

Project 3  
Group 2

Marvel Characters  
Good versus Evil

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## Data Introduction

Our data analysis dashboard allows users to discover, compare, and contrast the good versus evil characters in the Marvel Universe. We initially reviewed two data sources. The first data source is the Marvel Characters dataset from Kaggle. This is composed of eight csv files denoting character statistics, characteristics, and powers. The dataset also denotes if characters are considered good or bad within the Marvel Universe, their first appearance, and amount of appearances in comics or movies. This became the only data source used for the dashboard.

The second dataset reviewed was from the Marvel Universe API. Initially, we hoped to use location data from this data set to create a map of character locations or Marvel Universe events. This data set did not provide the appropriate data. We also researched other data sources to find location data for a map; however, no free data sources were found.

Multiple visualizations were considered in order to compare and contrast the different attributes of the various characters. Ideas included, using a stacked bar chart for common powers or traits for good versus bad characters, line or scatter plot for first appearances, bubble chart for appearance amounts, and a pi chart or radial bar chart for character statistics. A sunburst chart to look at character powers and characters was also suggested. We also looked at many visualization ideas from our inspiration and are discussing adding visualizations such as seen in the image examples from our inspiration.

## Inspiration & Research Questions

Our inspiration came from the Marvel movie takes on and the multiple characters they introduce us to. Kaggle and Tableau also provided inspiration on creative visualizations. Multiple visuals compared and contrasted various characters (see image examples in work cited). Since a map was not possible with our dashboard, it was decided to focus on more visualizations for the character attributes instead. From this inspiration, we decided to focus on good versus evil character attributes. This led to the inspiration for our research questions. (See Appendix)

Our research questions were as follows:

- Does good triumph over evil when comparing their statistics?
- Which character is the most powerful?
- What are the similarities/differences of the most powerful characters?
- Are there more characters aligned with good or evil? Are there more male or female characters?

Regarding regression and correlation, we initially proposed that a correlation between strength and overall power would be shown. The amount of powers would also correlate to overall character performance in battle. We proposed that good characters would consistently score

higher in performance, would have more powers, and be more likely to win in a one on one battle against evil characters. Lower amounts of powers would decrease a character's chance of winning in a head to head battle. We also proposed that an equal amount of good and evil characters would exist but a lower amount of female, or neutral characters would exist versus male characters.

## Data Cleaning

Since the data was initially provided in eight different csv files, the data needed was merged into one dataframe including hero name, alignment, gender, physical characteristics, abilities, and powers. Duplicates were searched for and removed. Characters with null values for powers, alignment, or gender were also removed.

Superhero powers were listed as true-false, boolean values within the data. This was changed to numerical values to allow for greater ease in plotting the power data. Powers labeled as true were changed to the value of 1 and powers listed as false were changed to the value of 0. These columns were then changed to integer from the previous string values. Abilities were already denoted in a numeric value with a maximum of 100.

## Visualizations & Dashboard

### Dashboard Design

For our color theme we used colors seen regularly in the Marvel Universe, including red, black, gray, orange, and blue. The color palette found was composed of the specific Marvel colors. We also used images from the Marvel Universe, including comics and movies, to visually tie the dashboard and website together. The dashboard design was the Superhero Bootswatch design and color scheme. This was chosen to further the Marvel look and feel of the dashboard. (See Appendix) The slideshow for the presentation also used Marvel Universe images of various heroes and villains.

The dashboard was constructed with an opening home page to direct viewers to the multiple visualizations. The navigation bar at the top of the screen, which was a constant on each page, directed the viewer to multiple overlapping radar charts, filtered radar charts depicting one on one battles, a exploration sunburst chart for alignment and gender break down, and a bar chart tracking the number of powers in the top fifty superheroes. The data set is provided in table format on the next page to further allow exploration and user inspiration for the one on one fights. Finally, a page introducing the group members finishes the site.

## Radar Charts & Filters

We used the Radar chart to compare the Marvel characters' powers and abilities with each other. This chart allowed us to quickly compare six most common attributes a superhero or villain may have. By using the Radar chart, we were able to see all six attributes at once and easily compare and contrast with another character. Before we built the Radar chart in Javascript, we first created the chart with Python in Jupyter Notebook to ensure we understood the logistics behind making it. We used Plotly to create the Radar chart in Javascript. There were two charts to choose from: a basic Radar chart, which would display one character's attributes at a time, and a Multiple Trace Radar chart which could compare multiple characters' attributes by stacking them on top of each other in a "web-type" fashion.

We decided to create three static Radar charts, and two dynamic Radar charts which included filters. For the static Radar charts, we chose two different Marvel characters and compared their attributes against each other. The characters we chose to compare were Iron Man and Thanos, Black Widow and Bloodaxe, and Captain America and Red Skull. For these, we created a Multi-Trace chart which allowed us to compare their attributes in one chart. We colored each character's trace to correlate with the character's color so it's easier to understand which trace is whose (see Appendix).

For the dynamic Radar charts, we created two basic Radar charts that display one character's attributes on each. We then filtered these charts and coded them to respond to selections on two dropdowns made by the user. We set up event listeners to "listen" for a change in the dropdown selection. Once a new selection is made, the radar charts will display the selected characters' attributes. This allowed the user to quickly and easily compare their desired characters and see who would win in a duel.

## Sunburst

At first, a four layer sunburst chart was suggested to visualize character alignment, gender, and powers. However, due to the amount of power options available, a visualization showing only alignment, gender, and hero name was used. Characters that did not have a gender were removed from the data because they also did not have an alignment present. Only three characters were removed, which is only 0.5% of the data and determined to be statistically insignificant. When initially creating the visualization, six lines from the data was hard coded into the plotly sunburst code to ensure the visualization displayed the data appropriately.

The data was filtered with Python and Jupyter Notebook to only provide gender, alignment, and name in order to group characters into the appropriate parent category. Both the plotly and d3 libraries were reviewed in an attempt to create the visualization. Plotly was used for the final visualization. The parent and label categories were started to create the inner two layers. For the characters, a for loop was written in javascript to populate the appropriate parent (alignment),

and label (character name). The final visualization was then color coded using the black, red, and orange colors from the Marvel palette previously mentioned. The sunburst shows that the Marvel Universe has more male than female characters. Both male and female characters are predominantly aligned with good. The amount of bad male characters is close to the number of female characters in total. Both male and female characters have neutral heroes who are not considered good or evil. For example, Deadpool is considered a neutral character and could fight on either side of a battle. (See Appendix)

## Bar Chart

Initially, a filtered bar chart denoting hero powers which tied to the radar chart filter for hero abilities was proposed. This was not finalized. Therefore, a bar chart, created with the D3 library, was created which focused on the amount of powers of each hero. Since over five hundred heroes were reviewed in the data, the initial bar chart showed too many data points. The top fifty heroes with the most powers were pulled from the data and populated the bar chart. This data showed the most powerful superheroes. When compared to the filtered sunburst charts, the visualizations showed that heroes with the most powers also showed the highest ability levels. For example, Amazo and Thanos are both very powerful heroes with a large number of powers. When compared in radar charts, their abilities are also very high level. (See Appendix)

## Conclusions

Many conclusions were found through our data analysis. Surprisingly, the well known characters were not the most powerful. Based upon combined power score, Stardust is the most powerful Marvel character. However, Spectre has the most powers compared to all Marvel characters. A correlation was shown between the amount of powers and ability levels: more powers on average meant higher ability levels in a character. The neutral characters tended to be more powerful, followed by the bad or evil aligned characters. This differed from our initial hypothesis. Two of the three most powerful characters were from the Kryptonian race, and the majority of the highly powerful characters were male. Overall, there are more male than female characters. There are almost as many bad male characters as there are total female characters within the Marvel Universe.

## Limitations & Future Work

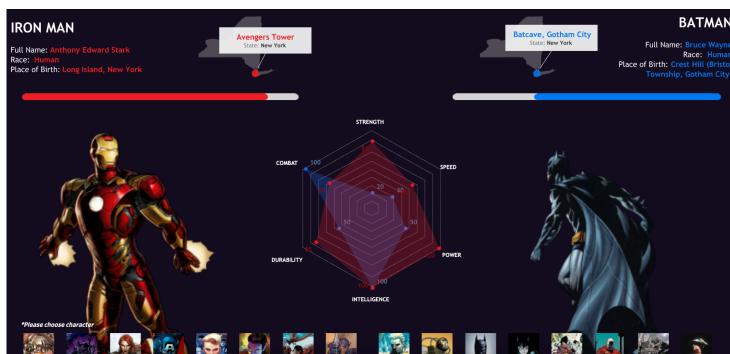
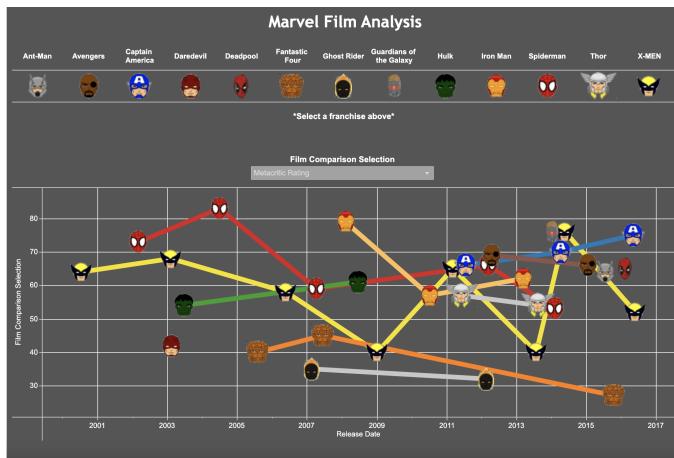
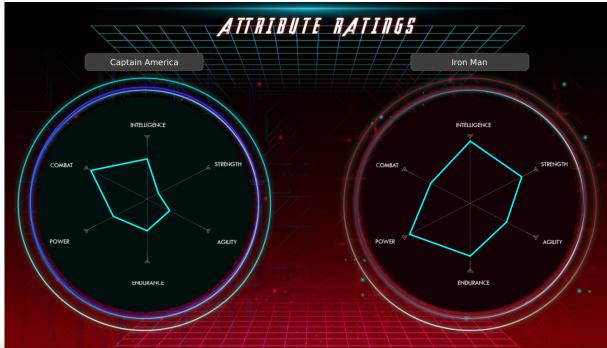
Our data analysis was limited due to the lack of location data. This meant we were not able to create a map for the dashboard. Since the API did not have the data we searched for, and no other free sources of information provided this data, a different approach to the analysis was taken.

Future work would allow for making the radar charts dynamic or overlapping in the filtered section of the dashboard, as well as, add titles to the charts. We would also like to add the power bar or lollipop chart to the filtered page to further analyze character abilities versus powers. We would also wish to include a multi-select dropdown to compare the multiple heroes from one dropdown. We would like to incorporate an image system for each character to be displayed

when selected. This would contribute to the design of the dashboard. Lastly, we would like to look for correlations to the length of time a character has been in the Marvel Universe to the amount of powers and level of abilities of a specific character.

# Appendix

## Inspiration images



# Dashboard Homepage

Marvel Universe

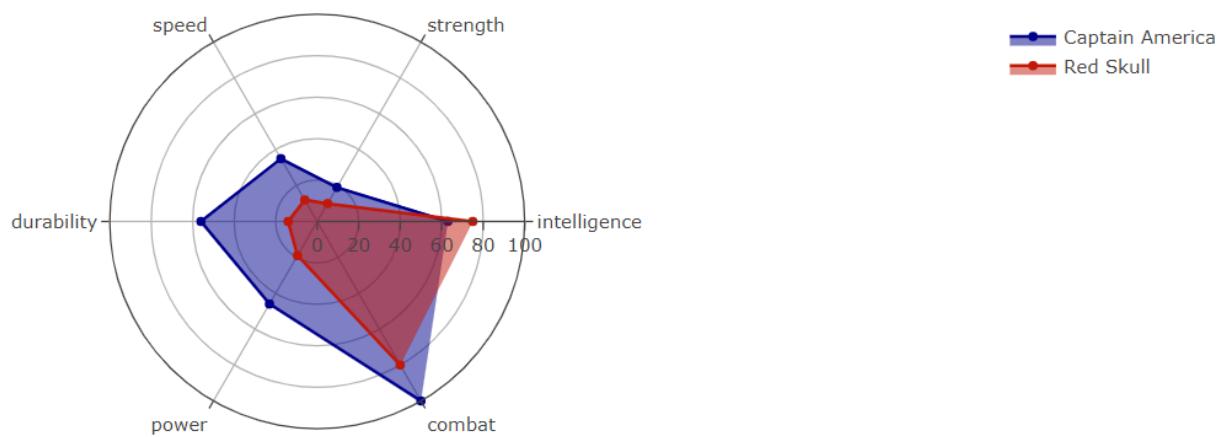
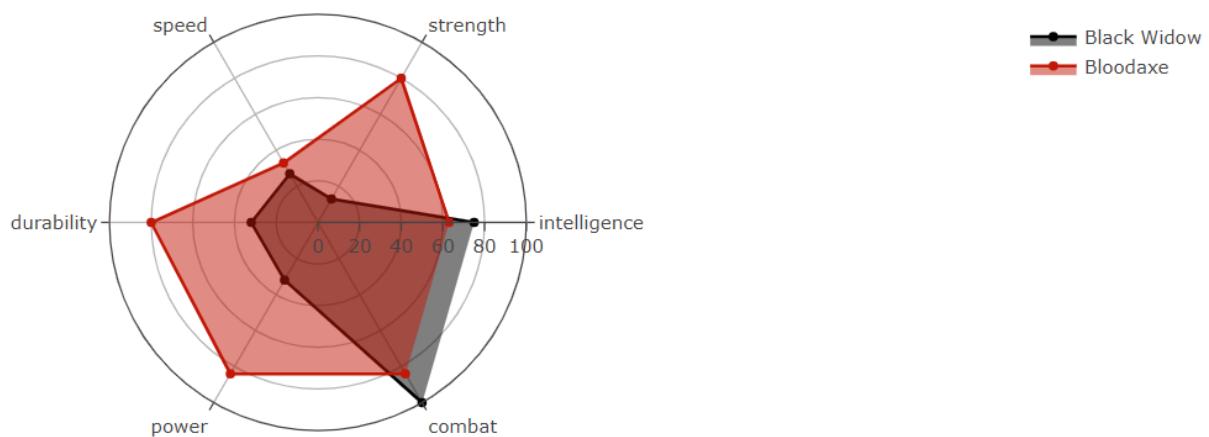
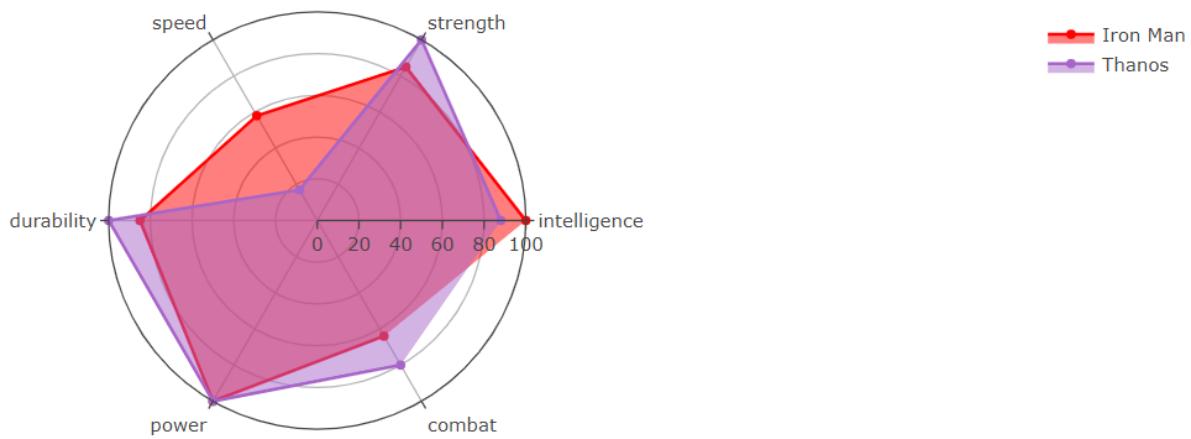
Iron Man vs Thanos Black Widow vs BloodAxe Captain America vs Red Skull Pick the Fight Explore Data Works Cited About Us

Marvel Universe

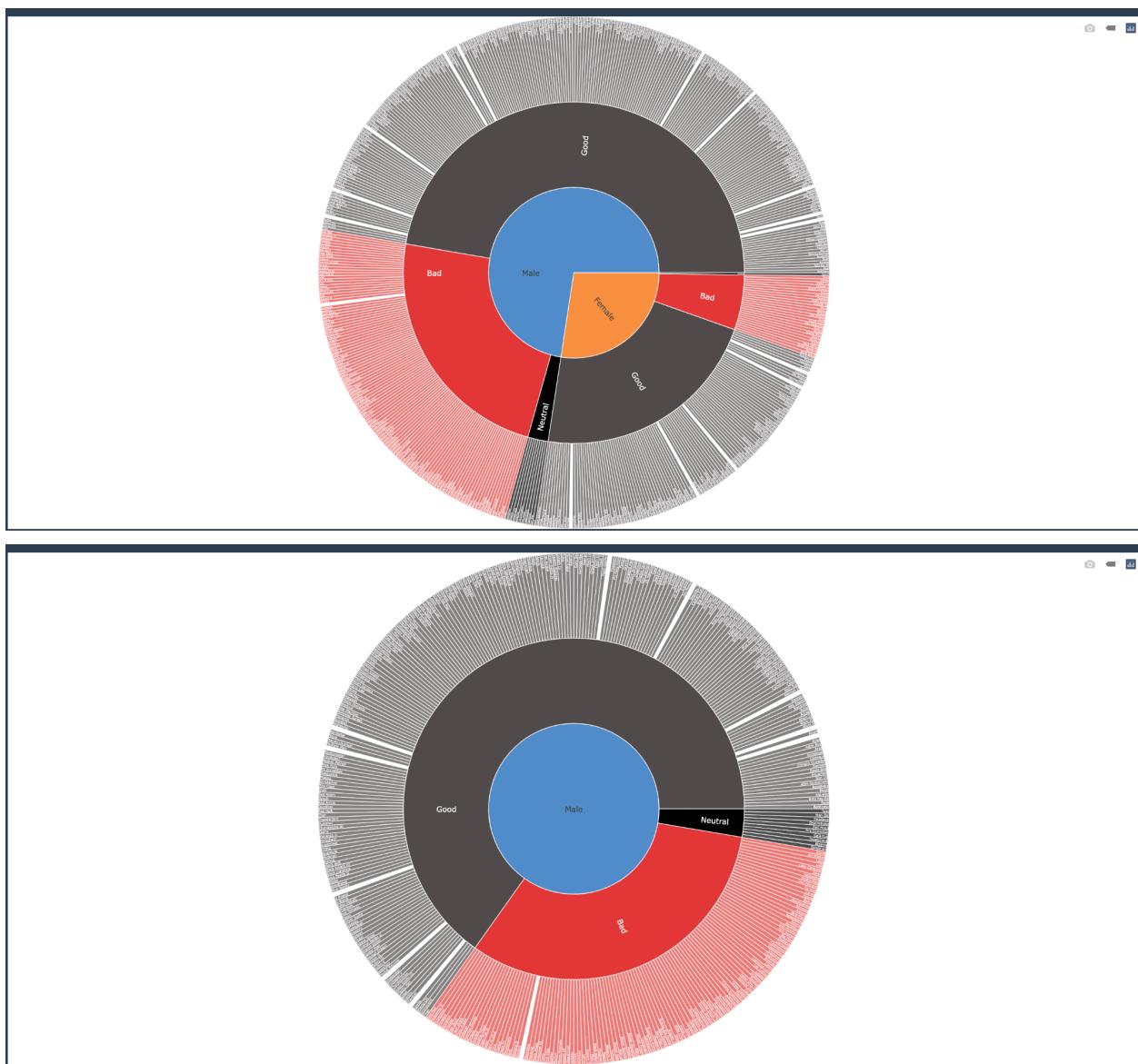


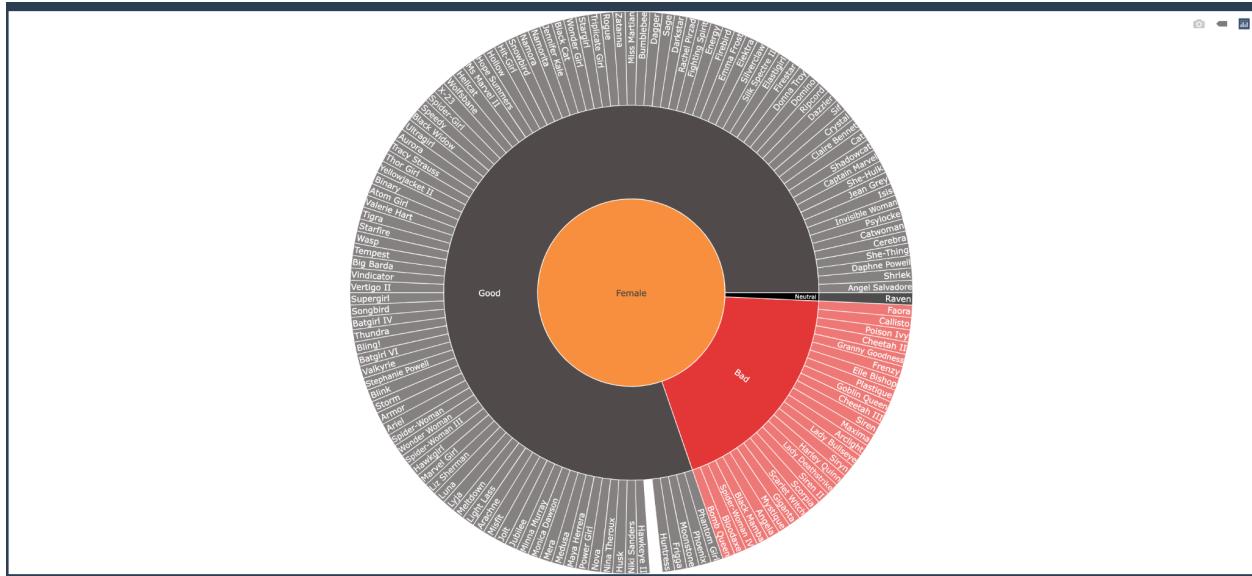
The Marvel Universe is a highly popular creation, and we had the desire to compare our favorite heroes and villains. By using a Kaggle Data Set we were able to display exactly this via the use of Sunburst Chart, Radar Charts, and Bar Charts. As a guide we have a couple of our favorite Heroes/Villains above to get your feet wet, but when you are you can pick your own fight! If you need inspiration the explore tab is for you. Explore and have fun!

## Radar Charts



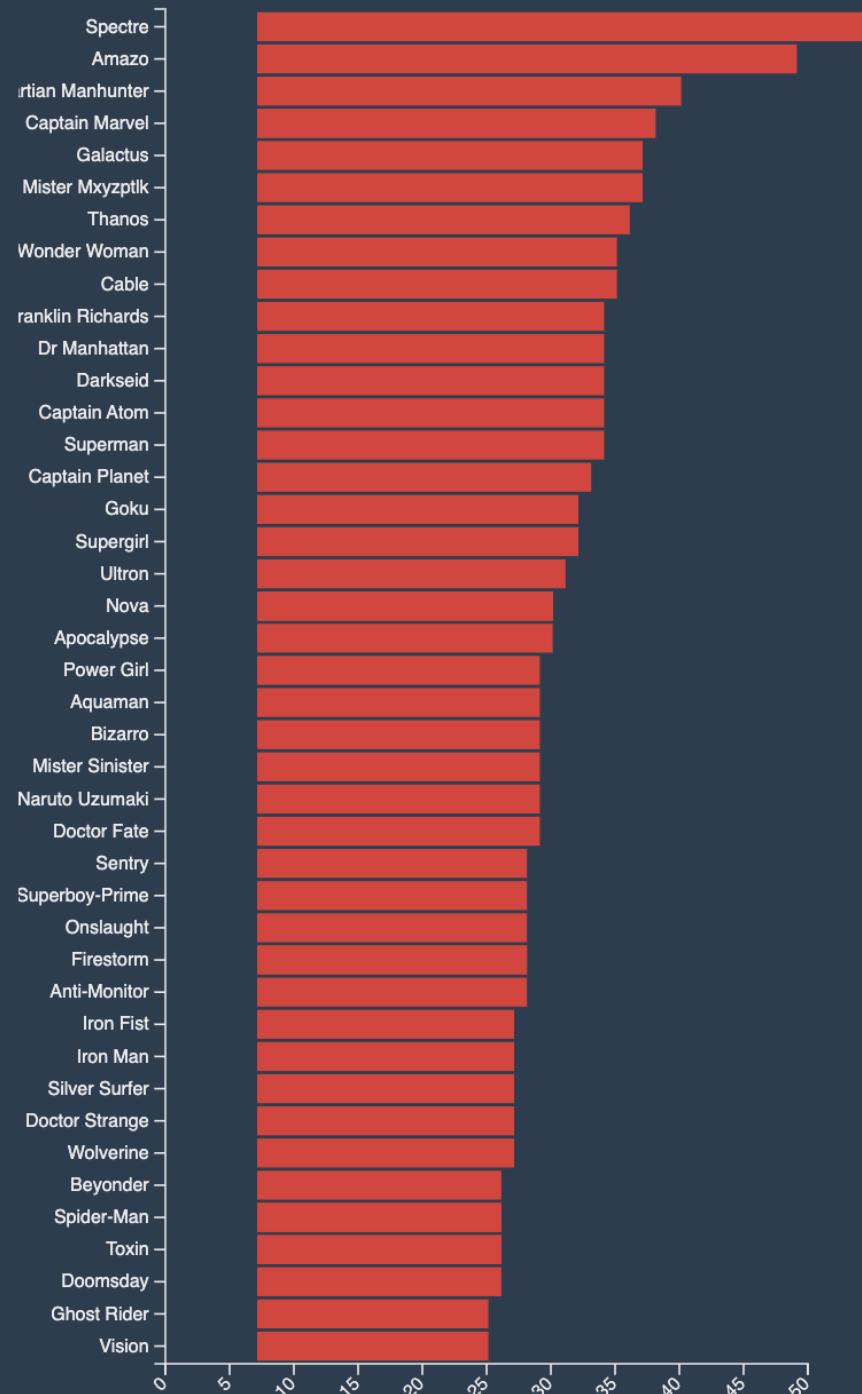
## Sunburst



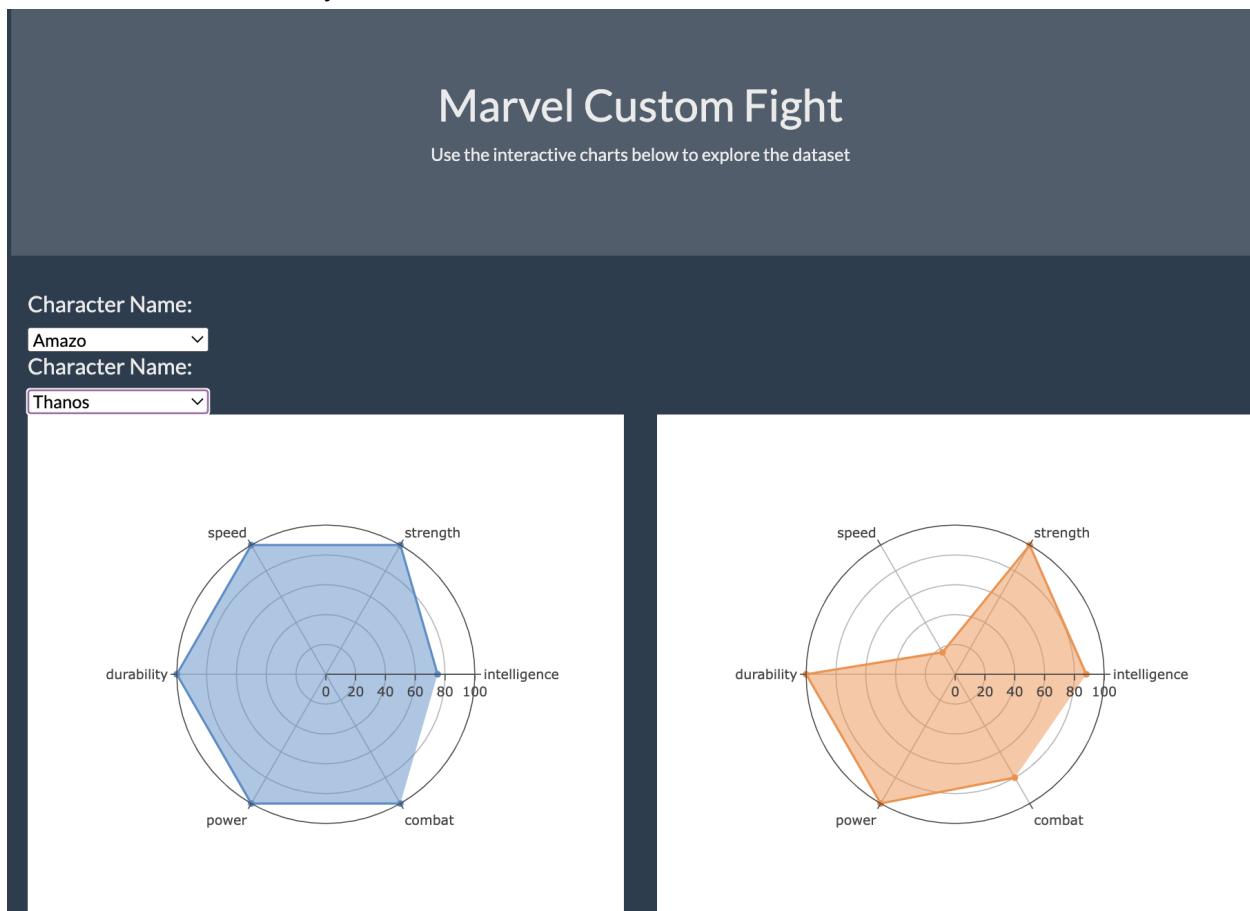


Bar Chart

## Amount of Powers for Top 50 Superheros



## Amazo versus Thanos Dynamic Radar



## Work Cited

- Marvel color palette <https://www.color-hex.com/color-palette/6563>
- Kaggle Marvel Superheros  
[https://www.kaggle.com/datasets/dannielr/marvel-superheroes?select=marvel\\_characters\\_info.csv](https://www.kaggle.com/datasets/dannielr/marvel-superheroes?select=marvel_characters_info.csv)
- Marvel Interactive API <https://developer.marvel.com/docs>
- Marvel Tableau examples <https://public.tableau.com/app/search/vizzes/marvel?page=4>
- Dashboard inspiration:  
<https://public.tableau.com/app/profile/tokopedia.bi.team/viz/MarvelVSDC/dashboard>
- Dashboard inspiration:  
<https://public.tableau.com/app/profile/mathieu.rondeau/viz/MARVELCharacters/Mydral>
- Dashboard inspiration:  
<https://public.tableau.com/app/profile/mathieu.rondeau/viz/MARVELCharacters/Mydral>
- D3 Bar chart: [https://d3-graph-gallery.com/graph/barplot\\_horizontal.html](https://d3-graph-gallery.com/graph/barplot_horizontal.html)
- Sunburst Plotly <https://plotly.com/python/sunburst-charts/>
- Bootswatch <https://bootswatch.com/superhero/>
- D3 Sunburst <https://strongriley.github.io/d3/ex/sunburst.html>