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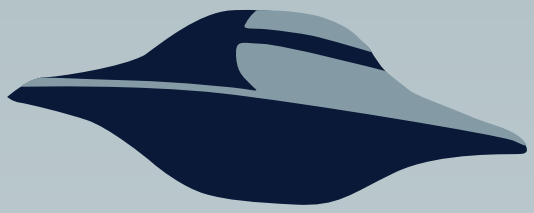

DATA VISUALIZATION

UFO SIGHTINGS

Github: https://github.com/m20180054/UFO

1. Dataset Description

For this Data Visualization project, we researched multiple datasets from different sources. We wanted to choose an interesting topic, which would also allow us to create some challenging visualizations, and apply the concepts that we learned in the practical classes of the course during the semester.

Having this in mind, we eventually stumbled upon a Kaggle dataset entitled "UFO Sightings" [1]. This dataset was divided into two versions, complete and scrubbed. The main difference between the two is that the scrubbed version did not have any missing/incomplete reports. For the latter reason, and for the sake of simplicity, we decided to go forward with the scrubbed version of the data set, which even though it is smaller than the complete data set, it still covers a total of around 80 thousand records. For the visualization, we narrowed the records a bit using only sightings from 1994 onwards and only recorded in the US.

Analyzing the data set in more detail, it is composed of 11 different variables, and every single one of them is described in table 1.

Variable	Type	Description
datetime	Date	the date and time in which the UFO was sighted
city	String	the city in which the UFO was sighted
state	String	the state in which the UFO was sighted (if applied)
country	String	the country in which the UFO was sighted
shape	String	the shape of the sighted UFO (30 different labels)
duration (seconds)	Numeric	the duration of the UFO sighting (in seconds)
duration (hours/minutes)	Numeric	the duration of the UFO sighting (in hours/minutes)
comments	String	the description of the event by the individual or group of individuals that sighted the UFO
dateposted	Date	the date in which the UFO sighting posted
latitude	Numeric	the latitude of the coordinates of the UFO sighting
longitude	Numeric	the longitude of the coordinates of the UFO sighting

Table 1. Dataset description

2. The inspiration for the project

The inspiration for this project came from different places. Regarding the theme of the project, and the dataset itself, all members of the group are big fans of Sci-Fi and pop-culture. So, when we came across a Kaggle dataset [1] with information about UFO Sightings, it was the perfect fit. When it comes to the visualizations, we researched published public works online [3], to get a sense of the kind of visualizations that we wanted to produce, and the aesthetics that we wanted to convey.

3. The Visualization

The produced visualization follow an Interactive slideshow structure, balancing the author-driven and reader-driven stories, where it freely allows the user to explore the data

mid-narrative, at his own pace, before moving on to the next chapter of the narrative. The layout is simple, organized and thematic. Overall, there are seven ***tabset*** panels and, as the user navigates through them, the granularity/level of information detail increases.

The visualization starts with a generic panel *Home*, that introduces the theme to the user, providing the data scope and source of the information. The objective of this tab is to introduce the narrative. In this same page, a US map is available, pinpointing the locations of UFO sightings since 2010, to provide a general idea.

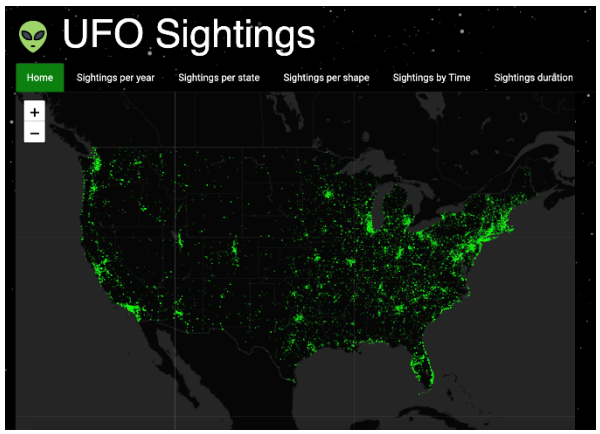

Fig 1. Home tab

Next, at *Sightings per Year,* users can explore the evolution of total sightings per year in the US by analyzing a line plot, where we use points as marks and brings an interactive feature, giving the user the ability to choose the year range and to explore the number of sightings in more detail. Given the big discrepancies between years previous and after 1993, it is useful to analyze different time ranges and realize that prior to 1993, the evolution line in a global range becomes indistinguishable. Furthermore, in this panel, some information regarding events that might be correlated with the increase of sightings are provided to the users in a sidebar panel.

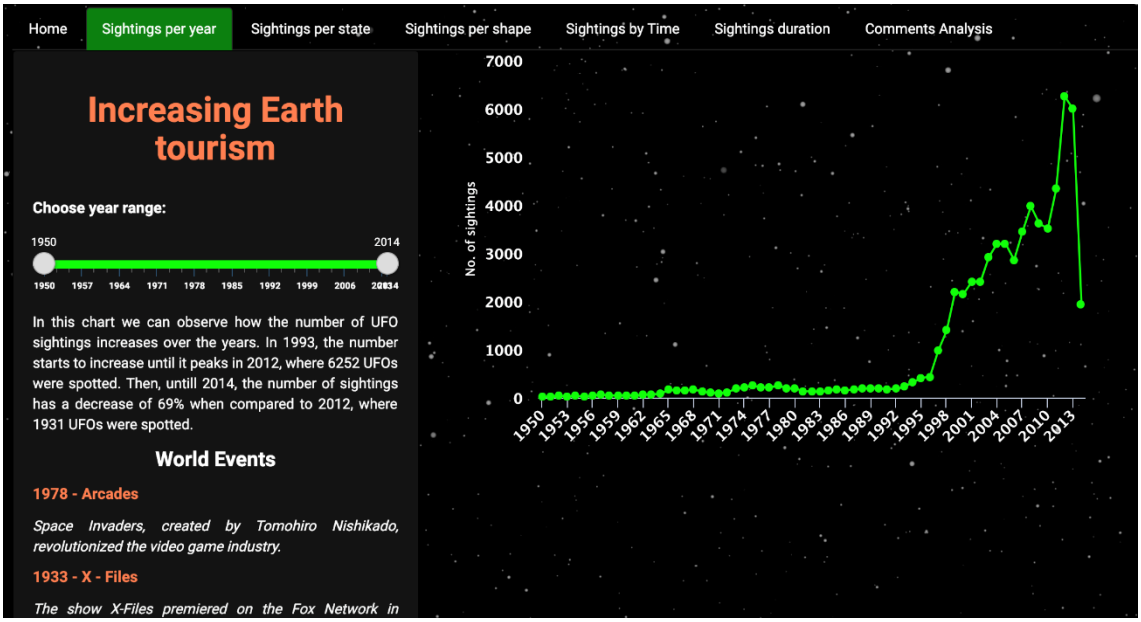

Fig 2. Sightings per year tab

The following tab shows the recorded sights of UFO through a leaflet map with circle markers whose radius varies according to the number of sightings. This information is

presented to the user by an animation that will automatically start in the year 1990 and move until the end of the period. The main objective of this tab is to present the user with

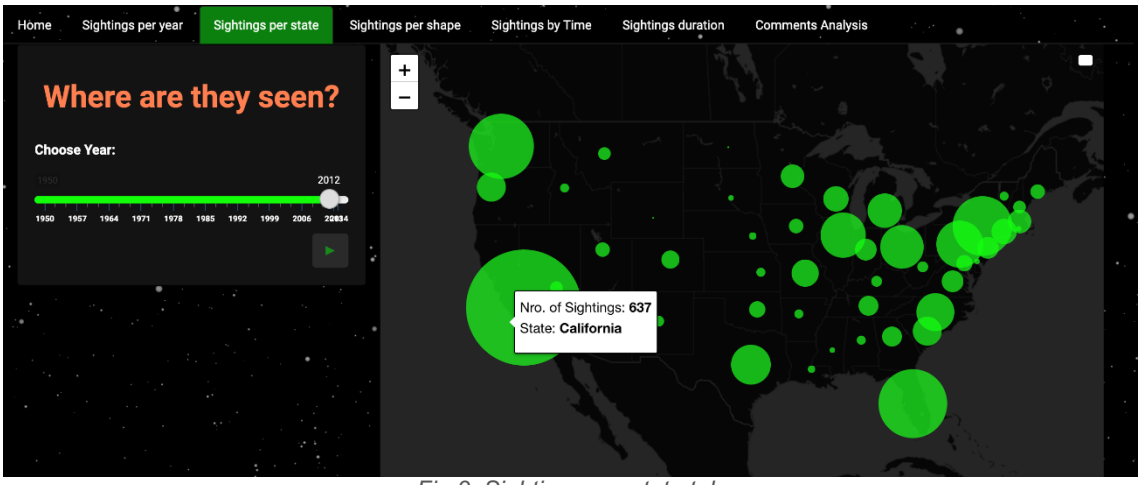

Fig 3. Sightings per state tab

more geographical information of where the sights occur. After the animation is played, the user is free to decide which year to see and by hovering the mouse cursor above the markers' information, it is displayed containing the number of UFO that have been seen and the name of the state.

Moving forward in the visualization, we have information regarding the shape of the seen UFO. In *Sightings per Shape,* the user accesses information through a bar plot that shows the number of UFO by the 18 shape categories. In this tab there are also interactive features, the user can choose if the data relates to the whole country or only a specific state in a dropdown widget. Furthermore, there is the option between filtering data of only one chosen year, or observe the cumulative data from 1950 (beginning of the period) until that chosen year, created with both a checkbox and a slider widget. Some individuals see triangle and light like shapes, and others observe a less frequent diamond shaped object. Counting all frequencies, the most common shapes, excluding the unknown ones, are light, triangle, circle, flare and disk.

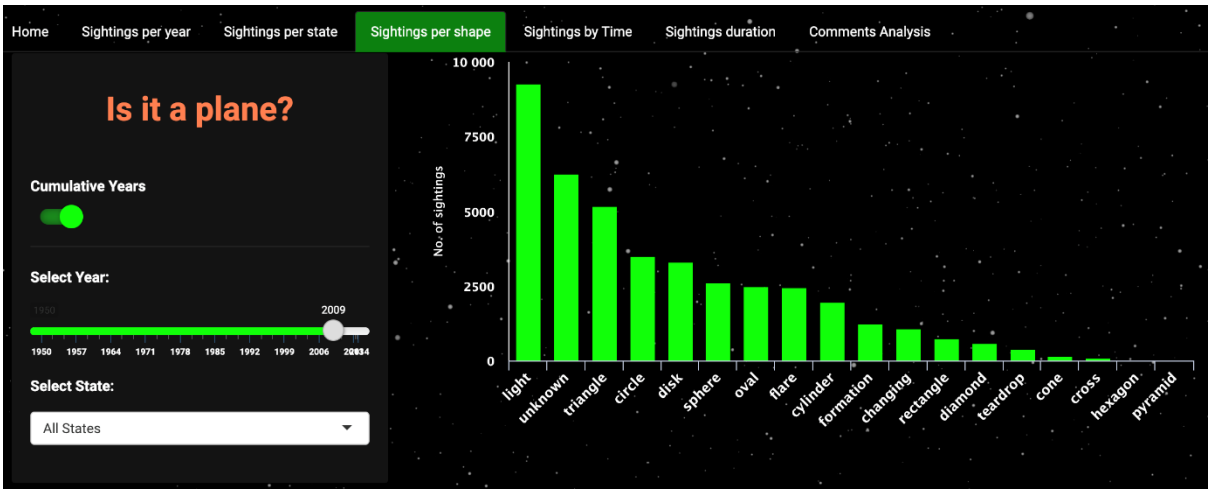

Fig 4. Sightings per shape tab

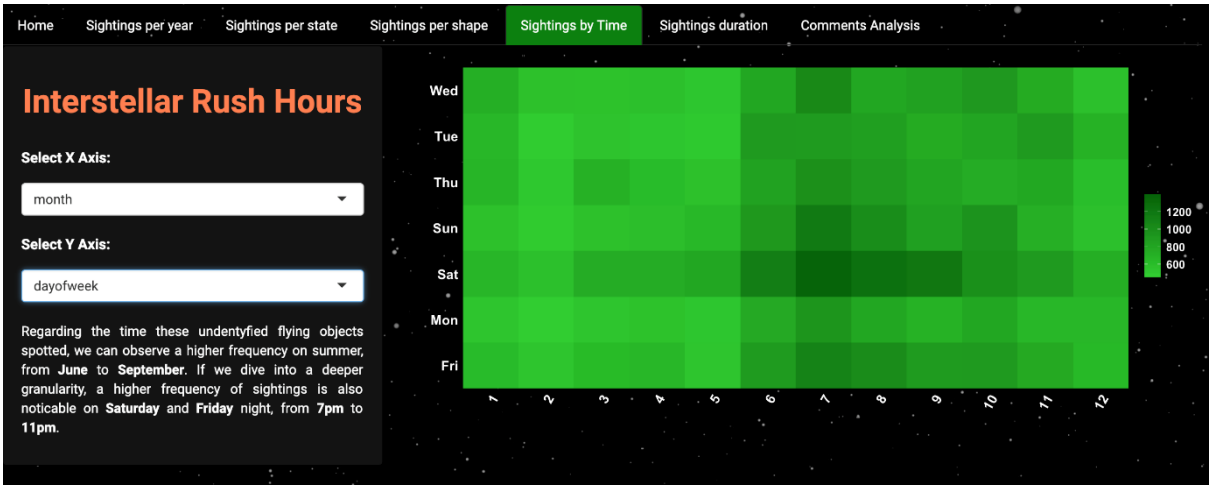

Fig 5. Sightings per time tab

Another important analysis is to see when sightings are mainly occurring during the day/night, in the beginning, or ending of the week and so on. This analysis is provided to the user by a heatmap where we see the absolute frequency of spotted UFO by different time variables. At *Sightings per Time,* users can interact by choosing the granularity of the axis, they can choose between observing: day (of the month), the day of the week, month or hour in each of the axis. Conclusions can be made such as there is higher frequency on summer, from June to September and also a higher frequency of sightings on Saturday and Friday nights, from 7 pm to 11 pm, during drinking hours.

Each of the sightings has a duration, presented in minutes, that ranges from a single glimpse to testimonials of individuals who claim to have seen a UFO for three months straight. In this tab, *Sightings* duration, users can explore how durations vary along the year in all the different states. For the interactivity tab, it was implemented with two sliderInput that invites the user to choose the years' range and the duration's range that he wants to see.

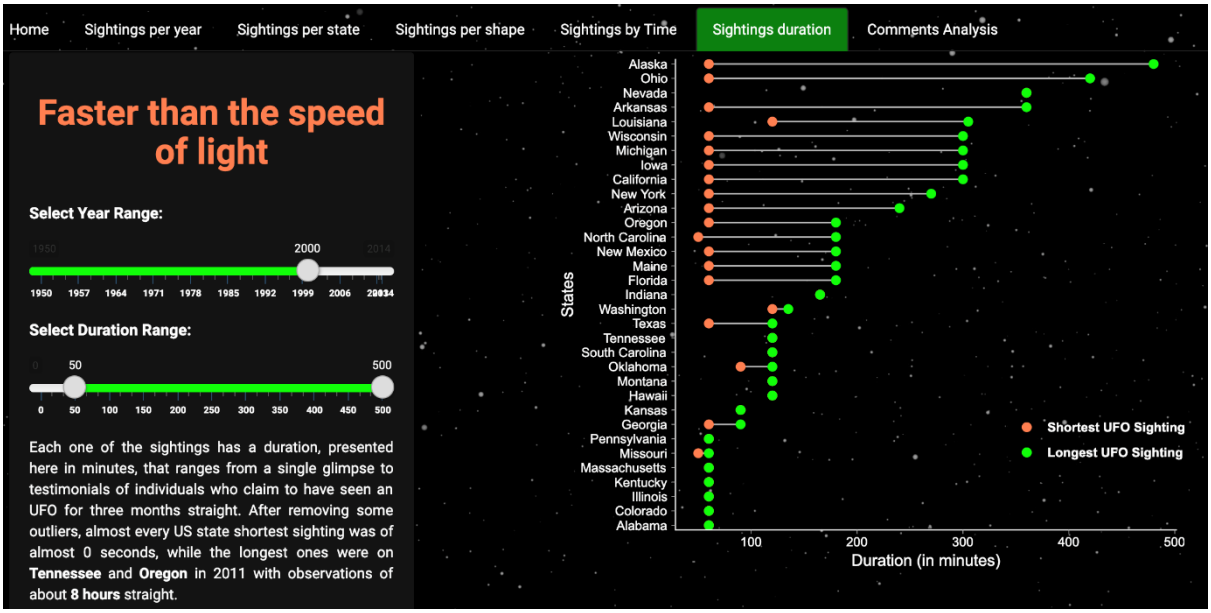

Fig 6. Sightings duration tab

Lastly, using the commentary about what people observed, we presented a completely different tab where users can analyse the most common words used on the observer testimonial through a Wordcloud. The majority of the comments have words like light, bright, object and sky. There are also some shapes and colours in the most frequent words, namely red, white and orange. To make this more interesting, we created two sliders that allow the user to control the Wordcloud output. The top slider controls the minimum frequency with which a word has to appear to be shown in the chart, while the second slider controls the maximum number of words that appear in the chart.

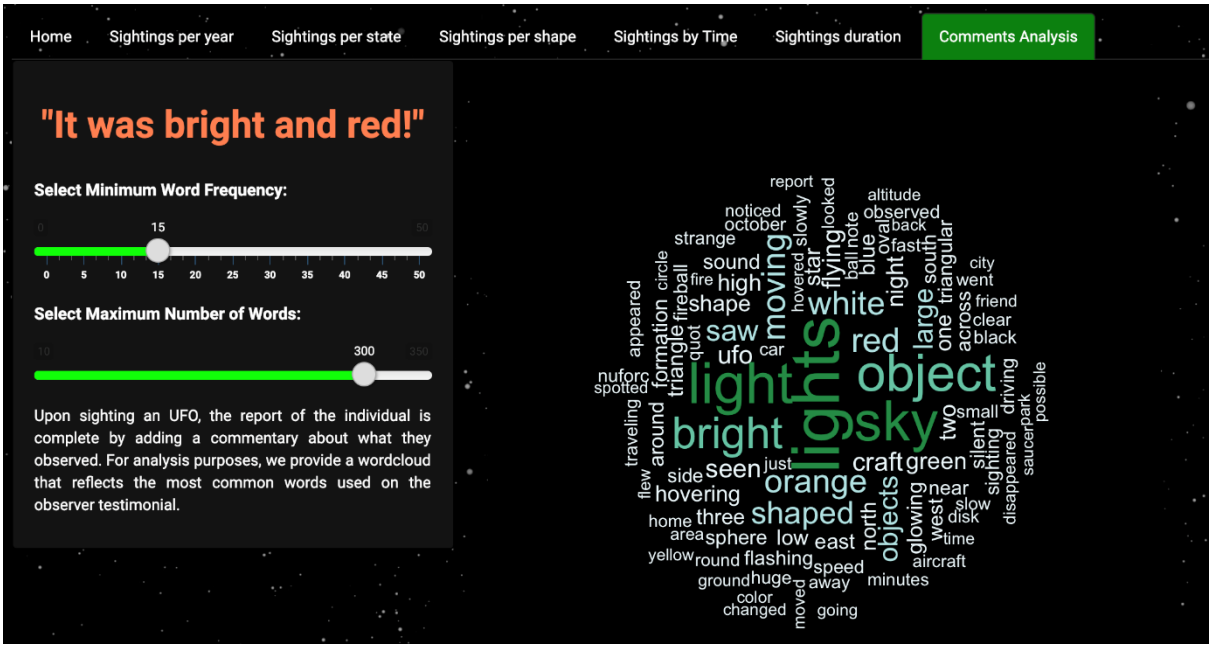

Fig 7. Comments analysis tab

It is important to notice that even though one of the Tufte's rules advice is not to use bright colours, the choice of the Lime colour (bright) for all the charts was due to aesthetics reasons and a dark background that provides a pleasant contrast, being in accordance with the thematic of the project. Table 2. Dataset description

4. Discussion

This project was really important to complement the practical lectures and allowed us to better understand the R language and deepen our knowledge, especially in controlling the details of Shiny apps visualizations. In addition to this, it was also really useful to put into practice all the theoretic principles learnt. We believe that it was really interesting to be able to choose the data we were working on because it allowed us to explore a more "informal" theme that we liked and consider interesting.

Throughout the project, we felt some limitations regarding the language and the amount of time needed to understand how to control all the details, given that it was the first big project where we used RStudio. Nevertheless, we felt that the basis learned during classes were really important and used some as baselines.

In the end, we were happy with the result of our visualization and felt that all the time spent researching about R paid off, given the final Shiny app. Even though we think that the result turned out good, there are some things that could be improved in the future, such as trying to implement this in Tableau.

5. References

[1] https://www.kaggle.com/NUFORC/ufo-sightings#scrubbed.csv, consulted on 09/01/2019
[2] http://www.sealthreinhold.com/school/tuftes-rules/rule_one.php, consulted on 12/01/2019
[3] https://public.tableau.com/profile/zach.bowders?fbclid=IwAR28keHKFXNGuaTEl-rH208tSuuL-2NY20WWJP5uk3rnvjJbuBQrLsDNPLM#!/vizhome/SaucerCountryExposingAmericasSecretPost-RoswellUFOSightings/SaucerCountry, consulted on 09/01/2019