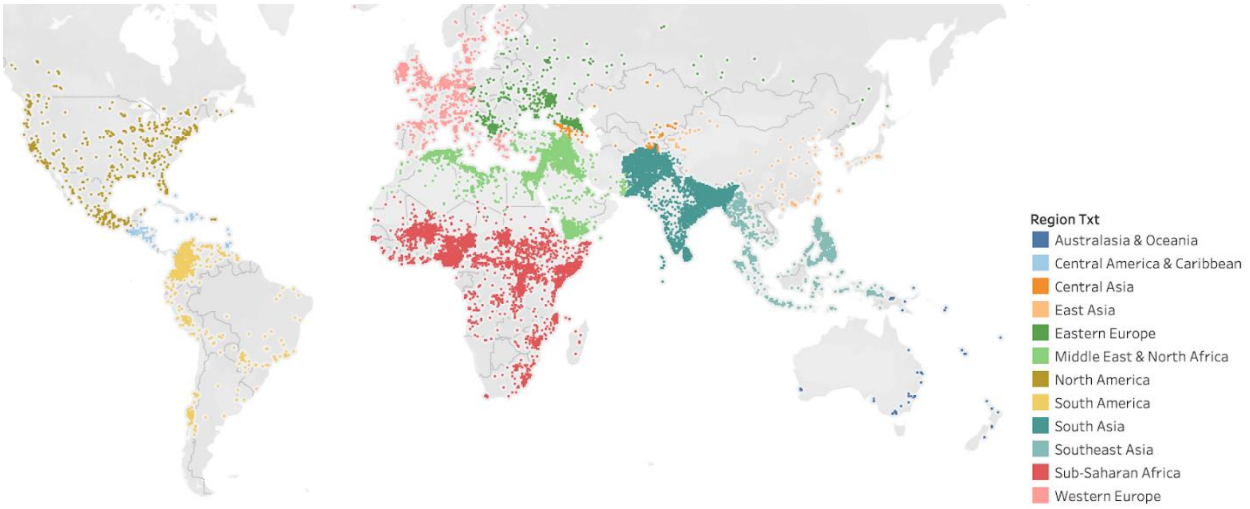
6. **Regions** are included in the dataset, such as South Asia, Middle East & North Africa. **Countries** are also included, such as Egypt, India, and the United States. **Cities**, like Washington, are also included.

7. By taking a good visualization of where and when the most attacks happened, why they happen, what weapon types they are using, we can achieve our goals to increase public understanding of terrorism. Weaknesses of the database include potential media bias and misinformation, lack of information beyond incident specific details alone, and missing data from a set of cards that were lost during an office move of PGIS.

## 3.0 Data Story

Global terrorism is a phenomenon that affects all continents, with varying degrees of intensity and frequency. To gain insights into the patterns and trends of global terrorism, we can analyze data from the Global Terrorism Database.

*Figure 1: Distribution of terrorist attacks in the dataset according to regions and countries*




By coloring the map of terrorist incidents by regions, we can make the following observations:

- The Middle East has a high concentration of terrorist incidents compared to other continents, which indicates that it is a hotspot of global terrorist activity.
- The continent of Africa has a considerable number of terrorist incidents, particularly in regions such as Central Africa, East Africa, and North Africa.
- The European continent has fewer terrorist incidents compared to other continents, but some European countries have been the targets of significant terrorist attacks, such as France, the United Kingdom, and Germany.
- The Americas have relatively fewer terrorist incidents compared to other continents, but there have been significant incidents, particularly in Latin America.
- The continent of Asia has a high number of terrorist incidents, particularly in countries such as Afghanistan, Pakistan, and India.

By visualizing the distribution of terrorist incidents on a map, it becomes clear that terrorism is a global phenomenon that affects all continents, with varying degrees of intensity and frequency.

*Figure 2: A table showing the target type and respective details*

Attacktype1 Txt

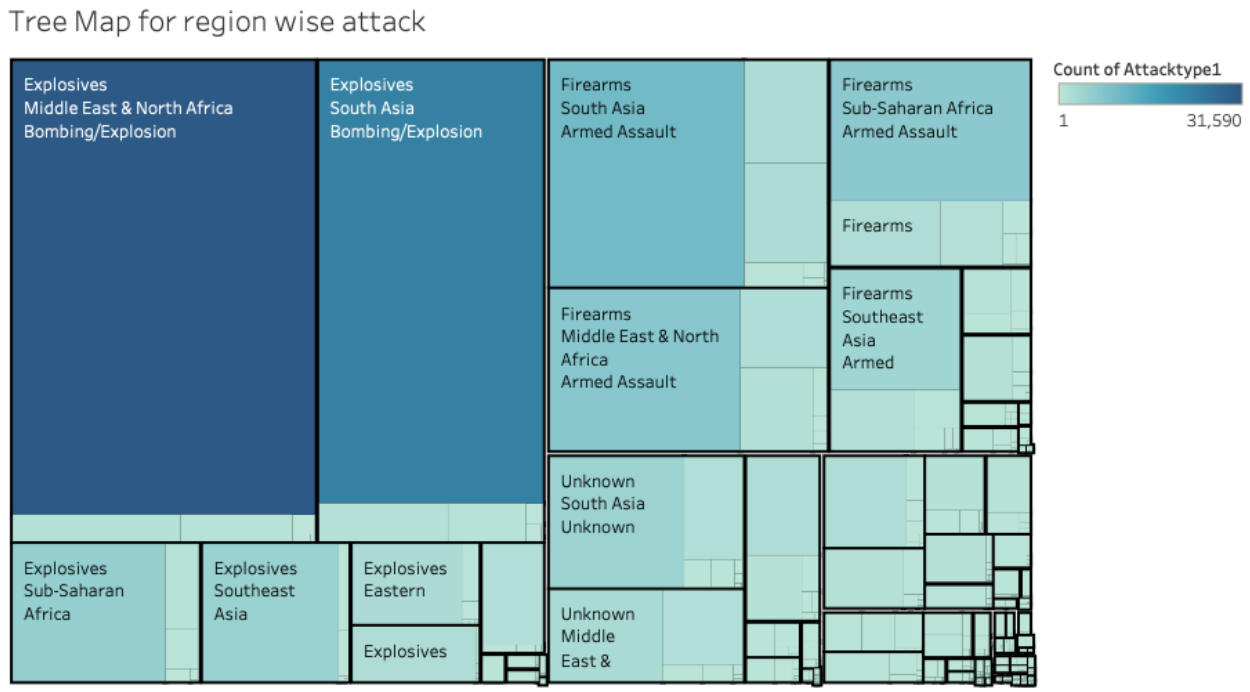
| Targtype1 Txt | Armed Assault | Assassin.. | Bombing.. | Facility/Infrastruct.. | Hijacking | Hostage Taking (.. | Hostage Taking (.. | Unarmed Assault | Unknown |
|---|---|---|---|---|---|---|---|---|---|
| Abortion Related | 1 | | 3 | 25 | | 1 | | | |
| Airports & Aircraft | 66 | 5 | 321 | 9 | 25 | 1 | 10 | 2 | 8 |
| Business | 1,479 | 52 | 6,028 | 1,635 | 65 | 141 | 893 | 63 | 143 |
| Educational Institution | 574 | 54 | 1,843 | 499 | 7 | 37 | 337 | 57 | 35 |
| Food or Water Supply | 27 | | 112 | 35 | 3 | 2 | 5 | 2 | 3 |
| Government (Diplomatic) | 422 | 59 | 649 | 102 | 29 | 5 | 174 | 11 | 46 |
| Government (General) | 3,129 | 4,186 | 4,877 | 989 | 20 | 54 | 1,292 | 83 | 384 |
| Journalists & Media | 269 | 547 | 298 | 142 | 2 | 20 | 407 | 60 | 34 |
| Maritime | 24 | 3 | 76 | 9 | 38 | 2 | 41 | 1 | 4 |
| Military | 8,028 | 683 | 11,869 | 216 | 24 | 26 | 903 | 68 | 3,795 |
| NGO | 217 | 35 | 175 | 49 | 11 | 4 | 306 | 9 | 25 |
| Other | 38 | | 123 | 8 | 4 | 1 | 5 | 1 | 7 |
| Police | 7,651 | 1,207 | 9,110 | 429 | 18 | 55 | 894 | 74 | 1,792 |
| Private Citizens & Property | 9,508 | 1,632 | 19,490 | 1,747 | 119 | 131 | 5,204 | 336 | 1,871 |
| Religious Figures/Institut.. | 895 | 235 | 1,613 | 652 | 1 | 22 | 248 | 28 | 42 |
| Telecommunication | 40 | 1 | 322 | 471 | | 7 | 20 | 3 | 6 |
| Terrorists/Non-State Mili.. | 809 | 390 | 1,218 | 38 | 2 | 3 | 204 | 1 | 475 |
| Tourists | 46 | | 65 | 11 | 2 | 3 | 56 | 3 | 1 |
| Transportation | 425 | 1 | 2,516 | 367 | 47 | 15 | 85 | 15 | 36 |
| Unknown | 55 | 2 | 6,368 | 31 | 4 | | 6 | 1 | 36 |
| Utilities | 84 | 1 | 2,296 | 258 | | 7 | 23 | 1 | 31 |
| Violent Political Party | 302 | 430 | 357 | 91 | | 2 | 126 | 6 | 57 |

Count of Attacktype1 T..
1 19,490

Count of Attacktype1 Txt broken down by Attacktype1 Txt vs. Targtype1 Txt. Color shows count of Attacktype1 Txt. The marks are labeled by count of Attacktype1 Txt.

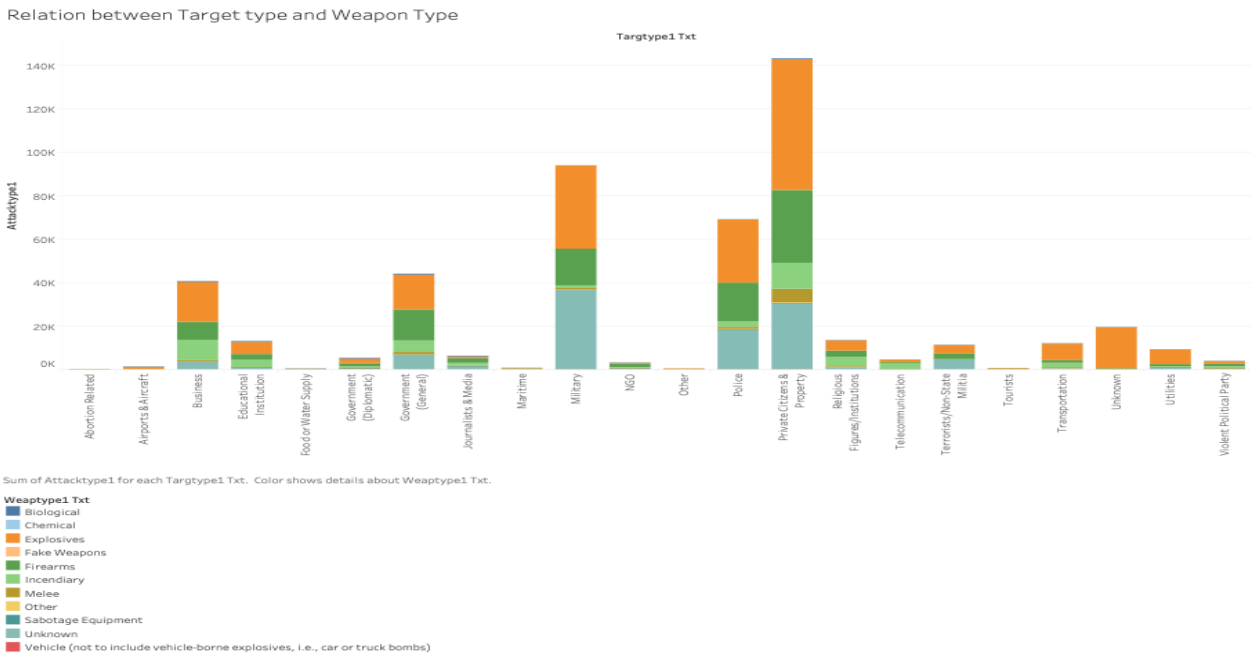
By looking at the relationship between the target type and the attack type, we can identify patterns and trends in terrorist attacks. The most common target type for terrorist attacks is Private Citizens & Property, followed by Military, Police, and Government (General). Similarly, the most common attack types are Bombing/Explosion and Armed Assault. By analyzing the data, we can identify which target types are more likely to be associated with certain attack types, such as Bombing/Explosion being the most common attack type for attacks on Private Citizens & Property, while Armed Assault is the most common attack type for attacks on Police. These observations can be used to inform counter-terrorism strategies and policies, such as measures to protect civilians and targeting certain types of attacks.

*Figure 3: A treemap showing the preferred attack and weapon type in different regions across the dataset*



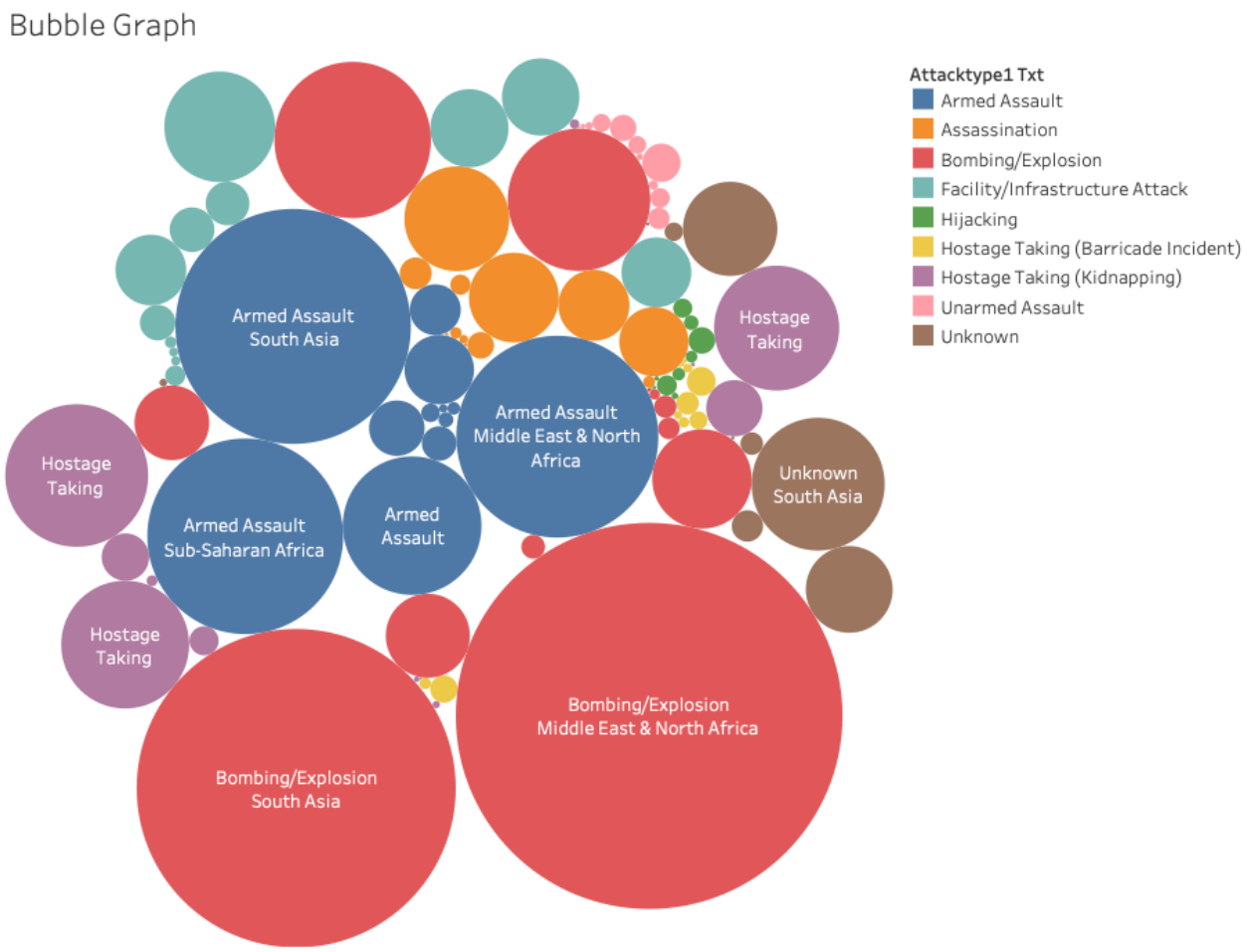

To further understand the distribution and success rates of different types of terrorist attacks across regions, we can visualize the data using various graphs. The treemap shows that the terrorist is targeting mostly African and South Asian countries, and the attack types that are commonly used are Explosives or Firearms.

*Figure 4: A stacked bar chart showing the relationship between target type and weapon type*



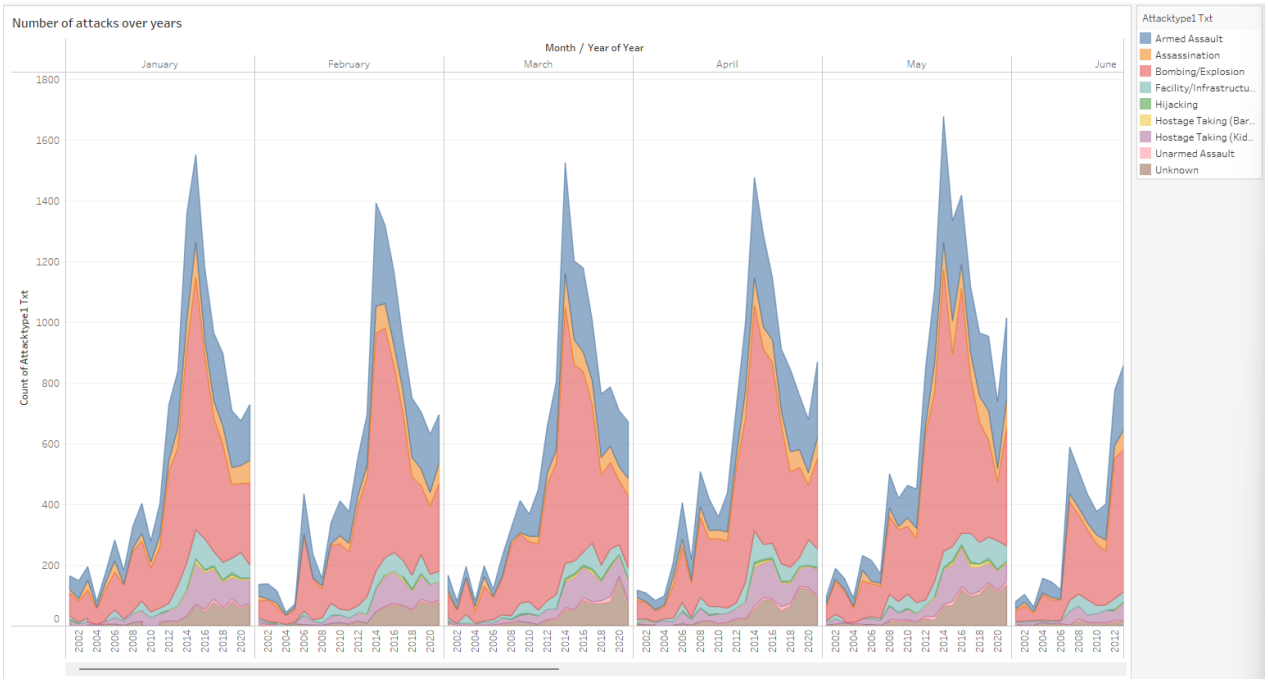
The stacked bar graph highlights that terrorists use explosives as their main weapon, with most of the targets having more explosive attacks than other types of attacks. By coloring the map of terrorist incidents by regions, we can observe that the Middle East has a high concentration of terrorist incidents compared to other continents, followed by Africa, Asia, and the Americas.

*Figure 5: A Bubble Graph showing the success ratios of terrorist attacks relative to attack type and region*




Finally, the bubble plot displays the relationship between attack type and success, with a breakdown by region. Bombing/Explosions were the most successful type of attack, with the highest number of successful attacks occurring in the Middle East and North Africa region, followed by South Asia. Armed Assault was the next most successful type of attack, with a higher frequency in South Asia compared to the Middle East and North Africa. These insights provide valuable information that can inform efforts to prevent and respond to terrorist attacks around the world.

*Figure 6: A plot showing the number of attacks over the year – month-on-month comparison*




From the plot above, the spike in terrorism attacks from 2010 to peaks levels in 2014 is obvious – with 'Armed Assault' and 'Assassination' leading the way; 2004 have the lowest number of terrorist attacks recorded. The months of May 2014 and July 2014 have the highest levels of terrorist attacks recorded in the dataset – while January 2004 represented the safest month i.e., with the lowest number of attacks recorded.

## 4.0 Summary and Conclusions

The data visualization project analyzed the Global Terrorism Database to gain insights into the patterns and trends of global terrorism. The project includes four different visualizations - a treemap, stacked bar chart, map, bubble plot, and a line graph - which show different aspects of terrorist incidents such as the type of weapon used, the success rate of attacks, frequency of attacks, and the relationship between target type and attack type. Overall, the project highlights that terrorism is a global phenomenon that affects all continents, with varying degrees of intensity and frequency, and provides valuable insights into the distribution and success rates of different types of terrorist attacks across regions.

## 5.0 References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## 6.0 Contributions

| S/N | Name | Contribution |
|---|---|---|
| 1. | Sanjana Godolkar | Sanjana worked on plotting & analysis of the visualizations along with a summary to come up with a storyline for the project. |
| 2. | Anthony C. Okoye | Tony was responsible for ensuring the team is meeting project goals and objectives. Alongside handling literature and research, he worked on curating the final submission documents. |
| 3. | Sanchit Vijay | Sanchit played a vital role in the data collection, cleaning, wrangling, and merging process, thereby ensuring that the data was well-structured and readily available for further analysis and visualization. Moreover, Sanchit worked on formulating insightful and thought-provoking questions that guided the data exploration process. |
| 4. | Yongxin Luo | Yongxin Luo conducted research on data collection methodology and data synthesis and wrote a comprehensive description of the dataset. |
| 5. | Sudhanshu Deshpande | Sudhanshu Working on generating visualizations based on SMART questions to give the end user a clear perspective of the data. Sudhanshu is able to discover the precise information that is most important to the end-user and display it in a visually attractive and educational manner by employing SMART questions. |

For the code files please use the GitHub repository

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If you would like to learn more about our project, please reach out to any of the team members below:


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