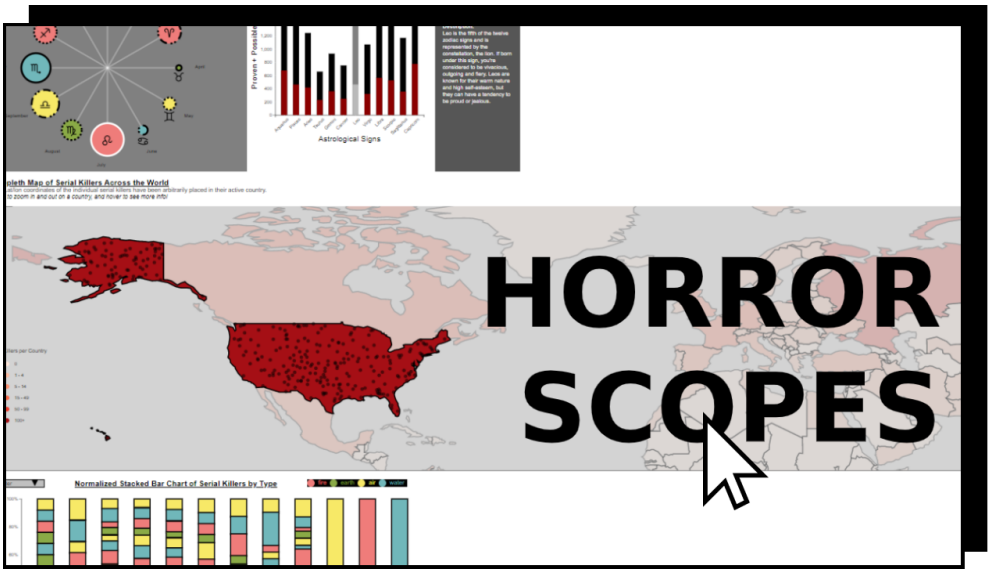
HORRORSCOPES

A Visualization of Serial Killers by Astrological Signs!

Team BabyYodaVision

Section 1: Overview



Summary

This data visualization is purely for entertainment purposes and gives the viewer information about serial killers and their corresponding horoscope (astrological sign). These interactive views will allow users to explore and learn more about serial killers such as their sun signs, their kill magnitude breakdown, as well as their locations around the world. You can even find the distributions of the individual serial killer types (e.g. necrophile, strangler) by sign!

For believers and non-believers of astrology, this data visualization is a fun way for people to support or deny their pre-existing beliefs and stereotypes associated with each astrological sign.

Section 2: Data

Description of data in domain-specific and and abstract language

Attributes / information we are encoding:

1. Astrological zodiac signs
    a. Categorical

    b. Cardinality: 12
2. Astrological sign element groups
    a. Fire, earth, air, water
    b. Categorical
    c. Cardinality: 4
3. Number of killers (for each sign)
    a. Quantitative
    b. Integer: Range [30, 51]
4. Number of proven kills (for each sign)
    a. Quantitative
    b. Integer: Range [228, 774]
5. Number of proven and possible kills (for each sign)
    a. Quantitative
    b. Integer: Range [657, 1998]
6. Number of killers per country
    a. Quantitative
    b. Integer: Range [0, 293]
7. Serial killer type
    a. E.g.. Strangler, necrophiliac, rapist
    b. Categorical
    c. Cardinality: 7
    d. A serial killer may have none, several, or all of the serial killer types

Links to the original data source

Our database was created by manually incorporating 2 sources together:

- List of serial killers by numbers of victims from Wikipedia
- The Serial Killer Database by Killer.Cloud

World TopoJson was retrieved from: https://www.npmjs.com/package/world-atlas

As for our information regarding the astrological signs themselves, we created our own .csv file while referencing sources such as:

- Zodiac signs and astrology signs meanings and characteristics
- The elements in astrology
- What's your zodiac sign? The 12 zodiac symbols
- Astrological symbols

Data preprocessing pipeline

Our first iteration of our dataset used data from Wikipedia on this page: https://en.wikipedia.org/wiki/List_of_serial_killers_by_number_of_victims
We converted the wikitables to .csv files using https://wikitable2csv.ggor.de/.
Through this we obtained 322 items of data, 211 of which had birthdays listed (we need birthdays in order to obtain their astrological signs).

Since the last milestone, however, we found additional information in "The Serial Killer Database" by KillerCloud (https://killer.cloud/). Now we have increased our data pool to 512 serial killers with known birthdays.

Unfortunately, the database from KillerCloud did not have prepared .csv or .json files for sharing, so we proceeded to add the new serial killer information through manual data entry. This was a very long, arduous and tedious process, but we are hoping that adding all of this data will help us discover more meaning from our visualization. Due to manually integrating serial killer information from 2 different sources into one dataset, we encountered 71 errors with the dataset such as spelling mistakes and missing commas/quotations. We had to go find and fix the errors in the csv as it was causing data to be parsed incorrectly. Additionally, since we also needed to link the serial killer csv file with the world TopoJson data, countries that no longer exist today were replaced with the current country equivalent. For example killers from the Czech Republic were changed to be from Czechia instead so that it matches the country name from the world data.

As for our information regarding the astrological signs themselves, we created our own .csv file while referencing sources such as:

- https://www.astrology-zodiac-signs.com/
- https://cafeastrology.com/natal/elements-astrology.html
- https://blog.prepscholar.com/zodiac-symbols-signs
- https://www.liveabout.com/astrological-symbols-4122678

Within our directory, the source files are:

- `data/collective-serial-killer-database.csv`
    - Contains combined list of our Wikipedia and KilledCloud sources
- `data/signs-info.csv`
    - Information about the signs (modality, description, element, dates, etc.)
- `data/countries.topo.json`
    - Used for the map view

Section 3: Goals and Tasks

- NODE VIEW <-> BARCHART VIEW
    - Hover
    - Sort
    - Compare
- MAP VIEW
    - Click
    - Hover
- TYPE VIEW
    - Hover
    - Compare
    - Sort

Our intended tasks are as follows:

- User can easily [compare] the number of serial killers associated with each sign
- User can [sort] the signs (by most number of killers to least, or least to most) to get a more accurate read
- User can [hover] over an astrological sign on the “radial chart” to see which astrological signs see the exact numbers of serial killers or proven/possible kills associated with each sign.
- User [clicks] a country on the world view (map) to zoom into the country
- User [hovers] over a dot in the country to see information about a specific serial killer born in the US (name, nicknames, birthday, type of killer they are, countries & years active, possible & proven victims, and notes on the killer)
- User [clicks] a country while zoomed in to zoom back out into the world map
- User can [hover] over a sign on the stacked bar chart to see the exact percentage and number of killers of that sign for that type of killer
- User can [compare] the distribution of signs of serial killers by type (e.g., medical, torturer, strangler)
- User can [sort] the distribution of signs of serial killers by type (by sign order, most to least, least to most, and element groups) to get a more accurate read

In our visualization, a user can easily compare the number of serial killers associated with each sign. Our visualization facilitates this by providing a drop down menu, where the user can select between “Number of Killers”, “Proven Kills”, and “Proven + Possible Kills”. If the user chooses “Proven + Possible Kills”, the stacked bar visualization allows

the user to compare a sign's proven kills and possible kills. Additionally, they can also compare these two variables between different signs.

Users can hover over a node on the "radial chart" in order to see the exact numbers of killers, proven kills, or proven + possible kills. They can easily connect the sign from the node to the same sign encoded in the barchart, and vice versa. This is done through the use of bi-directional highlighting.

Users no longer have to select an astrological sign on the "radial chart" to compare each sign. As mentioned in milestone 2, after discussion with the TA and with the team, all 12 signs will be visible on the bar chart. In milestone 2, we discussed the possibility of allowing a user to drag the bars of the bar chart around in order to easily compare values that are not next to each other on the chart (ie, comparing Aquarius with Capricorn). However, this was not implemented given that comparisons became simple once sorting was implemented.

Users can easily sort the bar chart by 'least to most', 'most to least' and 'sign order' (ie by month) by selecting an option from a dropdown menu.

Our visualization will no longer facilitate "selecting" to enter the world view - rather, users can scroll down and see the world map. Users can now compare the number of killers from one country to another. Instead of displaying numbers on the map, we have changed our implementation to a choropleth map. This allows a user to easily compare the number of killers per country by comparing the opacity of colour between different countries.

When a user selects a country, they are given a zoomed-in view of the country with different points on it. Users no longer have to select to be given specific information, instead a user is given both basic and specific notes about a killer when they hover over a point.

Section 4: Visualization

We have 4 views:

1. Node-link diagram of astrological signs ("signs network" view)
    a. Subview: Cyclic setting
    b. Subview: Element group setting
2. Stacked bar chart showing killing count
3. World map of serial killers

4. Normalized stacked bar chart of serial killer type distributions

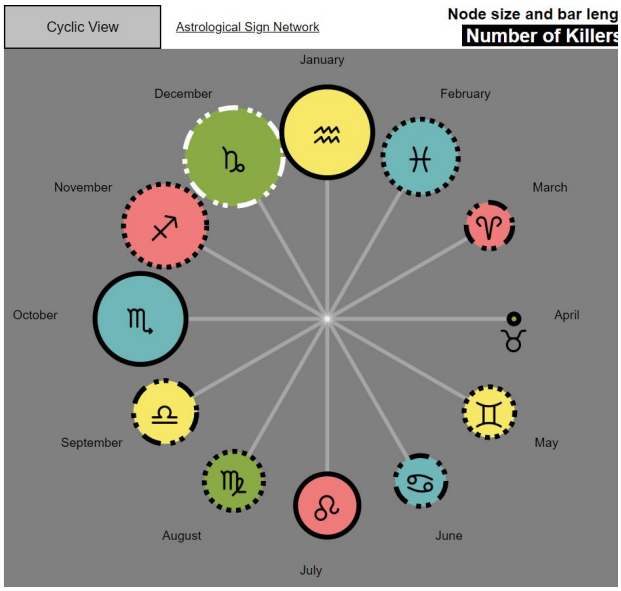
The signs network and first bar chart (views 1 and 2) are linked.

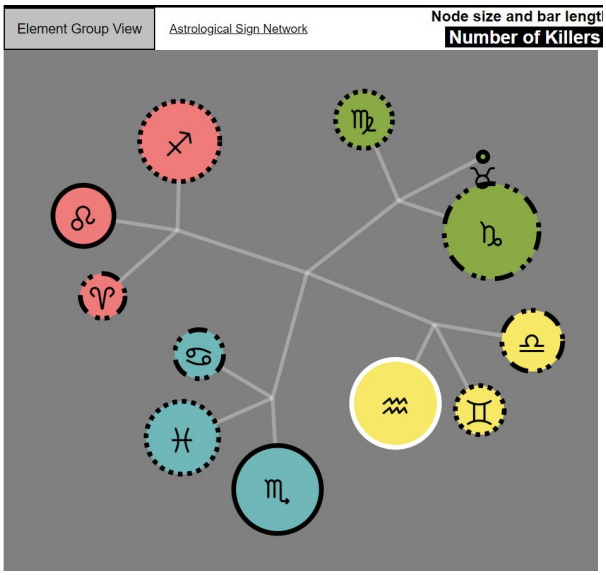
We have 4 UI elements:

- Count Type Dropdown Menu
    - Can show quantities in the view by:
        - Number of killers (for each sign)
        - Number of proven kills (for each sign)
        - Number of proven and possible kills (for each sign)
    - This dropdown primarily affects the signs network and bar chart views and helps link them
- View toggle for Signs Network view
    - Toggles between a "cyclic view" and "element group view"
- Sort dropdown for killing count bar chart
    - Can sort by:
        - Sign order
        - Most to least
        - Least to most
- Sort dropdown for normalized stacked bar chart
    - Can sort by:
        - Sign order
        - Most to least
        - Least to most
        - Elements groups

View 1: Signs Network
The node-link diagram has two “subviews”: cyclic and element group. This view allows users to compare the magnitude of kills between signs.

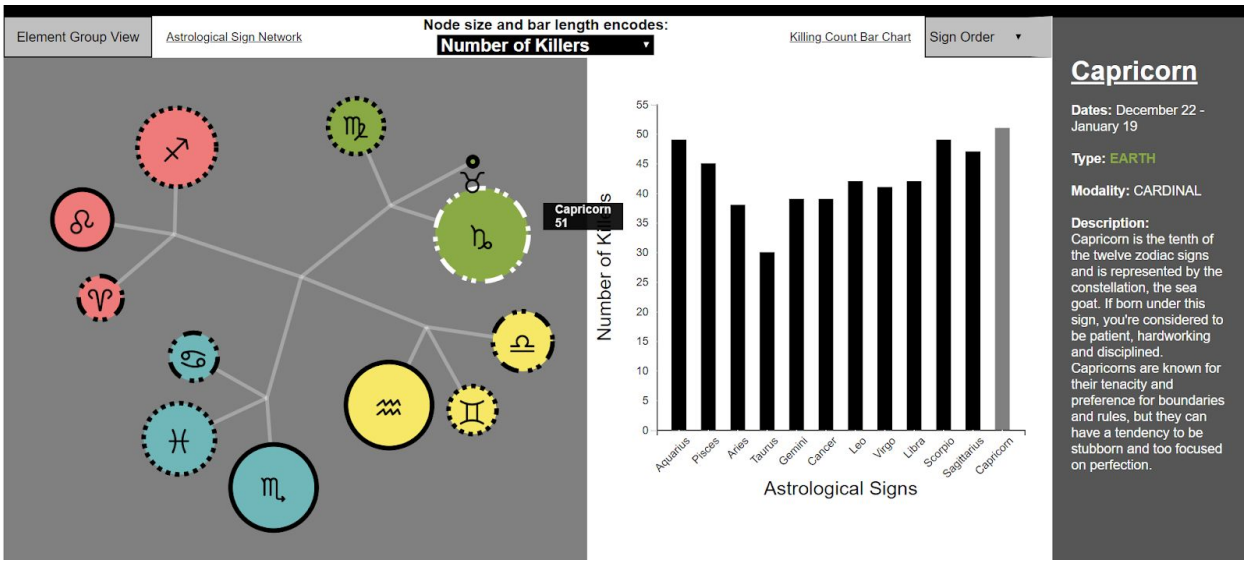
Each node represents an astrological sign, encoded by an icon of the sign’s traditional symbol. Color encodes the sign’s attributed natural element (i.e. fire), and the node size encodes the selected kill count type (as determined by the UI dropdown). The border stroke style encodes the modality type of the sign (i.e. cardinal, fixed, mutable). For example, the Virgo sign is represented by a mossy green node with a dotted line for its border stroke.





In the cyclic subview, positions of the nodes are fixed in chronological order of their designated period of the year. There are labels that display the month at a particular place in the cycle. We used this fixed positioning to help get users familiar and comfortable with the zodiac cycle, while also being able to present any trends regarding time of the year/cycle for killing count.

In the element group subview, nodes are grouped by their element groups, to better help users compare the magnitude of kills between these groups. Unlike the cyclic subview, users can drag and move these nodes wherever they like! This enables users to compare two specific nodes side by side. It is also just really fun to drag and move the nodes.



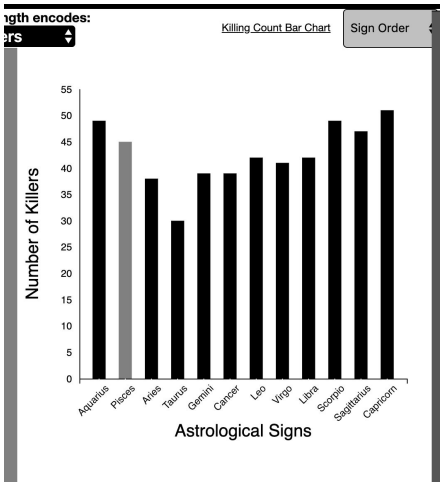
Hovering over a node in the signs network opens up a tooltip with the sign's name and the value of the kill count. Through bidirectional highlighting, it will also highlight the corresponding bar in the linked bar chart, and update the additional information about the sign on the very right of the screen.

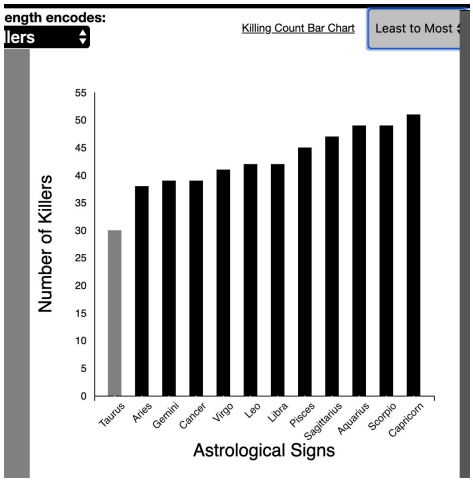
View 2: Bar Chart for Killing Count

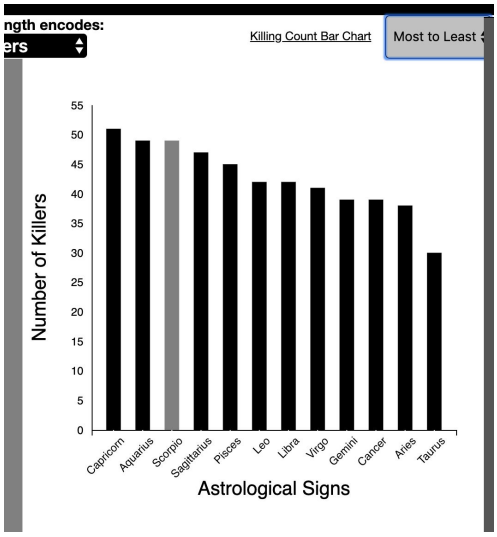
The bar chart visualization allows users to compare and sort the number of killers, proven kills, or proven + possible kills per sign. The bar chart was made in mind as an extension of the signs network. The connection between the bar chart view and signes network view was made by the bi-directional highlighting. This allowed for a subtle yet effective way to show users that the two views are linked.

For the signs network view, we realized that it may be difficult for users to see the subtle differences of the killer/kill count when it is encoded as the area of each node. As such, the bar chart's main focus was on allowing the user to easily compare the data between the signs.

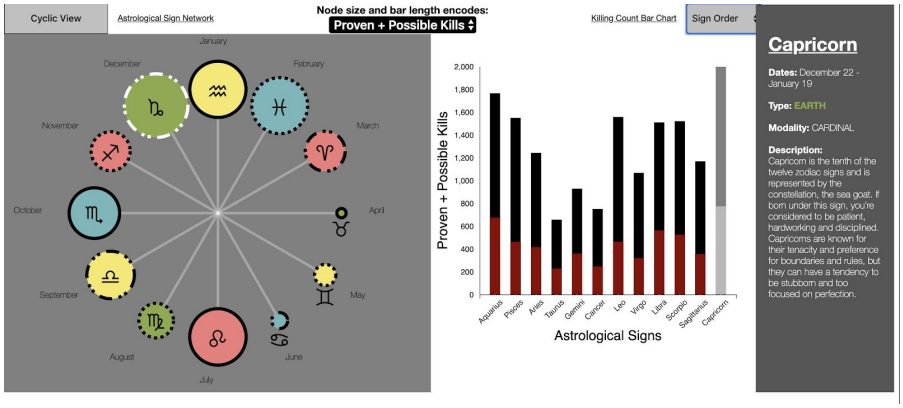
After milestone 2, we briefly played around with the idea of allowing the user to drag a bar next to another one they would like to compare (ie, dragging the bar encoding Aquarius next to Capricorn). However, given that there are only 12 signs, and thus 12 bars, dragging the bars seemed too extreme. Furthermore, there were concerns raised about disorienting the user. As such, the user can sort the bars from least to most, or most to least. By doing so, the bar chart is a lot less disorienting (ie, different heights side by side).







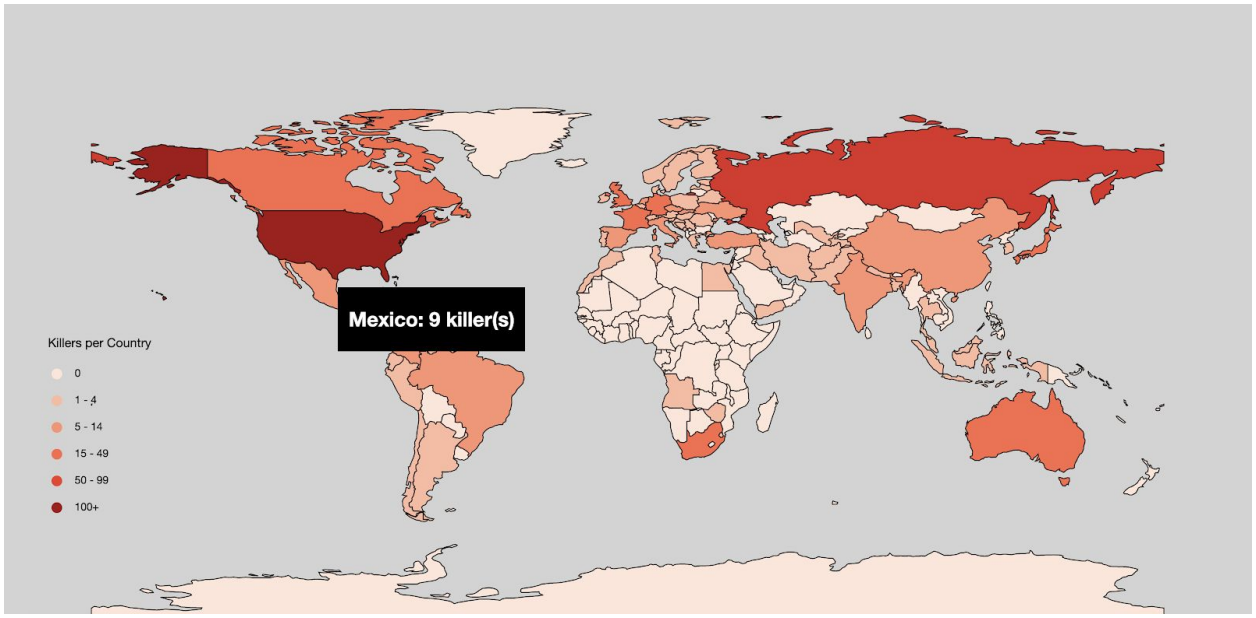
Additionally, more specific comparisons are encoded in the bar chart for the view which encodes proven + possible kill count. This was done using a stacked bar chart, as we only had to encode 2 values. This encoding allows the user to compare between proven and possible kills per sign. For example, if a user wanted to find out whether or not a sign has more possible kills than proven kills, they will be able to do so with the stacked bar chart.



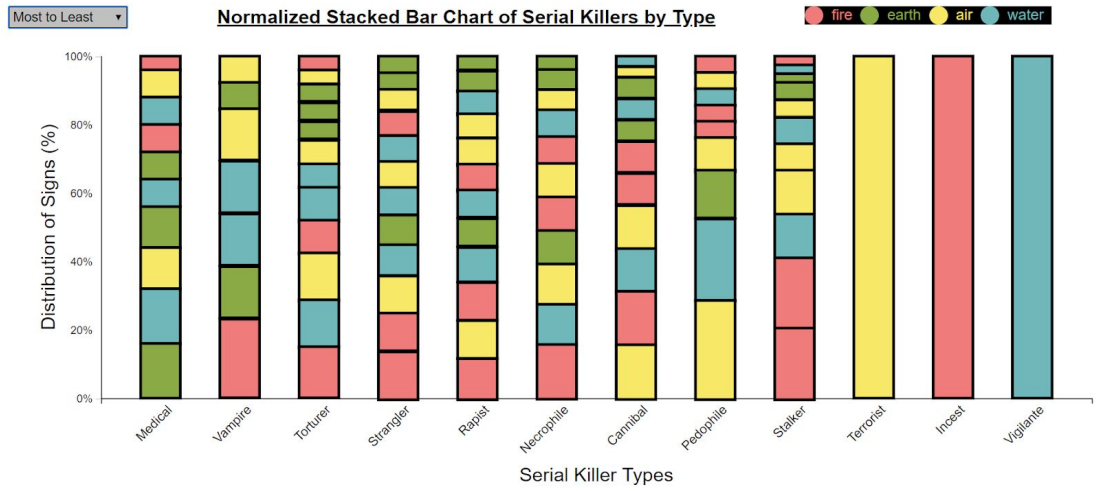
View 3: World Map of Serial Killers

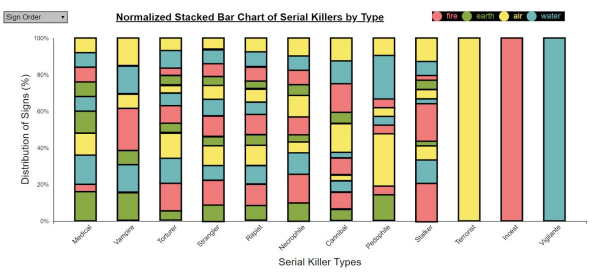
The map visualization allows users to see the locations of serial killers around the world by having point marks/circles represent each serial killer that was active within a country. Marks were used to represent serial killers because with a dataset of over 600 hundred killers, simpler designs will look cleaner. The location (longitude/latitude) of the serial killers were arbitrarily generated within each country. This choropleth map uses a red color scale to encode the number of killers per country. Since many countries only have a few killers and few countries have many killers, we decided to use scaleThreshold for the color legend in bigger and bigger increments. The first threshold shows 0 killers, the second 1 to 4, the third 5 to 14 killers, and so on. The color legend is shown on both the world map view as well as the zoomed in view since the tooltip that shows how many killers a country has in the world map view is disabled on the zoomed in view. This way, users have another reference, in addition to the number of dots, as to how many killers a country might have.

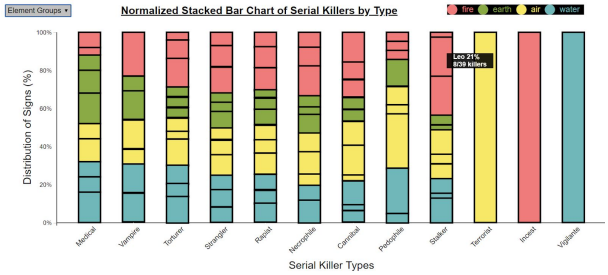
In this world map view, users can hover over a country to see how many documented serial killers are within that country and then click to zoom into the country to see all the serial killers. Once zoomed in, users can hover over a mark to see a tooltip that shows the killer's information: name, nicknames, birthday, type of killer they are, countries and years active, possible and proven victims, notes on the killer. The user can then click on the country again to zoom back out into the world view.



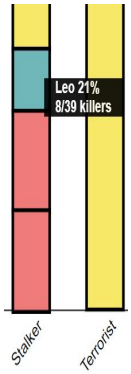
View 4: Normalized Stacked Bar Chart for Killer Types







This view allows users to determine the distribution of signs for each serial killer type (i.e. necrophile, torturer). Our data may be limited since we do not have attributed serial killer types for each serial killer item, but nonetheless, this view does reveal some interesting results! For example, while Sagittarius is the 9th sign with the most kills (out of 12), it actually is the #1 sign for four of the serial killer types (strangler, torturer, rapist, and necrophile). Similar to view 1 (signs network), color encodes the element type of the particular sign. The length of the bars indicates the distribution of the serial killer types by sign (percentage).



Hovering over a bar segment shows a tooltip with the sign's name, the percentage they make up of the serial killer type, and the fraction of the actual calculation.

You can sort the bars by sign order, element groups, and from largest to smallest percentage, or vice versa.

Section 5: Reflection

While our overall visualization goals have not changed, during milestone two, we found new data that we wanted to showcase. It was an extensive addition to our database of numerous serial killer items, with details such as serial killer types and descriptions. As such, we had new goals that we wanted to achieve within our visualization. Our primary goal from our proposal was to “allow users to explore and learn more about serial killers such as their sun signs, their kill magnitude breakdown, as well as their locations around the world.” With our new data set, which gives us more comprehensive serial killer “types” (Stalker, Strangler, etc), we wanted to include this in our goals. As such, our new goal included allowing users to be able to learn about serial killer types and compare them based on astrological signs (i.e. number of stalkers who are Geminis vs. stalkers who are Aquarius).

We believe our original proposal was pretty realistic in terms of what was possible in D3. Although adjustments had to be made based on feedback and what was possible to do, we were able to implement the majority of our visualization using D3.

In our original design for the astrological nodes and barchart, we had planned on users being able to select astrological signs in the signs network view to compare side-by-side in a linked bar chart. After discussing both within the team and with Zipeng, we have decided to have all 12 of the signs shown at once in the bar chart. The cardinality of the astrological signs will always be fixed at 12, and so it is not too heavy of a cognitive load to display and compare between 12 at once.

For the map visualization, our initial implementation was to show the locations of serial killers around the world by having marks/dots represent each serial killer that was active within a country. However, after implementing the world map, we realized the countries were too small to properly show all the information in a visually appealing way, especially considering the United States has over 200 killers. Instead, for milestone 2, we changed the design so that when the page is first loaded, the number of killers that was active in a country is initially shown as a text label. Countries without any killers are represented by having a grey fill. Manual zooming and panning were implemented on the map so that once the user has zoomed in to a certain size such that the country is big enough on the screen, the text labels will get replaced with the individual dots that

represent individual serial killers. From there, the user can hover over a dot to see basic information about a specific serial killer or select the dot to get specific notes.

This map implementation we started in milestone 2 was difficult to achieve for milestone 3 since we weren't able to figure out how to calculate the amount or extent one person has zoomed in order to replace the text labels with the dots. As such, we removed the option to manually zoom and implemented clicking on a country to auto zoom. We also removed the text labels since Europe was extremely cluttered and not visually appealing. Instead, the country name and number of killers are shown on a tooltip when the user hovers over the country. With our new implementation, we were able to achieve our visualization goal of showing the locations and information of serial killers around the world.

With additional time, we would like to encode more elements and add more functionality on the world map. For example color coding the serial killer marks by type (fire, water, earth, air) or adding additional UI elements such as being able to filter the serial killers that's shown on the map by year. Another thing we would do differently next time is to leave additional time at the end of each milestone strictly for bug fixes. It was difficult to get bounding boxes for countries that are very big on the map projection and we would like to find more efficient and effective ways next time. If we were to start the assignment again from scratch, we would like to focus more on page layout. Right now, our visualizations require scrolling down the page in order to see each view. It may have been nicer if we were able to fit all the elements onto one page, or have tabs such that scrolling won't be required.

Section 6: Team Assessment

Contributions Breakdown

	Grace	Margaret	Alexis
Tasks and responsibilities throughout the project	● Parsing + mangling the data so that each killer's birthday is matched correctly to an astrological sign ● Parsing + mangling data to match astrological sign to total	● The world map visualization: zoom into the world map on click, spawn individual killers within a country, show information about killers on hover, click to reset the state of	● The astrological nodes visualization (force simulation) with cyclic and element group view options ● The normalized stacked bar visualization for the distribution of

	number of proven kills and number of proven/suspected kills ● Implemented a barchart which updates based on dropdown selection (# of killers, proven kill count, proven/suspected kill count) ● Implemented sorting (least to most, most to least) for bar chart ● Manual data entry to improve database of serial killers ● Manual data fixes for suspected kill count (took the average of sliding scale counts, ie. 8-10 suspected kills were changed to 9 suspected kills) ● Bug fixes ● Milestone write-up	the map ● Parsed countries information from serial killers .csv ● Linked data from the serial killers dataset to data from world TopoJSON ● Originally implemented manual scroll to zoom functionality ● Manual data entry to improve database of serial killers ● Manually fixed errors and reformatted info in the csv file ● Moved and formatted content from Google docs into README ● Bug fixes ● Milestone write-up	serial killer types by sign ○ Can sort by sign order, least to most, most to least, and element group ● Parsing + mangling signs information data ● Parsing + mangling data to sort killers by their killer type ● UI elements ○ Dropdown for network kill count ○ Network View button toggle ○ Dropdown for sorting normalized stacked bart ● Data compilation and processing of astrological signs information ● Implemented birectional highlight for linked signs network and bar chart ● User interaction of showing detailed astrological information on node hover ● Manual data entry to improve our database of serial killers ● Manual data typo

			fixes for serial killer types ● Bug fixes ● Milestone write-up