# TERRORISM

GROUP H

FOR THE PROFESSOR
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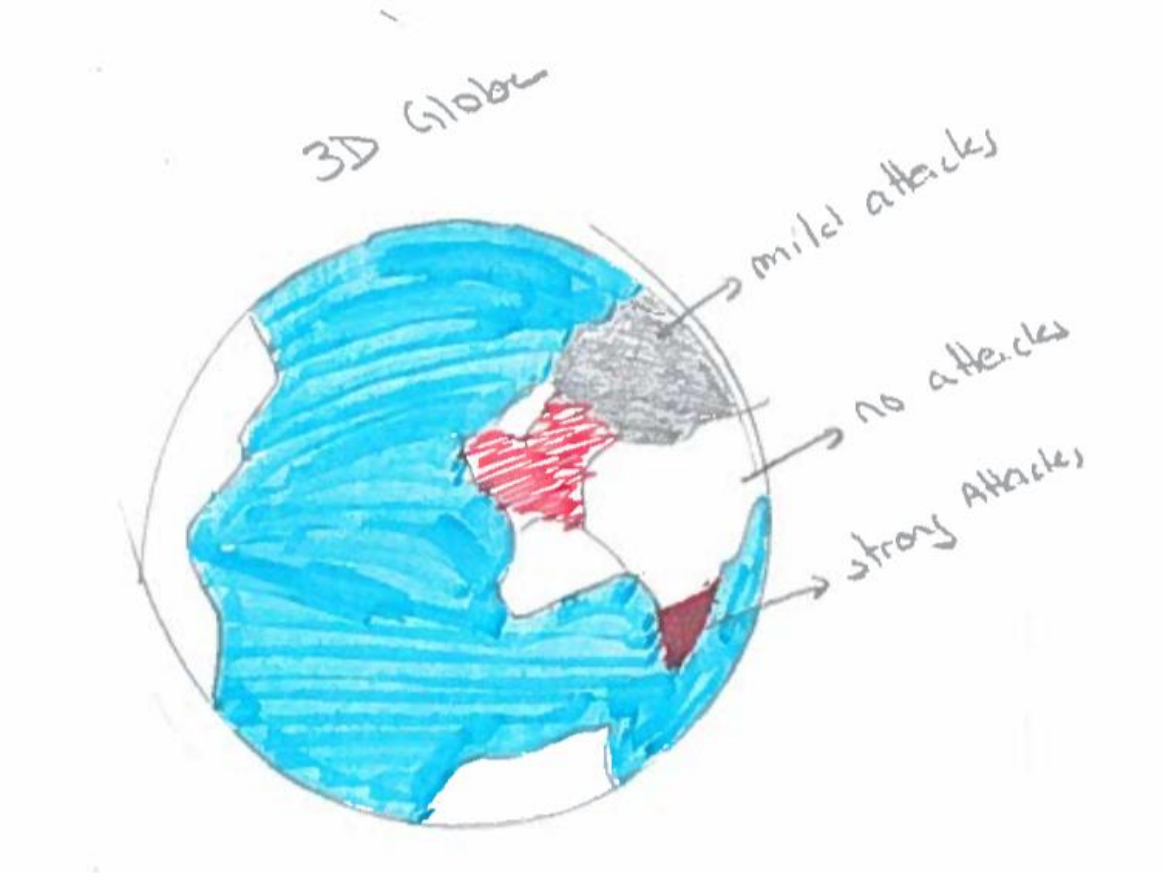
ie Reinventing Higher Education

# OBJECTIVES

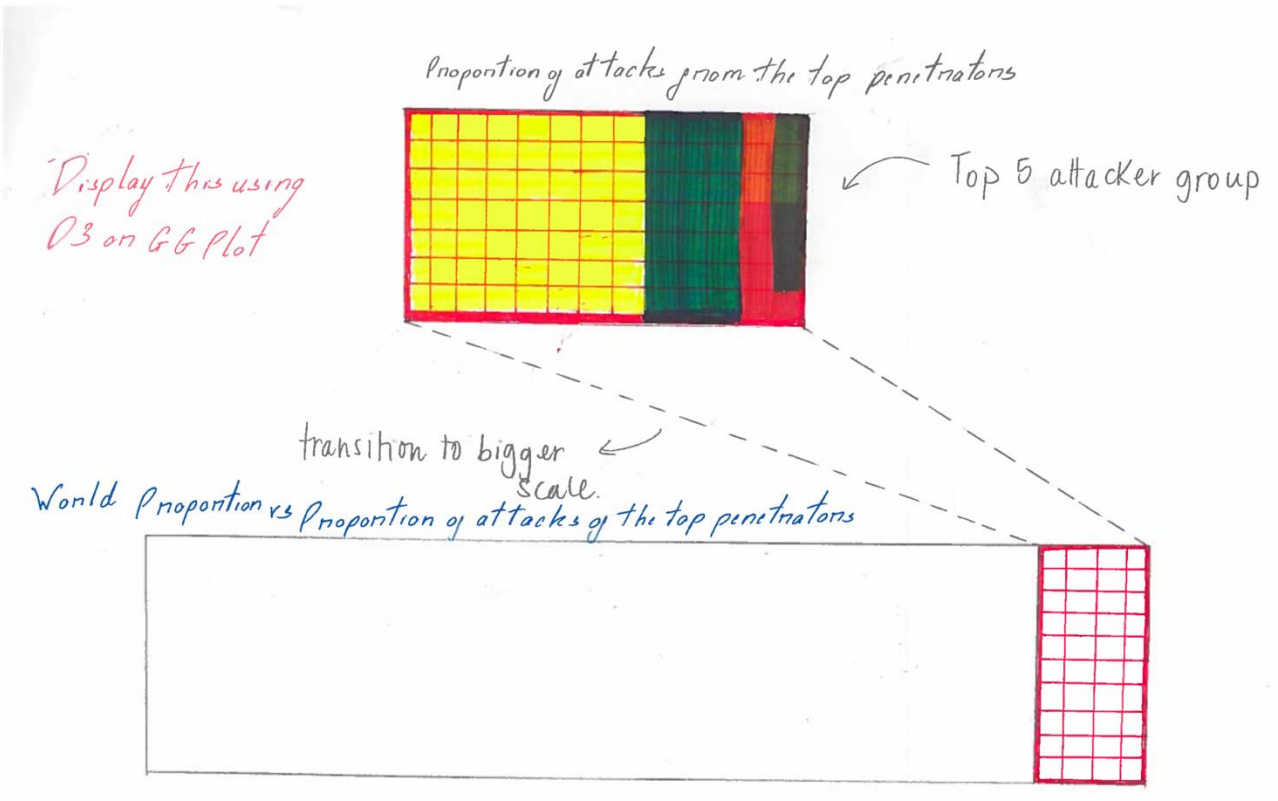
The objectives of these visualizations are to demonstrate the uprising of violence in the world, between the years 2000 and 2017. We want to capture the areas of the world most affected by this negative trend. Also, we can identify which terrorist/attack group has had more effect and when in time they started their activities. This data could be helpful for governments when trying to find ways to prevent these attacks, by knowing which areas are most likely to become targets in the future. Furthermore, we hope that this visualization will help users gain perspective on the War on Terror, since the global campaign against terrorism began in 2001. Has the War on Terror made us any safer?

# IDEA DESIGN

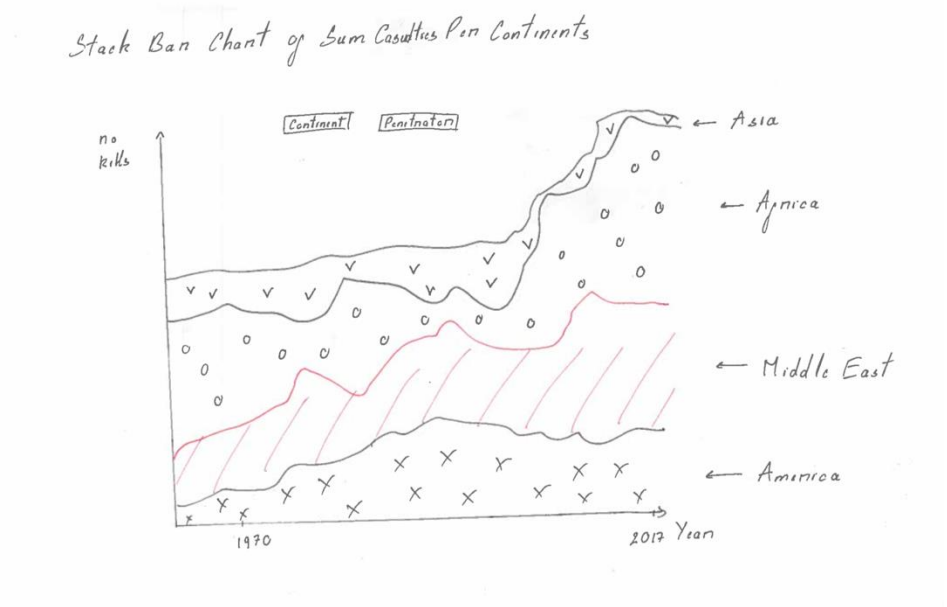
1. Interactive 3D Globe that helps the audience better visualize the magnitude of terror activities globally.



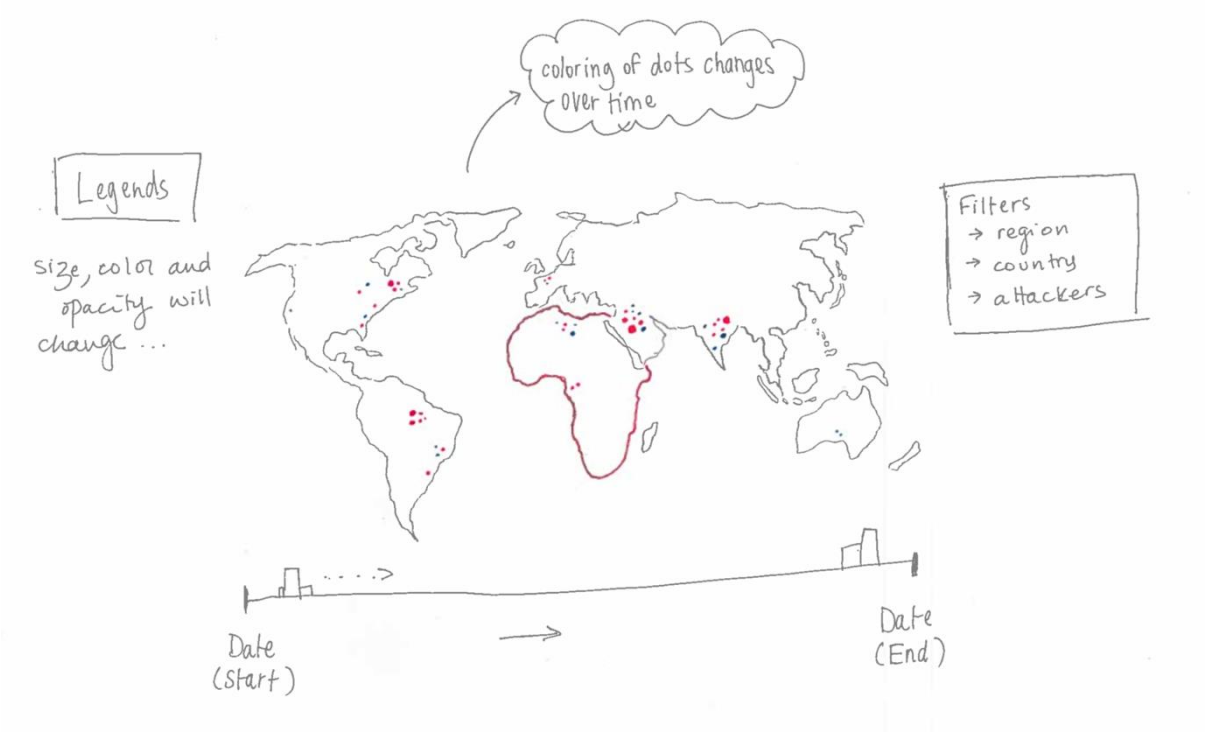
2. An interactive waffle chart that shows an overall picture of the attacking groups and the targets.




3. A Stacked area graph to visualize the sum of casualties that occurred during the attacks over different regions and across time.



4. An animated and interactive map of the world that shows the movement of the attacks across time and the concentration of attacks in the world. This will be the key visualization.

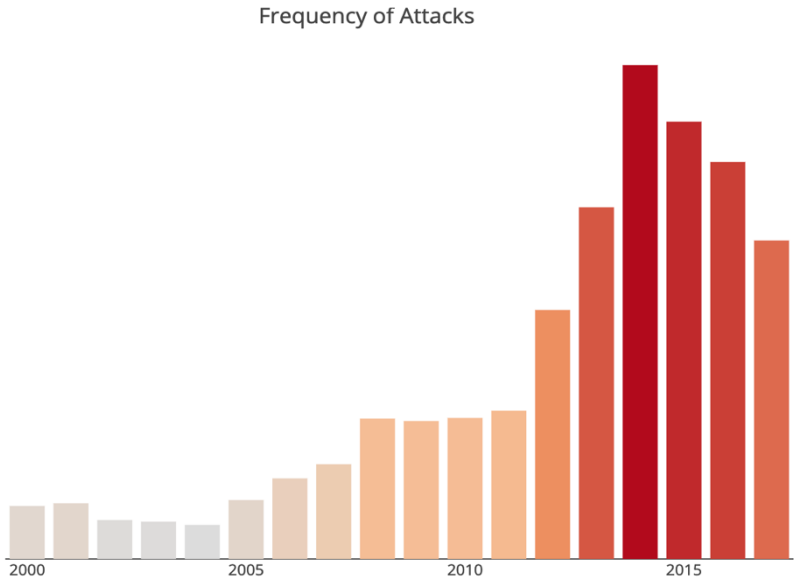



These four visualizations work well together because the map gives a global idea of the most popular regions as well as the dispersion of the points in one image. Then, the stacked graph then allows us to quantify the map with real numbers (deep dive). From the stacked graph, we can also compare regions in a quantitative way. Ideas were successfully implemented in two tools: R and CARTO. CARTO was a much more flexible tool to use and to show our objectives, however we were also able to do so with other visualizations in R.

# EXPLONATORY ANALYSIS

The variables that are the most interesting are the number of attacks and casualties based on the different regions and the attributes related to them, such as the terrorist group that did the attack or whether the attack was successful or not throughout time or the target type. For data exploration purpose, we have developed four other graphs that allow audience to gain an overall view of the global terrorism trend. This helps the audience to build up intuition about the issue, preparing user for more in depth interraction with the final visualization. *** Please check the html for interaction.**

## TERRORISM ATTACK FREQUENCY FROM 2000 TO 2017

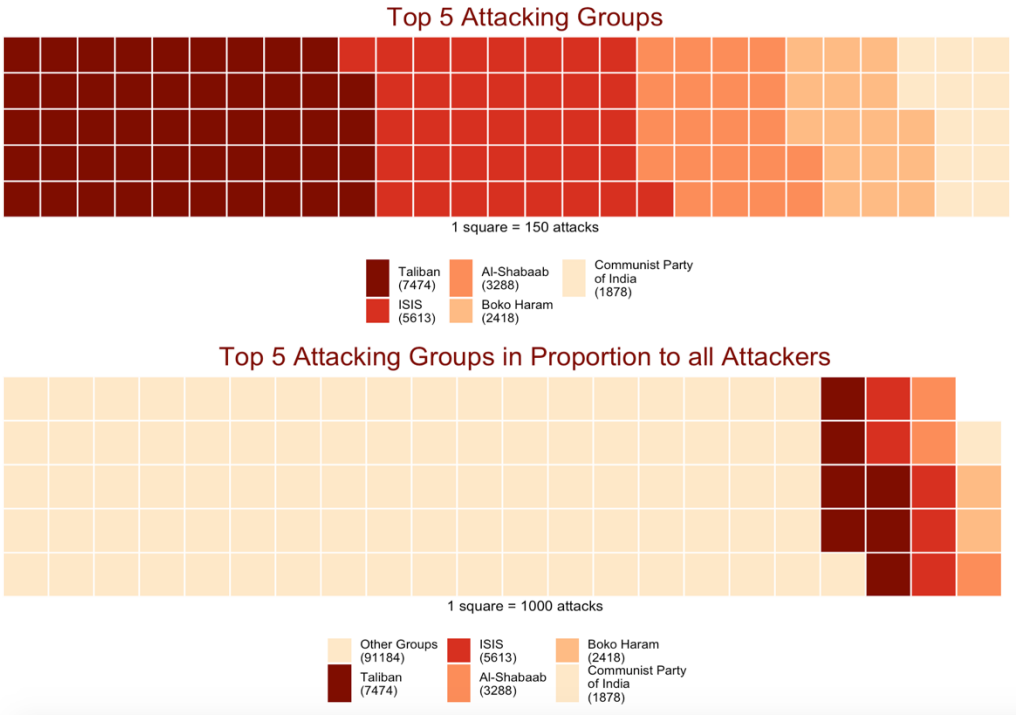



This interactive bar chart was built using the Plotly package. It shows the frequency of attacks that happened throughout the years. We can see that 2014 was a very bad year in which the number of attacks were the highest. The amount is almost 8 times higher than the years prior to 2005. The good news is that after this year the number of attacks decreases however it is still pretty high compared to the years before 2011.

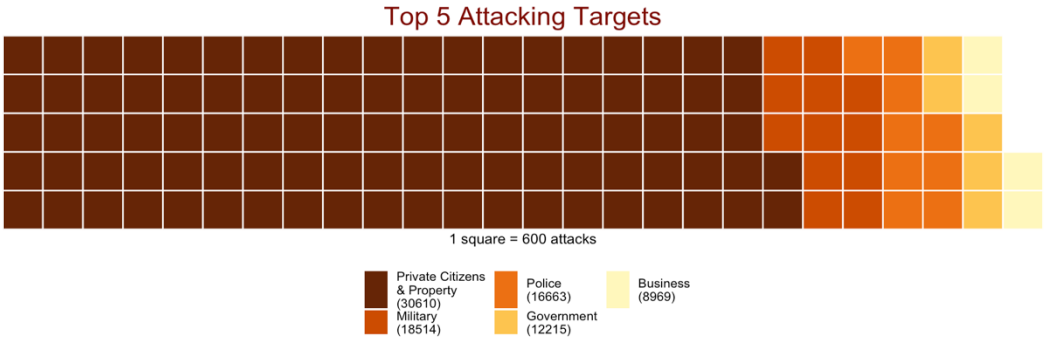
- Color here was also used as a visual encoding to highlight how bad the year was. The darker the red the worst the year and the more attacks it had. Size of the bar is another visual encoding to illustrate the magnitude of the frequency.

- An additional feature was added in which the user can click on a specific bar and it will show him the year and the exact total amount of attacks that occurred during that year.

## WHO ARE THE ATTACKERS & WHO ARE THE TARGETS?

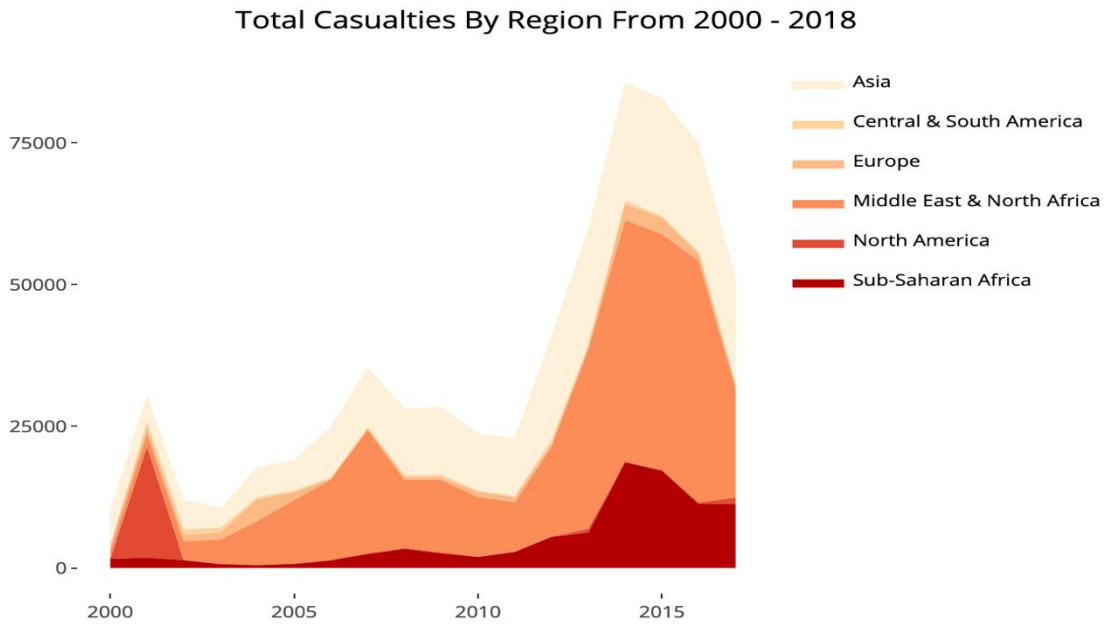



The first waffle chart was designed to show the proportion between the top 5 attacking groups. Taliban and ISIS's attack occupy around 75% of the attacks among the top 5 terrorist groups. What is interesting in these charts is that we can understand why the concentration of fighting terrorism is focused towards these terrorist groups. However, this graph is illustrated in small proportion. In reality, when comparing the top 5 with all the other organization that are attacking part of the world, we can see that their total proportion is very small of around 10%.




The third waffle chart shows that 75% of the attacks are mainly aimed at private citizens and properties. The **visual encoding** of these 3 charts is color, which represents each specific attackers or specific target group.

## WHICH REGION IS MOST AFFECTED?




For this visualization we used a combination of ggplot to graph and plotly to make it more interactive. The graph is a density chart by year that shows the number of casualties by region. The interactive feature of this plot is the use of the filters which give us information on demand about the region or multiple regions. The graph shows that the Middle East and Africa have always suffered the most casualties. While Asia and Europe suffer more or less the same number of casualties and the Central & South America have the least.

**Visual Encoding**

- Color is the visual encoding for this graph, where each region is represented by a different color
- Size of the stacked area represents the number of casualties

**Detail on Demand**

As the user hovers over the graph, we get notified about the year, exact amounts of casualties and region. The user also has an option to have a closer look and compare all the regions against each other by selecting “Compare data on hover” option and hovering across the years.

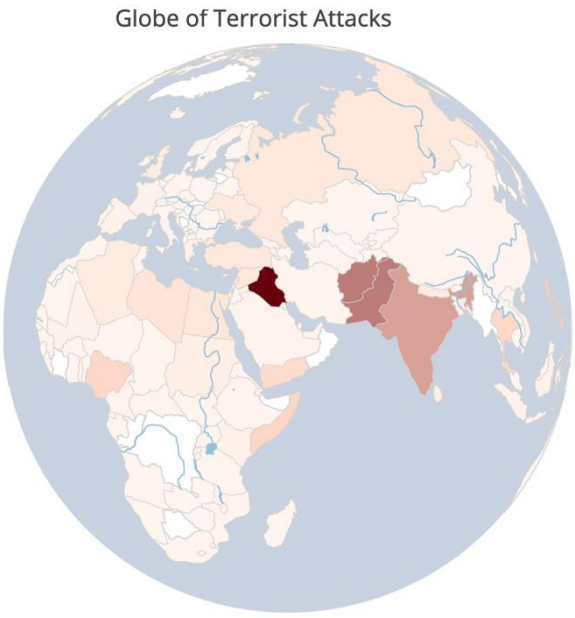
**Filter**

The graph can be filtered by region where one or more region can be selected.

- Double click on legend to isolate a region

- Single click to select or deselect a region

## A GLOBAL VIEW




Another view that was also done in R is the number of attacks from a 3D Globe perspective. The attack shows clearly the concentration of attacks in Iraq and around India. The Earth view can be turned around based on region interest.

**Visual Encoding**

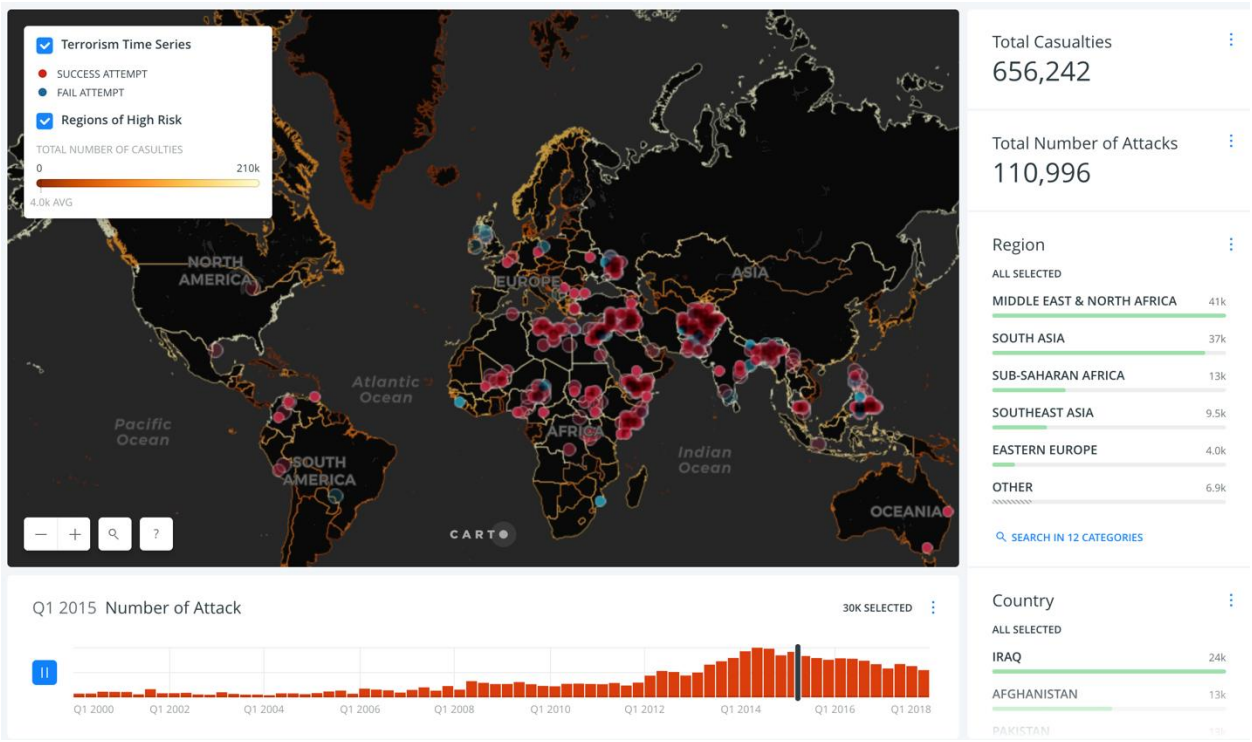
Color is also the visual encoding used where the darker the color, the more targeted attacks the country had.

**Detail on Demand**

Clicking in a specific country shows the name of the country and the number of attacks that occurred in this country.

# FULL PICTURE OF TERRORISM IN THE LAST 2 DECADES

For our map, we decided to implement the idea in CARTO. CARTO was the best tool to show an interactive and animated time map. We were able to create a time-lapse of the data points over the whole world.




[Click Here To Interact](#) - Please refresh your browser if animation has not run smoothly

The visual encodings that were used for the map are color and position. The colors explanation is in the legend and they were used for:

- The success of the attacks, red for a successful attack and blue for an unsuccessful attack.
- Aggregate number of casualties of a country, a palette color ranging from dark brown to white. The color borders the country showing the level of casualties.

To be able to focus on more details, the following filtering options were offered:

- **Filter by time**: we can pause as well as set a specific time frame that the viewer wants to focus on
- **Filter by Region**: audience can filter the attacks by any of the 12 specific regions.

- **Filter by Country**: this filter allows users to explore in depth what happened to a specific nation throughout time.
- **Filter by Attacker group**
    - Sub filter: any change in the region will show the appropriate total number of casualties and total casualties of the region selected, the same applies if we filter by attacker group. This filter allows us to explore on boiling issues such as is ISIS the biggest threat of security and what are the major targets of different attacking groups.

The map also has a zoom option in which the user can zoom in and out with information adapting to the changes.

The time series chart also gives us a more holistic view of attacks through a bar chart. We can clearly see that as of 2007, the number of attacks started growing and in 2012 the attacks started doubling.

# EVALUATION

## CARTO MAP:

In our opinion, it would be helpful for the viewer if we were able to also sub filter the total number of attacks and casualties when we filter in time.

The legend cannot be moved, shrinked or placed elsewhere and hence covers the US, which makes it difficult for the users to view the attacks unless they zoom out.

Adding detail on demand would be crowding the visualization and drifting from the objective.

## R BAR CHART:

We could add the trend line on the bar chart, however we decided to keep the chart simple and free of junk.

The colors may be overlapping the information of the bar size, however they are eye catching and useful to highlight our objective. This way, we were able to capture the user's attention directly on the darkest red bar.

## STACKED DENSITY CHART

The fact the density areas are overlapping makes it difficult for the user to see the details of some of the regions such as North America, where you can only see the first couple of years but the chart disappears behind the other charts. This highlights the importance of the filter to be able to compare and view what happens for this region in the upcoming years.

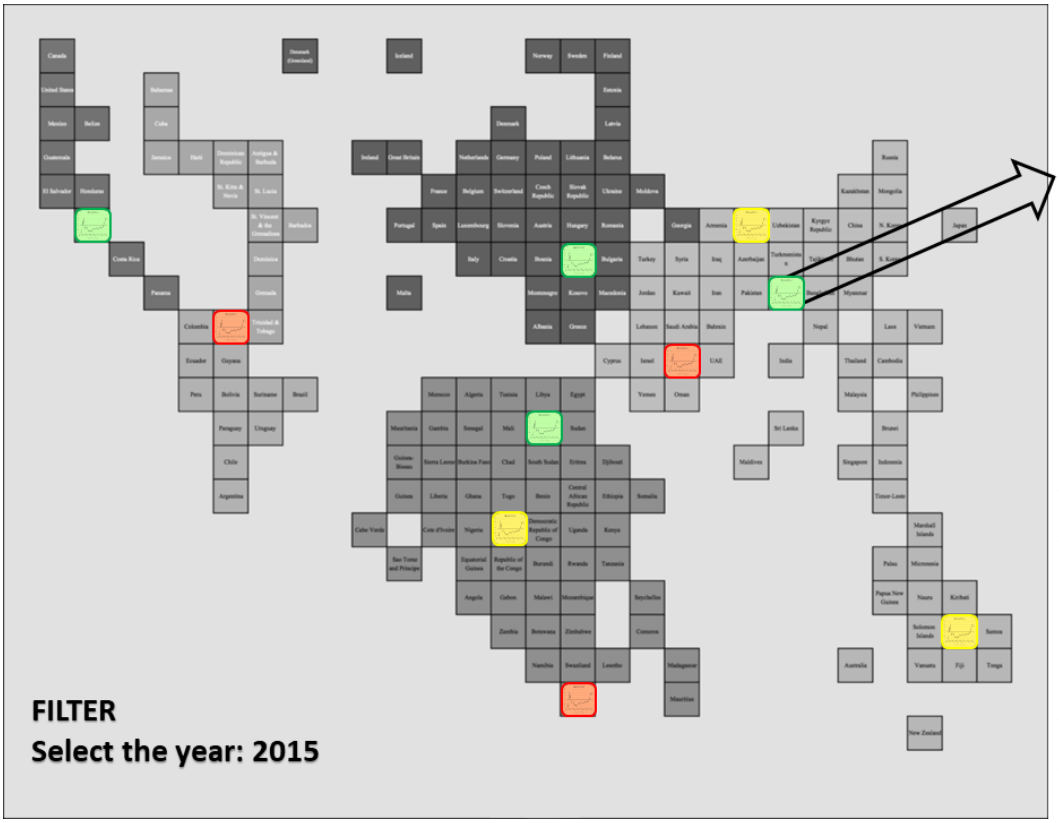
## 3D EARTH GLOBE

This visualization gives a general view of the attacks and clearly identifies the outliers. However, it would have been more informative if we could have included more details for the user, such as the number of deaths per country, etc…

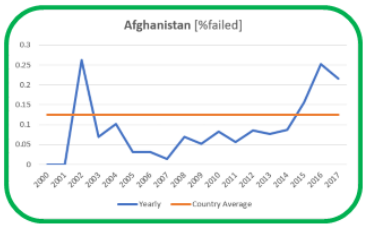
## DATA

For our following graphs, the data we gathered was stored in a Excel file. We tried loading the data in Gist but the file seemed to be to big to load. Thus, we provided the Excel file, however, in the future, we would like to understand how to load big datasets in Gist.

The graph below is a draft of what we were thinking of doing. The objective is to show how the countries are living through terrorism. We could not do this graph on CARTO, D3 or R. The graph will show if there is any correlation between the countries. If for example Africa is showing all red squares at the same time as the Middle East, this might give insights about some correlation or a specific event happening during this certain year. On the other hand, if a country and its neighbor are green, maybe this means that these regions are in a time of peace. This graph is different than the others as it compares the same country based on its average and thus shows the abnormality standard during a specific time.




**WHAT WE WANTED TO DO**




For each country we have the yearly number of terrorist attacks divided by the ones that failed and the ones that did not.

$$\%failed = \frac{\#\ failed}{\#\ tot\ terr\ attacks}$$

We wanted to visualize which country is tackling terrorism showing the percentage of terrorist attacks that failed out of the total.

We wanted an interactive graph in which the user visualize all the miniature of the line plots in the map and then, clicking on each country, would able be able to see a popup of the graph of the country (like shown for Afghanistan) with the average of the country (orange line) and the yearly (blue line). The miniature is green or red if the yearly % of the selected year (in the filter) is above or below the country average.

```
---
title: "Terrorism"
author: "Group 8"
date: "2/20/2019"
output: html_document
---

```{r setup, include=FALSE}
knitr::opts_chunk$set(echo = TRUE)

if(!'plotly'%in%installed.packages()){
  install.packages('plotly')
}
library(plotly)

if(!'plyr'%in%installed.packages()){
  install.packages('plyr')
}
library(plyr)

if(!'ggplot2'%in%installed.packages()){
  install.packages('ggplot2')
}
library(ggplot2)

if(!'waffle'%in%installed.packages()){
  install.packages('waffle')
}
library(waffle)
```
#Data Explonatory Visualization

## Terrorism trend from 2000 to 2017

```{r first}
df<-read.csv("GlobalTerrorism.csv")
```
```

```
total<-count(df$iyear)
fit<-fitted(loess(total$freq ~ total$x))

freq_plot<- plot_ly(data = total, x = ~x, y = ~freq, type = "bar", showlegend=FALSE, marker=list(color=~freq, showscale=FALSE)) %>%
  layout(showlegend=FALSE, title='Frequency of Attacks', xaxis = list(title='', side="right", showgrid=FALSE), yaxis=list(title='', showgrid=FALSE, showticklabels=FALSE))

freq_plot
```

## Who Are The Attackers?

```{r waffle}
df <- read.csv("Globalterrorism.csv")
df[,1] <- 1
gname <- aggregate(df['eventid'], by=list(df$gname), FUN = sum)
colnames(gname)<- c('attacker','count_attack')
gname <- gname[order(-gname$count_attack),]

Others <- sum(gname$count_attack) - sum(gname[c(2:6),2])

attack_group <- c(
  'Other Groups\n(91184)' = sum(gname$count_attack) - sum(gname[c(2:6),2]),
  'Taliban\n(7474)' = gname[2,2],
  'ISIS\n(5613)' = gname[3,2],
  'Al-Shabaab\n(3288)' = gname[4,2],
  'Boko Haram\n(2418)' = gname[5,2],
  'Communist Party\nof India\n(1878)' =  gname[6,2]
)
A<-waffle(
  attack_group / 1000, rows = 5, size = 0.5, legend_pos = "bottom",
  xlab = "1 square = 1000 attacks",
  colors = c('#fee8c8','#7f0000','#d7301f','#fc8d59','#fdbb84','#fee8c8'),
  title = "Top 5 Attacking Groups in Proportion to all Attackers") +
  theme(plot.title=element_text(size = 18, hjust = 0.5, color ="#7f0000"))

top_attack_group <- c(
```

```
  'Taliban\n(7474)' = gname[2,2],
  'ISIS\n(5613)' = gname[3,2],
  'Al-Shabaab\n(3288)' = gname[4,2],
  'Boko Haram\n(2418)' = gname[5,2],
  'Communist Party\nof India\n(1878)' =  gname[6,2]
)

B<-waffle(
  top_attack_group / 150, rows = 5, size = 0.5, legend_pos = "bottom",
  xlab = "1 square = 150 attacks",
  colors = c('#7f0000','#d7301f','#fc8d59','#fdbb84','#fee8c8'),
  title = "Top 5 Attacking Groups") +
  theme(plot.title=element_text(size = 18, hjust = 0.5, color ="#7f0000"))

iron(B, A)
```
##Who Are The Targets?
```{r }
cause <- aggregate(df['eventid'], by=list(df$targtype1_txt), FUN = sum)
colnames(cause)<- c('target','count_attack')
cause <- cause[order(-cause$count_attack),]

Other_target <- sum(cause$count_attack) - sum(cause[c(1:5),2])

target_group <- c(
  'Private Citizens\n& Property\n(30610)' = gname[1,2],
  'Military\n(18514)' = gname[2,2],
  'Police\n(16663)' = gname[3,2],
  'Government\n(12215)' = gname[4,2],
  'Business\n(8969)' =  gname[5,2]
)

#Plotting Data

waffle(
  target_group / 600, rows = 5, size = 0.5, legend_pos = "bottom",
  xlab = "1 square = 600 attacks",
  colors = c('#662506','#cc4c02','#ec7014','#fec44f','#fff7bc'),
```

```
  title = "Top 5 Attacking Targets")+
  theme(plot.title=element_text(size = 18, hjust = 0.5, color ="#7f0000"))

```
```
## Which Region Is Most Affected?
``` {r second}
aggdata <- aggregate(df['Casulties'], by=list(df$region_txt, df$iyear), FUN = sum)
aggdata$Group.1 <- as.factor(aggdata$Group.1)
levels(aggdata[[1]])[1] <- "Asia"
levels(aggdata[[1]])[2] <-"Central & South America"
levels(aggdata[[1]])[3] <-"Asia"
levels(aggdata[[1]])[3] <-"Asia"
levels(aggdata[[1]])[3] <-"Europe"
levels(aggdata[[1]])[6] <-"Central & South America"
levels(aggdata[[1]])[6] <-"Asia"
levels(aggdata[[1]])[6] <-"Asia"
levels(aggdata[[1]])[7] <-"Europe"

Attack <- aggregate(aggdata['Casulties'], by=list(aggdata$Group.1, aggdata$Group.2), FUN = sum)
colnames(Attack)  <- c("Region","Year","Casualties")

p <- ggplot(Attack, aes(x=Year, y=Casualties, fill=Region)) +
   geom_area() + scale_fill_brewer(palette="OrRd") +
  ggtitle("Total Casualties By Region From 2000 - 2018") +
  theme (panel.grid.major = element_blank(),
         panel.grid.minor = element_blank(),
         panel.background = element_blank(),
         strip.background =element_blank(),
         plot.background = element_blank(),
         axis.title = element_blank(),
         legend.title = element_blank())
ggplotly(p)

```
```
## A Global View
``` {r globe}
mydata <- df
```

```
jointable <- read.csv('https://raw.githubusercontent.com/plotly/datasets/master/2014_world_gdp_with_codes.csv')
mydata[,1] <- 1
aggdata <- aggregate(mydata['eventid'], by=list(mydata$country_txt), FUN = sum)
colnames(aggdata)<- c('country','deaths')
newdata <- merge(aggdata,jointable,by.x="country", by.y = "COUNTRY",  all = TRUE)

#Set country boundaries as light grey
l <- list(color = toRGB("#d1d1d1"), width = 0.5)
#Specify map projection and options
g <- list(
  showframe = FALSE,
  showcoastlines = FALSE,
  projection = list(type = 'orthographic'),
  resolution = '100',
  showcountries = TRUE,
  countrycolor = '#d1d1d1',
  showocean = TRUE,
  oceancolor = '#c9d2e0',
  showlakes = TRUE,
  lakecolor = '#99c0db',
  showrivers = TRUE,
  rivercolor = '#99c0db')

#Plot
p <- plot_geo(newdata) %>%
  add_trace(showscale = FALSE, z = ~deaths, color = ~deaths, colors = 'Reds', text = ~country, locations = ~CODE, marker = list(line = l)) %>%
  layout(title = 'Globe of Terrorist Attacks', geo = g)
p
```

# The Full Picture of Terrorism in The Past 2 Decades

<iframe width="100%" height="520" frameborder="0" src="https://victorvu.carto.com/builder/57b186a9-9939-4632-a502-027323fe1917/embed" allowfullscreen webkitallowfullscreen mozallowfullscreen oallowfullscreen msallowfullscreen></iframe>