

Visualizing 60 Year of the Paralympics

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(Equal Contribution)

Abstract:

While both regarded as the biggest and well-known global sport event, the Paralympics Games have historically received less interest and attention compared to the Olympics. In this study, we conducted an exploratory data visualization by focusing on four aspects of the historical data: 1) Comparison of Summer vs. Winter Events, 2) Changes of Women's participation, 3) Home-medal advantages for host countries, and 4) Medal dominance over the years. Results showed that summer events have more participation compared to winter events in both athlete counts and the number of participating countries. Over the past 60 years, women's participation in summer paralympics overall has been increasing steadily, reaching approximately 45% (of total athletes) in the latest event. On the other hand, women's participation in winter paralympics has remained somewhat static around 25% (of total athletes). Host countries appear to obtain a greater home-medal advantage in hosting the Winter Paralympics than Summer ones. Top countries in summer Paralympics vary greatly from those in winter Paralympics, which implies that Medal dominance may be largely affected by geographic locations.

1.Introduction

The Olympic and Paralympic Games are two of the biggest and well-known sport events hosted all over the world (Brittain, 2016). The Paralympic Games take place after the Olympic Games, and is intended for people with a variety of disabilities, including poor muscle power or movement, limb deficiency, leg length difference, short stature, hypertonina, ataxia, athetosis, eyesight, or intellectual disability (*International Paralympic Committee | IPC | International Paralympic Committee*, 2018). Similar to the Olympics Games, the Paralympics Games are held every four years, both in summer and winter. However, as the Olympics Games continues to attract public attention and media coverage, coverage of the Paralympics Games and Paralympians is still minimal and frequently depicts competitors in stereotypical ways, such as supercrips or suffering creatures (Tynedal & Wolbring, 2013). Over the past half-century, the Paralympic Games has helped form awareness and conversations for this long-neglected group and have

played a critical role in improving views around disability and driving the agenda for inclusion (Why are the Paralympic Games important? 2021). Investigating the data from the Paralympics will not only support the current social legacies of the Paralympics but also inspire conversations about making the events better and broaden its impacts beyond the games.

The distinction of media coverage and general interest received between the Olympics and Paralympics are also salient when comparing the winter vs summer events (Dickson et al., 2011). Visualization from The Economist has shown that winter Olympics are less popular than the summer Olympics, despite being more unpredictable and exciting (*Winter races are less popular than summer ones, but more exciting*, 2018). This has also negatively affected countries' interest to host the Winter Olympics (Abend, 2014). Given that the Paralympics Games are less popular than Olympics Games, how much more impact will this have on the Paralympics Games? Will we see a similar drop in athletes participating in the Paralympics Games? In this project, we will delve into the comparison of Summer and Winter Paralympics Games by examining the differences regarding women's participation, Home-Medal advantage, and medal dominance.

Inclusiveness and gender equality in sports have generated a number of academic and media coverage and discussion (Pfister, 2010). The discussions revolving around the Paralympics have centered around analyzing media portrayal of elite athletes and challenging gender and disability stereotypes (Rees et al., 2017; Mansfield et al., 2009). Researchers found that although there has been a positive shift in the media narrative surrounding professional athletes with disabilities, there is still a lack of representation and varied characterization (Pullen et al., 2020). Given the media's impacts to shape society's perceptions of disability, more research is needed to investigate the current situation and statistics of the Paralympics and provide a more holistic view of the underlying context of athletes with disabilities regarding gender (in)equality (Rees et al., 2017; Mansfield et al., 2009; Goh, 2020). Answering this call to action, we aim to form an overall understanding of the change of women's participation throughout the 60 years of the Paralympics.

In recent years, a trend has emerged in which fewer towns aspire to host the Olympics, putting the survival of a century-old tradition in jeopardy (Goldblatt, n.d.). One approach of encouraging countries to participate and bid for becoming a host country is emphasizing the intrinsic and broader benefits of hosting the Olympics and Paralympics Games. A significant amount of studies have examined the advantages of host countries through the performance of the Olympics Games (Berkowitz & Galocha, 2021). What about for

Paralympics Games? Our visualization will fill in this gap and see how much home nations can benefit from hosting the event.

In 2021, the most recent Tokyo Paralympics set a record for the biggest Paralympic Games with a total of 4403 athletes, competing in 22 sports and 23 disciplines (*Tokyo 2020 sets the record for most athletes and women at a Paralympic Games*, n.d.). Asian countries showed strong dominance in medals, with China stamping their authority by signing off with a whopping 207 medals (*Asia emerge as the dominant force at Tokyo 2020*, n.d.). Understanding how countries' performance and winning records will us better conceptualize the competition and dominance of medals. For the fourth and final aspect, we will visualize the trend of medal counts among countries and break down the performance in detail.

2. Literature Review

2.1 Summer vs. Winter Paralympics

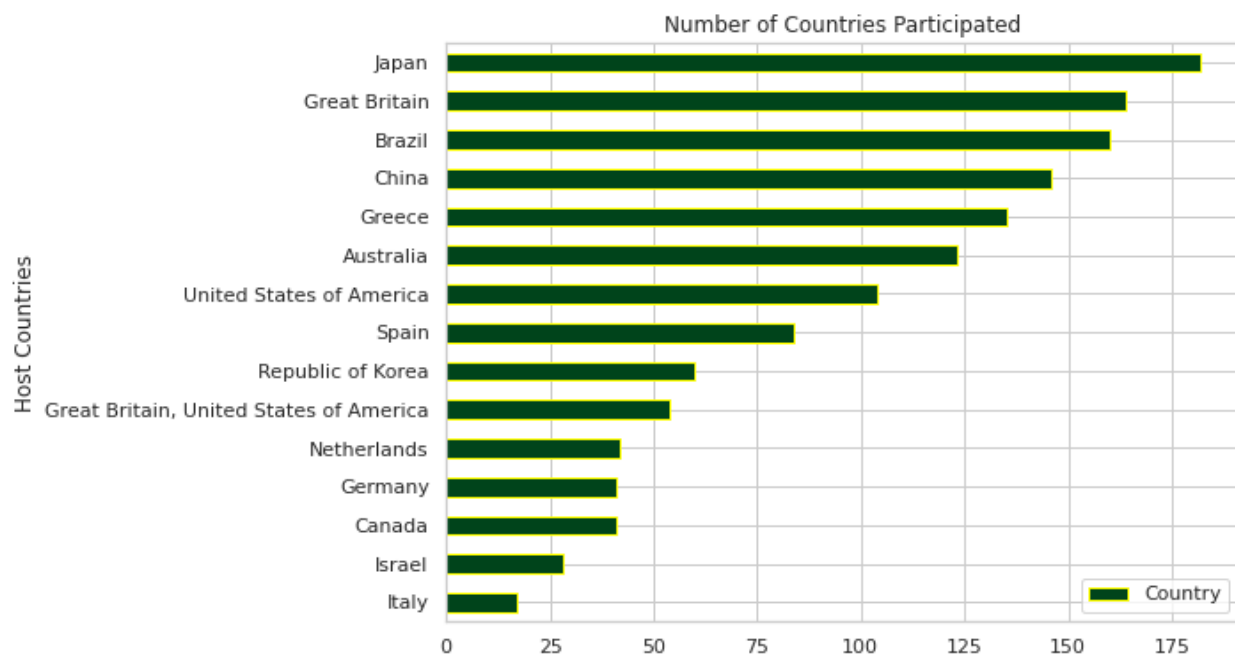


Figure 2.1 a: Number of Countries Participated by Host Countries

Many attempts have been made to visualize the Summer and Winter Olympics, however, few have focused on comparing the Paralympics. One basic method (*Deep EDA Paralympics 1960 -2020*, n.d.) is to show the number of countries that participated in the

Paralympics using a bar chart (see figure 2.1 a). This plot is effective for comparison since each bar can be perceived accurately to show the difference of the counts through length. However, the chart can also be confusing since there is no indication of the order of time for each host country. Readers will need to rely on common knowledge to assume that Italy was the first country to host the Paralympics and that the y axis should be read from bottom to top. One major drawback in this graph is that there is no distinction between each bar, and thus it is impossible to tell which countries were hosting the Summer Paralympics vs. the Winter Paralympics.

Another way used to visualize the difference between summer and winter Paralympics was a scatter plot (*Paralympic Data Analysis*, n.d.) (See Figure 2.1 b) This visualization used color to distinguish between the summer and winter events, which allows for clear distinction compared to the previous graph. However, the x-axis is hard to interpret because it was using a log scale. From the plot, we can see that there seems to be more Summer Paralympics hosted than Winter Paralympics, and there are more participating

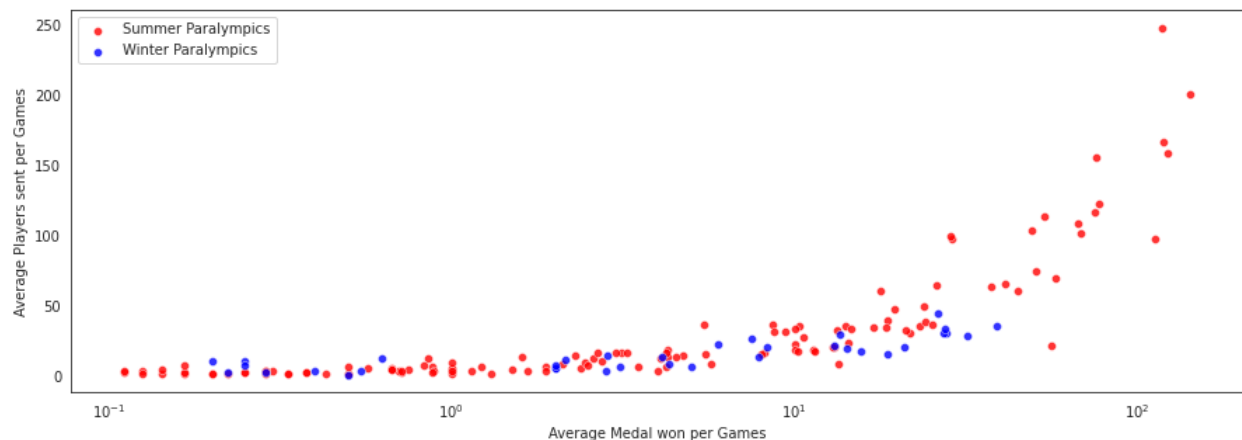


Figure 2.1 b: Average medal won per Games vs. Average Players sent per Games

athletes in summer. However, there was no specific comparison on athlete counts since scatter plots are not good with comparing items. In order to clearly compare variables such as athlete counts between the two types of Paralympics Games, we decided to learn from the pros and cons and use bar charts for comparing variables side by side at a granular level. For showing change over time, we decided to use line charts with color-coding to distinctly visualize the trend of the games.

2.2 Women's Participation

We also searched for visualizations created to display women's participation in the Paralympics. One simple approach (*Deep EDA Paralympics 1960 -2020*, n.d.) of

demonstrating the change is showing the total counts of women and men athletes (See figure 2.2 a). The two graphs below are effective in showing the counts and comparing them between countries. But the plots are nonetheless thin-meaning as they only showcase one Paralympic event with only 10 countries. In our visualization, we worked to showcase the counts of players across all Paralympic events.

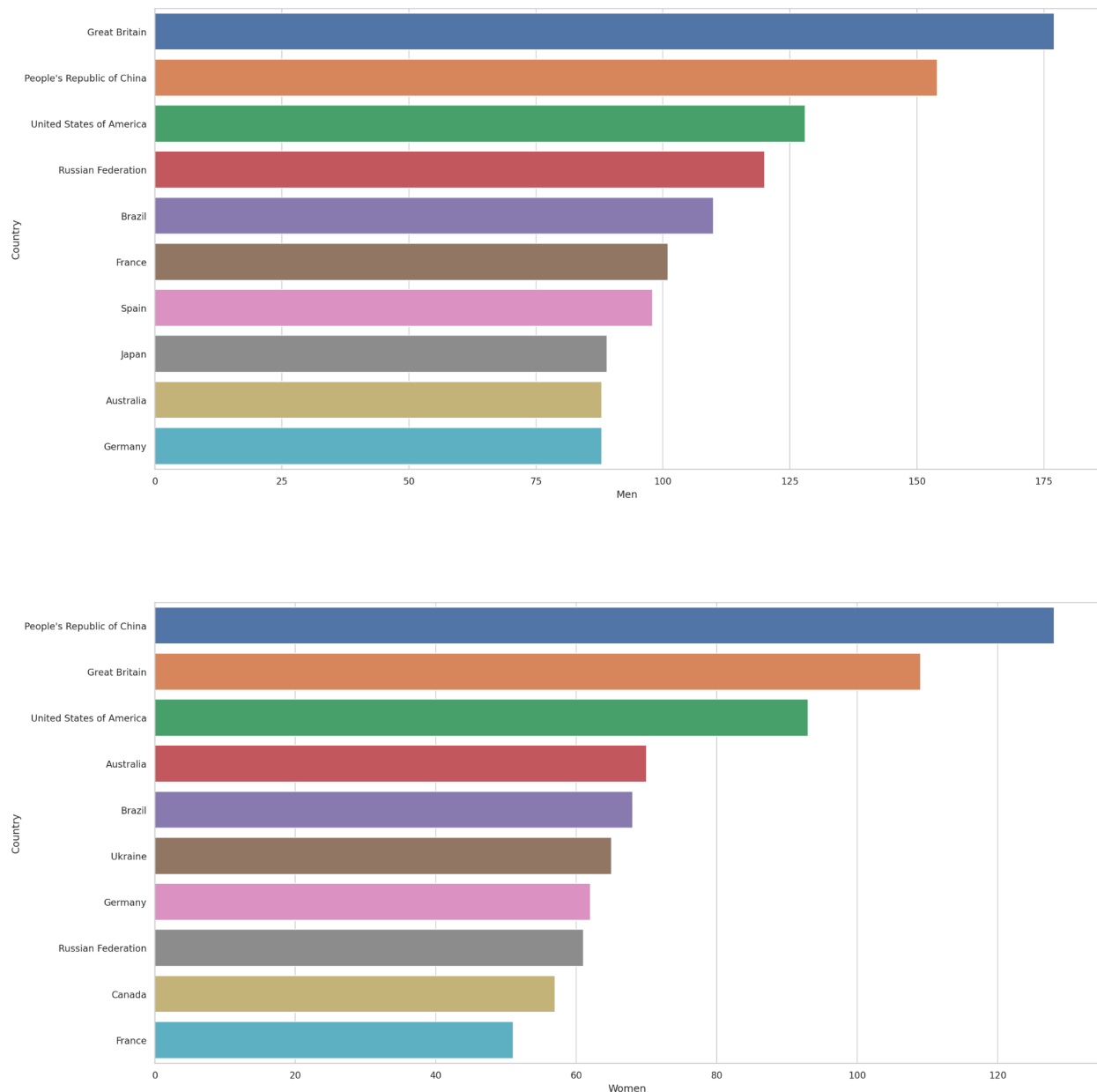


Figure 2.2 a: Number of athletes participants for top 10 countries in 2012 Paralympics

Graph 4. Historic Participation in Paralympic Games by Gender

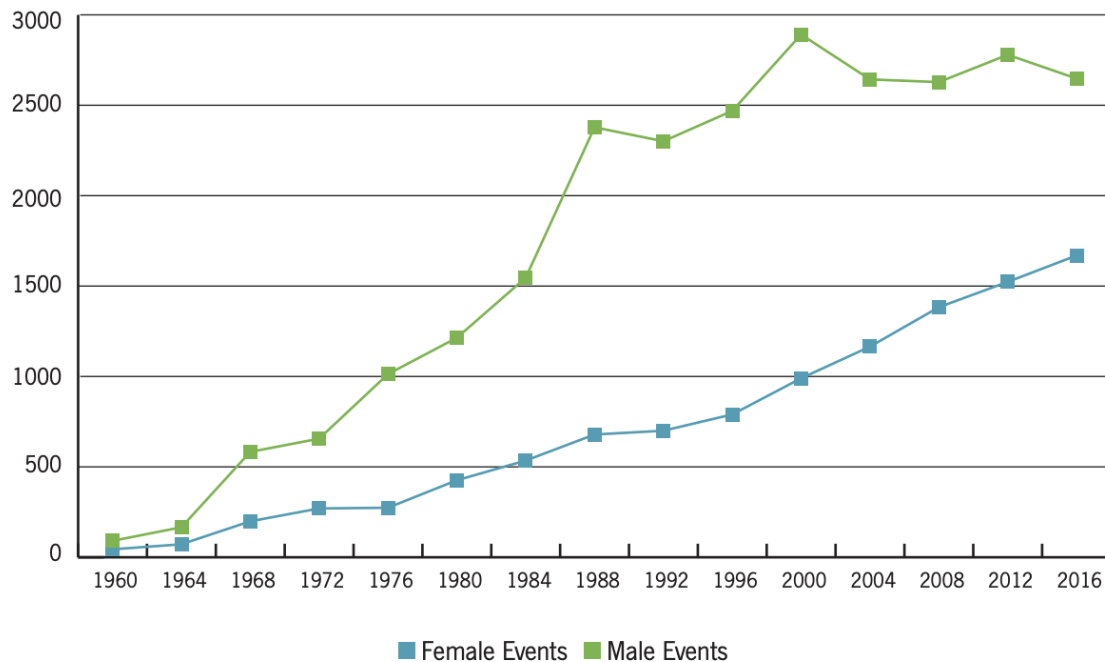


Figure 2.2 b: Historic Participation in Paralympic Games by Gender

The women's sports foundation (*WOMEN IN THE OLYMPIC AND PARALYMPIC GAMES: An Analysis of Participation, Leadership, and Media Coverage*, 2017) is also an attempt to show the change in women participation in Paralympics Games (see figure 2.2 b). The graph successfully presented the change over time for all Paralympic Games. It effectively shows both the drastic difference of athlete counts between genders and displayed the optimistic trend of a growing number of female players in each event hosted. For our visualization, we will build on this graph and explore other dimensions analyzing women's participation such as percentage and gender ratio.

2.3 Home-Medal Advantages

Similar to comparing summer vs. winter events and understanding women's participation, few visualizations were found on showing Home-Medal advantages for the Paralympics. To review more sophisticated visualizations and draw inspiration, we looked for Olympic data visualizations on this topic.

The Washington Post (Berkowitz & Galocha, 2021) released a series of visualizations showing the advantages of host nations (See figure 2.3 a). In this figure, a stacked bar

chart was used to represent the medal compositions. The color-coding in each bar also effectively shows the count for each type of medal over the years. One small limitation of this graph is that it is only describing the performance of one country, Spain. In our visualizations, we will apply stacked bar charts in multiple countries.

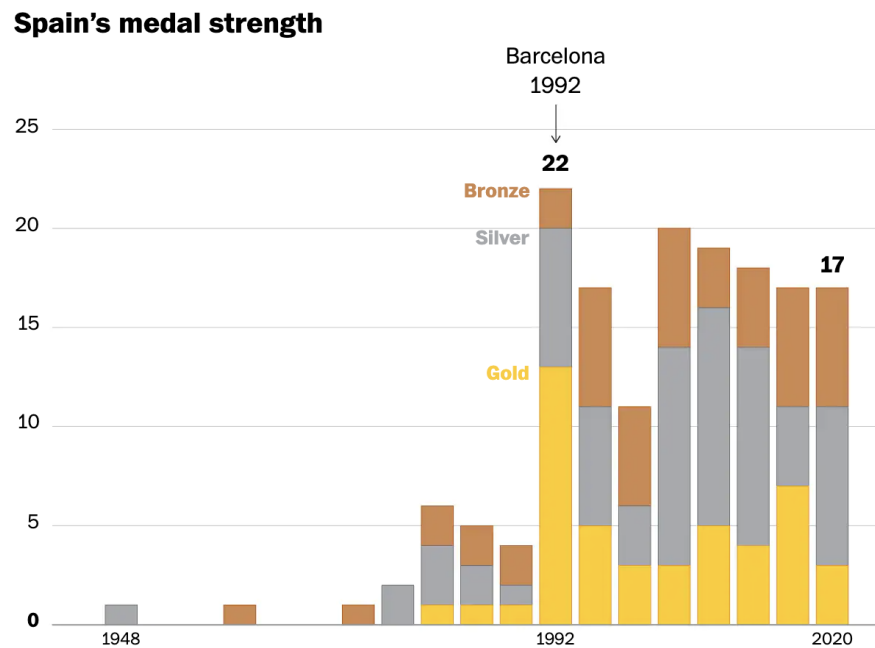


Figure 2.3 a: Spain's medal strength over time

2.4 Medal Dominance

Last but not least, we looked at ways people have used to visualize medal dominance for the Paralympics. Specifically, a country's dominance can be shown with total medal counts in each event as well as the number of gold medals won. Previous visualization attempts (*Deep EDA Paralympics 1960 -2020*, n.d.) have used bar charts to draw the medal counts, as we can see in figure 2.4 a. Similar to figure 2.3.a, different color coding was used for representing different kinds of medals for each country. However, in this graph, the bars are not stacked but overlap each other. We felt like this approach can be helpful for comparison since it allows readers to see where each kind of medal is from the same baseline. Yet it can also be misleading since the area of each bar is different, which could create confusion on whether the bar width may correspond to the value. In our visualizations, we will use only stacked bar charts to avoid such potential confusion.

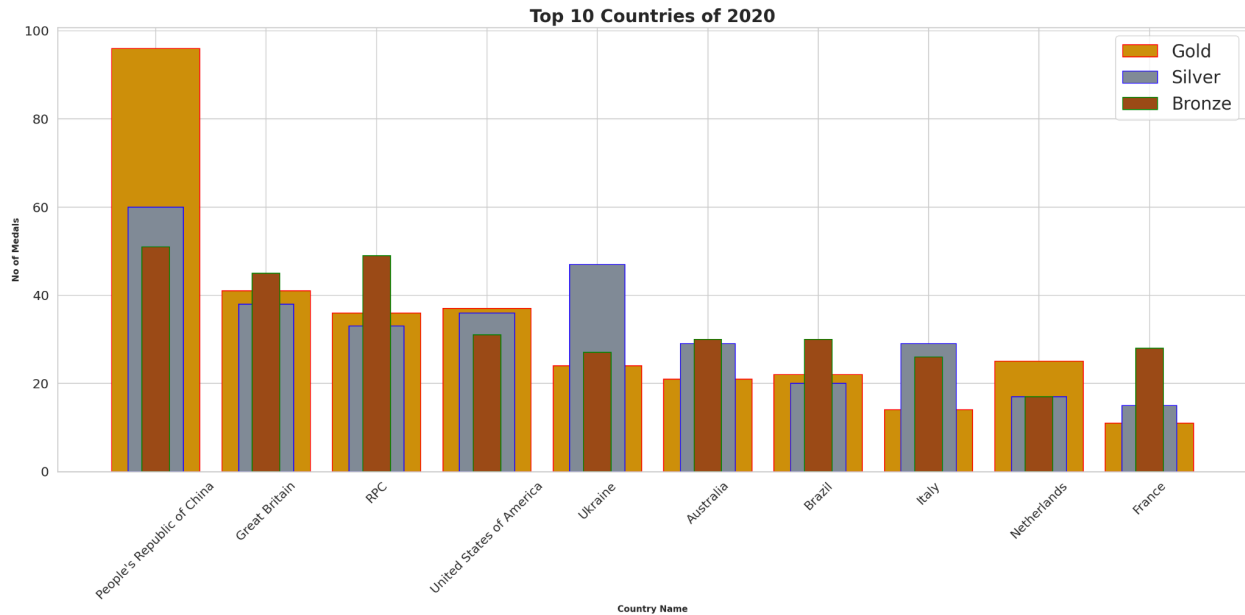


Figure 2.4 a: Top 10 countries of 2020 Paralympics

Based on the existing work related to the topics we are addressing, we came up with four research questions as we generated visualizations for describing the 60 years of Paralympics:

1. How have the athlete counts and gender ratio of athletes differed on Summer vs. Winter Paralympic Games?
2. How has women's participation changed in the Paralympics over the 60 years?
3. Considering the home-medal advantage, do host countries perform better in the Paralympic Event than others?
4. Which countries have been dominating the Paralympic Games with respect to medal counts? How has the medal dominance changed among countries over time?

3. Contribution

Based on the previous discussion, our project shows unique contribution in the following aspects:

1. One of the first attempts in creating a set of comprehensive visualizations to represent and describe the 60 years of Paralympics.
2. Provides new ways of analyzing Paralympics data through the lens of summer vs. winter events.
3. Demonstrates women's participation in the light of advocating inclusions and diversity in sports.

4. Applying and combining unique visualization techniques such as beeswarm scatter plot, KDE, and small multiples to investigate the home-medal advantages for the Paralympics.

4. Visualization Ideas & Plans

4.1 Dataset and data cleaning

In this project, we use a dataset from Kaggle - 60 Years of Paralympics (*60 years of Paralympics*, n.d.). The dataset contains two spreadsheets - Summer Paralympics and Winter Paralympics. We did some modifications due to the limitation on comparing, and also there is a year error in the Winter Paralympics data. The “1998” year section is mistyped as “1988” in the original dataset, which caused some misleading data. Also, to achieve a side-by-side comparison of Summer and Winter Paralympics throughout time, we have to add another pointer to connect the two Paralympics since the years on Winter Paralympics have shifted after 1992. We added a row called “No.,” the number of Paralympics hosted after 1960. For summer Paralympics, it starts from 1 to 16, and for winter Paralympics, it starts from 5 to 11. The reason it starts from 5 is that the first winter Paralympics was hosted in 1976, which is the fifth summer Paralympics. We did this for better visualization, shown below (Fig 4.1.a). As you can see, the dots of each value in the graph will be at the same x-axis if we use “No.” as the x-axis instead of the year. Another reason for using “No. of Paralympics” other than “Year” is that we are trying to see the correlation between Paralympics, so the importance should be the time throughout each Paralympics, not the year itself.

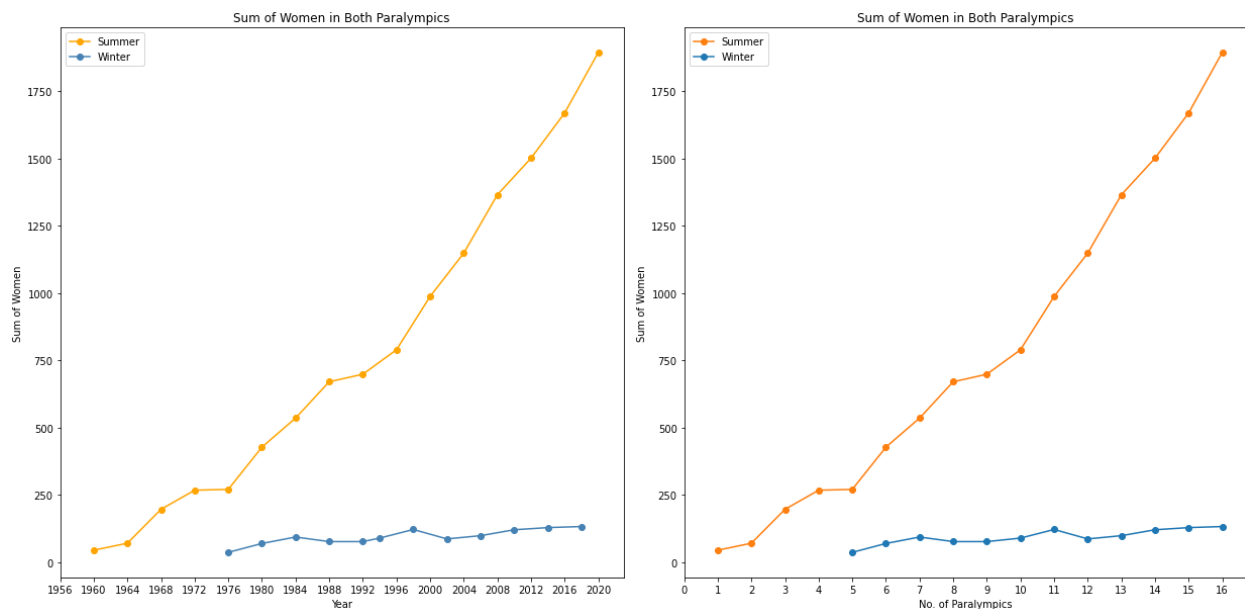


Fig 4.1.a - Comparison using Year and No. of Paralympics

Throughout the process, we also created two modified datasets using excel - summer and winter Paralympics female male percentage. We used Microsoft excel's pivot table tool to create lists of female / male player rates throughout Paralympics for both summer and winter, so we can visualize the rate between the total player count and the gender ratio.

We also created a few data tables throughout time, to calculate Home-Medal advantage, medal count, etc. through python. All of the records will be shown in the jupyter notebook and explained throughout the report.

4.2 Planning: Summer vs Winter Paralympics

We plan on using two different comparisons: Gender Ratio and Player count since these two sections are more general and it's clear to understand at a glance. During the sketching phase, we plan to use a simple line chart to show the relationships between the Paralympics. We sketched the Total Player Count chart (Fig 4.2.a), and a side by side Gender Ratio comparison between summer and winter Paralympics (Fig 4.2.b)

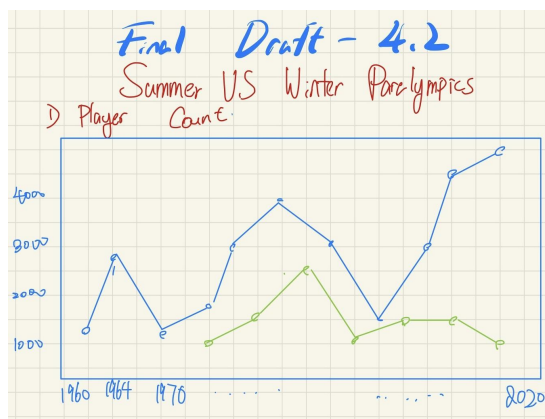


Fig 4.2.a

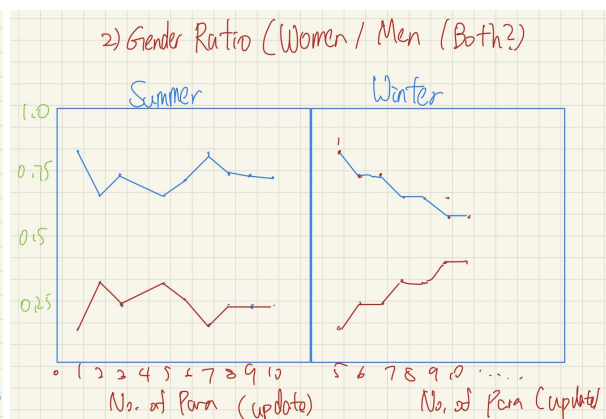


Fig 4.2.b

4.3 Planning: Women's Participation

In this part, we want to highlight the growth and development of female athletes throughout the Paralympics around the world. We are planning to use a geo map to show the female athlete count around the world (Fig 4.3.a), and some ratio chart comparing in both Paralympics (Fig 4.3.b).

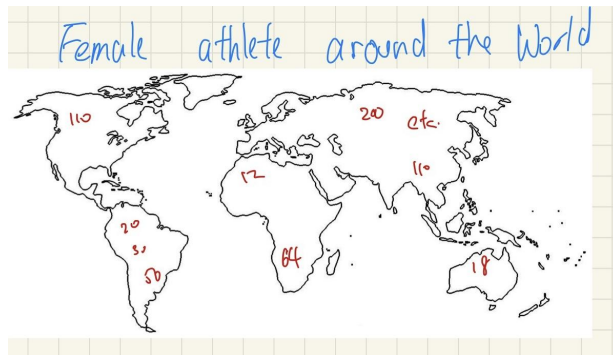


Fig 4.3.a

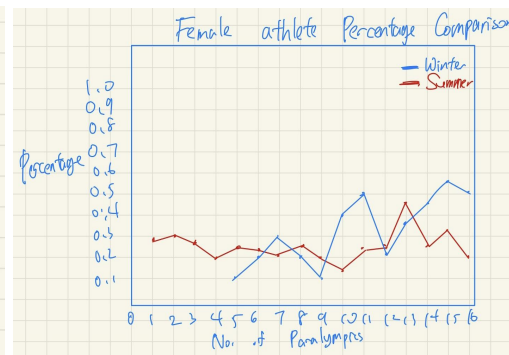


Fig 4.3.b

4.4 Planning: Home Field Advantage/ Home Medal Advantage

We started to research different methods for calculating the Home Field Advantage for different sports and previous Olympics/ Paralympics, but there are too many factors that our data do not cover. So, we plan on analyzing the Home Medal Advantage by comparing the medal count between host countries and guest countries during the Paralympics.

4.5 Planning: Medal Dominance

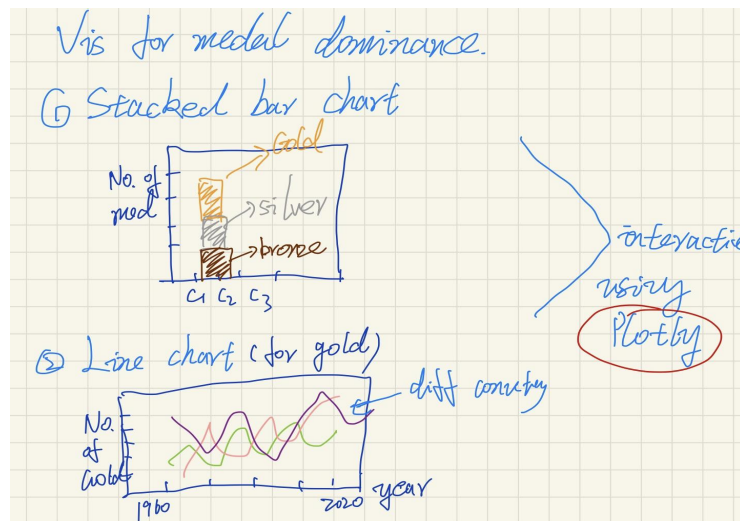


Fig 4.5

In the medal dominance section, we plan to draw a stacked bar chart to visualize the total medals earned by each country, and we also want to present all gold, silver, and bronze numbers in this stacked bar chart, like the first draft in Fig 4.5. Besides, we plan to visualize the number of medals changes over time because we have over 60 years of Paralympics datasets, and it would be useful to view which country is dominant and the trendings.

5.Results

5.1 Summer vs. Winter Paralympic

In this section, we are going to compare the Summer and Winter Paralympics throughout time. There are two main directions that we are going to compare - Total athlete count and Gender Ratio.

5.1.1 Total athletes count in both Paralympics - line chart

We started to draw out charts as we planned - a line chart showing the total player count. To do so, we created a data frame combining our modified datasets, which uses the No. of Paralympics as index, and includes female and male player count, female and male athlete percentage, and total player count throughout summer and winter Paralympics. Afterward, we used matplotlib's plot() to plot the chart (Fig 5.1.1)

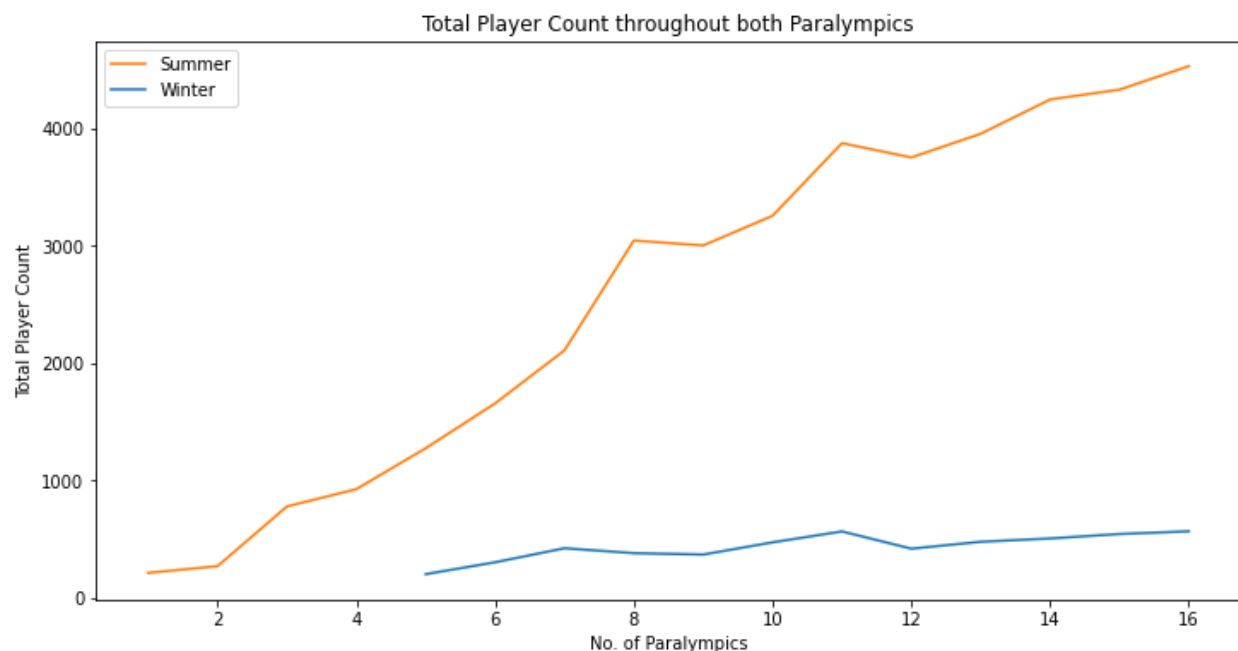


Fig 5.1.1

This chart puts the player count as a line. It tells the message, but it could be slightly confusing if we want to see the comparison side by side for each Paralympics. One of the best solutions is to compare them with bar charts.

5.1.2 Total Athletes Count in Both Paralympics - grouped bar chart

We used the same data frame to plot out the bar chart (Fig 5.1.2). For continuity throughout the project, we used an orange/ blue color scheme for binary comparisons.

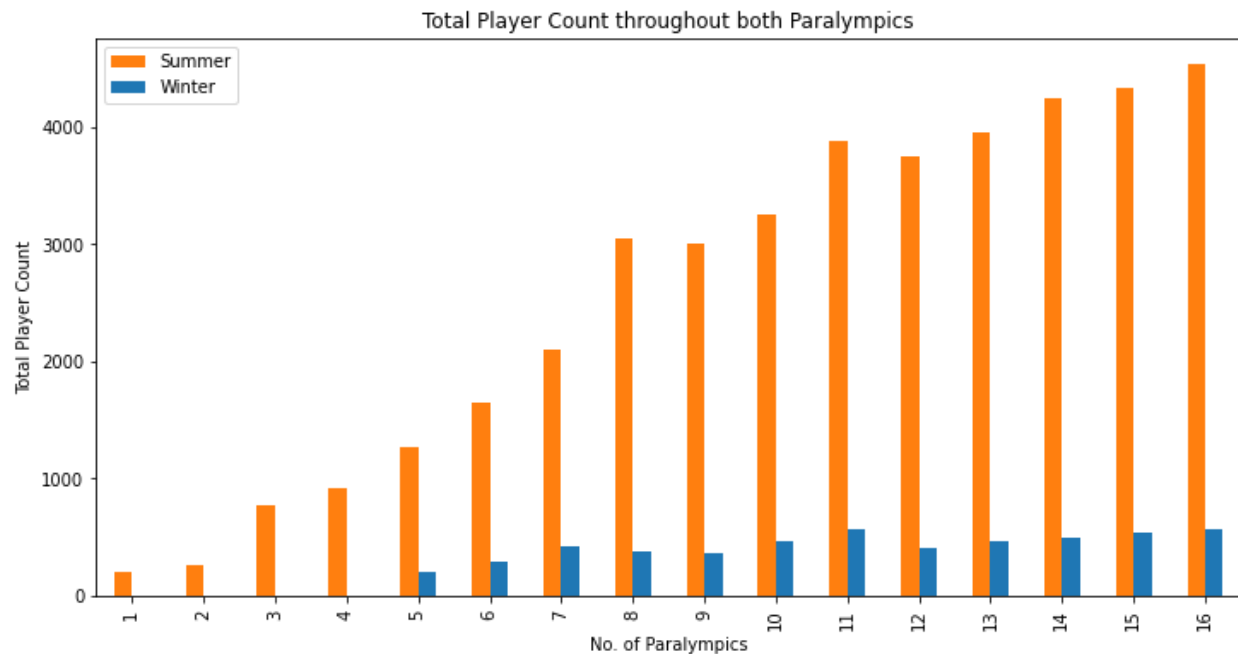


Fig 5.1.2

As we can see, it is more visually appealing and easier to recognize the differences between the Paralympics. We used the difference of length to show the data, and according to Steven's Power Law, one of the best methods to present differences is using length.

This graph tells a lot of information. First, we can see that the player count on Summer Paralympics is larger than Winter Paralympics by a couple of times. We can also see the steady growing trend on athlete count in Summer Paralympics, while the Winter Paralympics doesn't show much growth.

Although this is already a decent graph on viewing the player count between Paralympics over the year, there is still room for improvement, such as displaying a value for each bar, a potential line drawn over the bar, etc.

5.1.3 Gender ratio in summer Paralympics, the gender ratio in winter Paralympics - stacked bar chart

After we visualized the player count on both Paralympics over time, we want to dig deeper into that information. We want to visualize the gender ratio. Learning from the previous charts, we decided to not start with the line chart for those data and use

stacked bar charts to visualize (Fig 5.1.3.a, Fig 5.1.3.b). For women, we use orange and for men, we use blue to present.

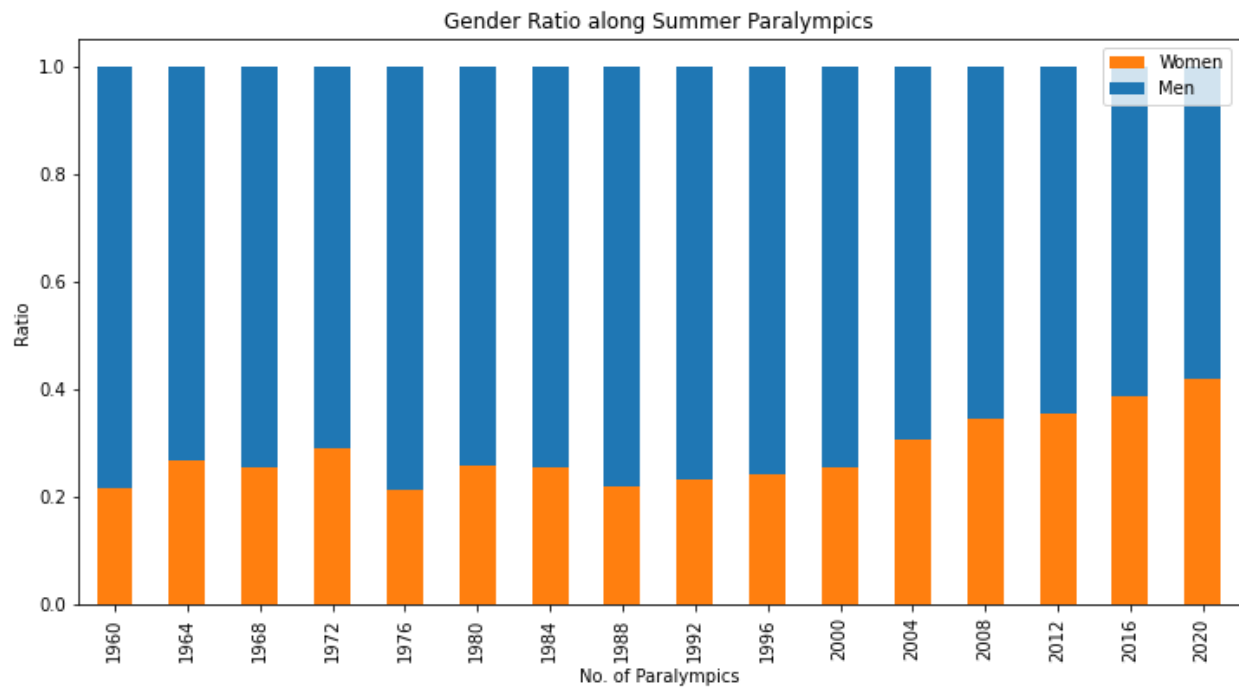


Fig 5.1.3.a

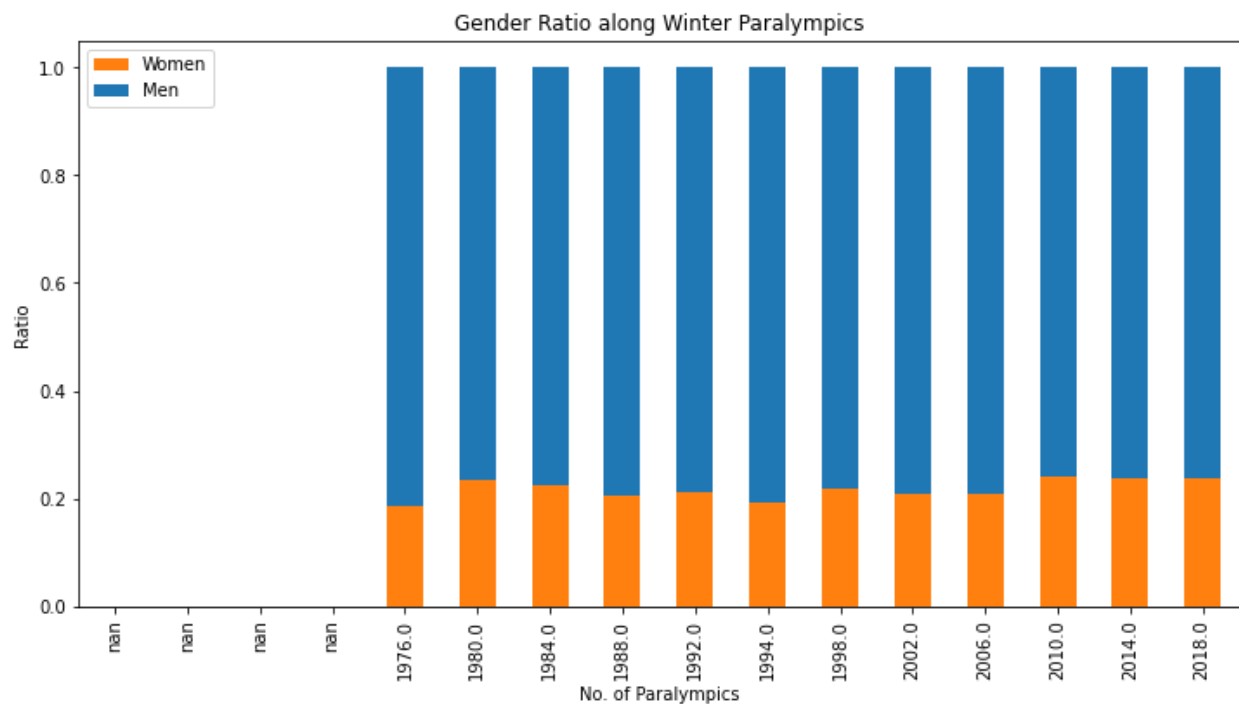


Fig 5.1.3.b

This chart shows the ratio between men and women athletes in the Summer and Winter Paralympics. This is clear if we want to see the ratio for each year, but if we want to see the overall pattern, we could use an area chart to improve it.

5.1.4 Gender ratio in summer Paralympics - area chart, the gender ratio in winter Paralympics - area chart

As mentioned above, we used an area chart to visualize the athlete's gender ratio in the Summer and Winter Paralympics throughout time (Fig 5.1.4.a, Fig 5.1.4.b).

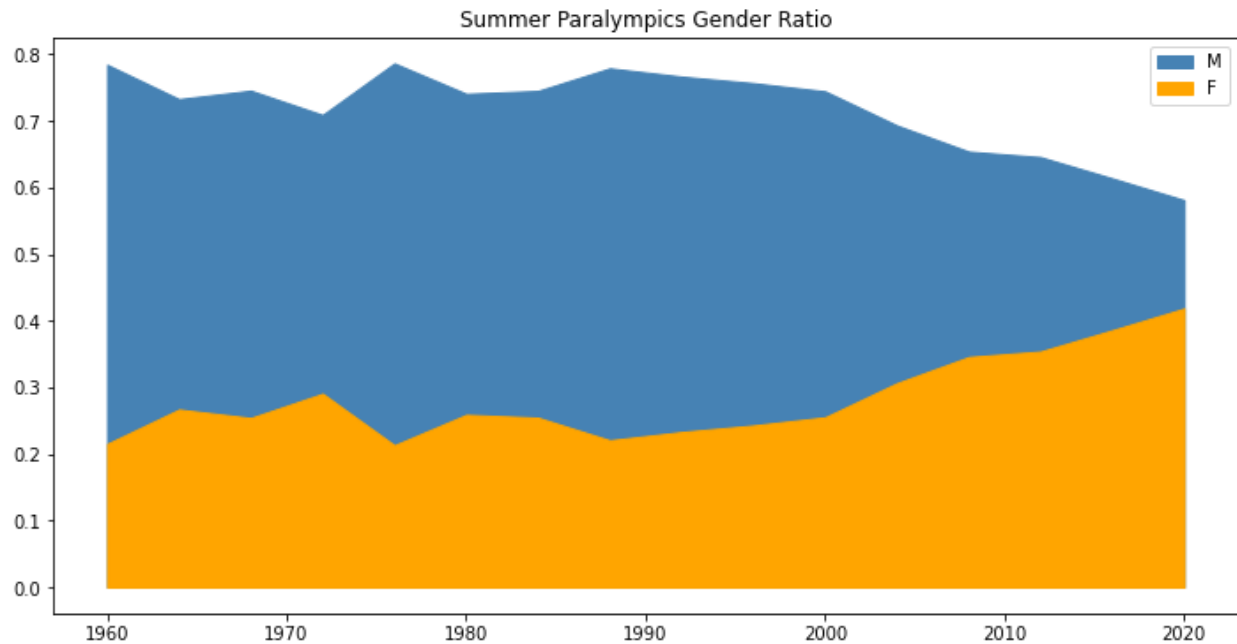


Fig 5.1.4.a

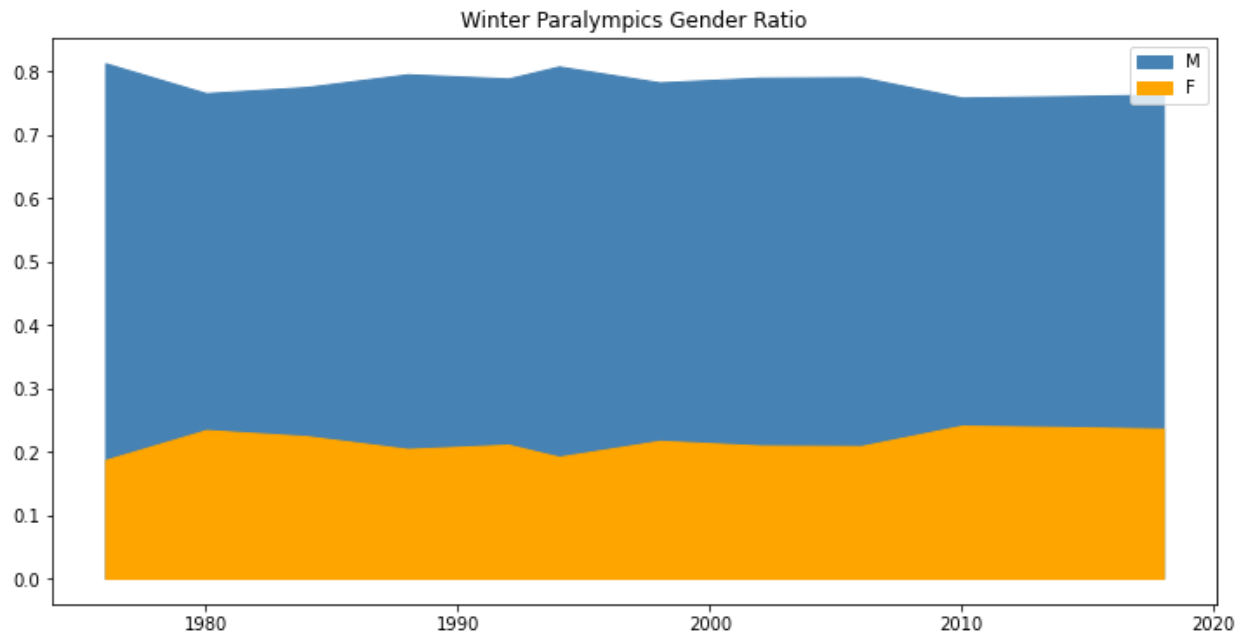


Fig 5.1.4.b

This area chart is better if we want to see the overall comparison between female and male athletes. However, if we want to compare each year individually, a bar chart would still be the choice.

We noticed that in both Paralympics, Men athletes are more than Women athletes. This brought our attention and decided to focus on Women's participation in the Paralympics throughout time in the next section.

5.2 Women's Participation

In this section, we are going to focus on women in Paralympics. We are going to compare the women's participation in both Paralympics, and compare between genders. We start with simple visualization methods such as line charts and attempt to use a more in-depth technique to visualize it throughout the section.

5.2.1 Sum of women in both Paralympics - just women

We start by plotting the female athlete count among total athletes throughout all Summer and Winter Paralympics (Fig 5.2.1).

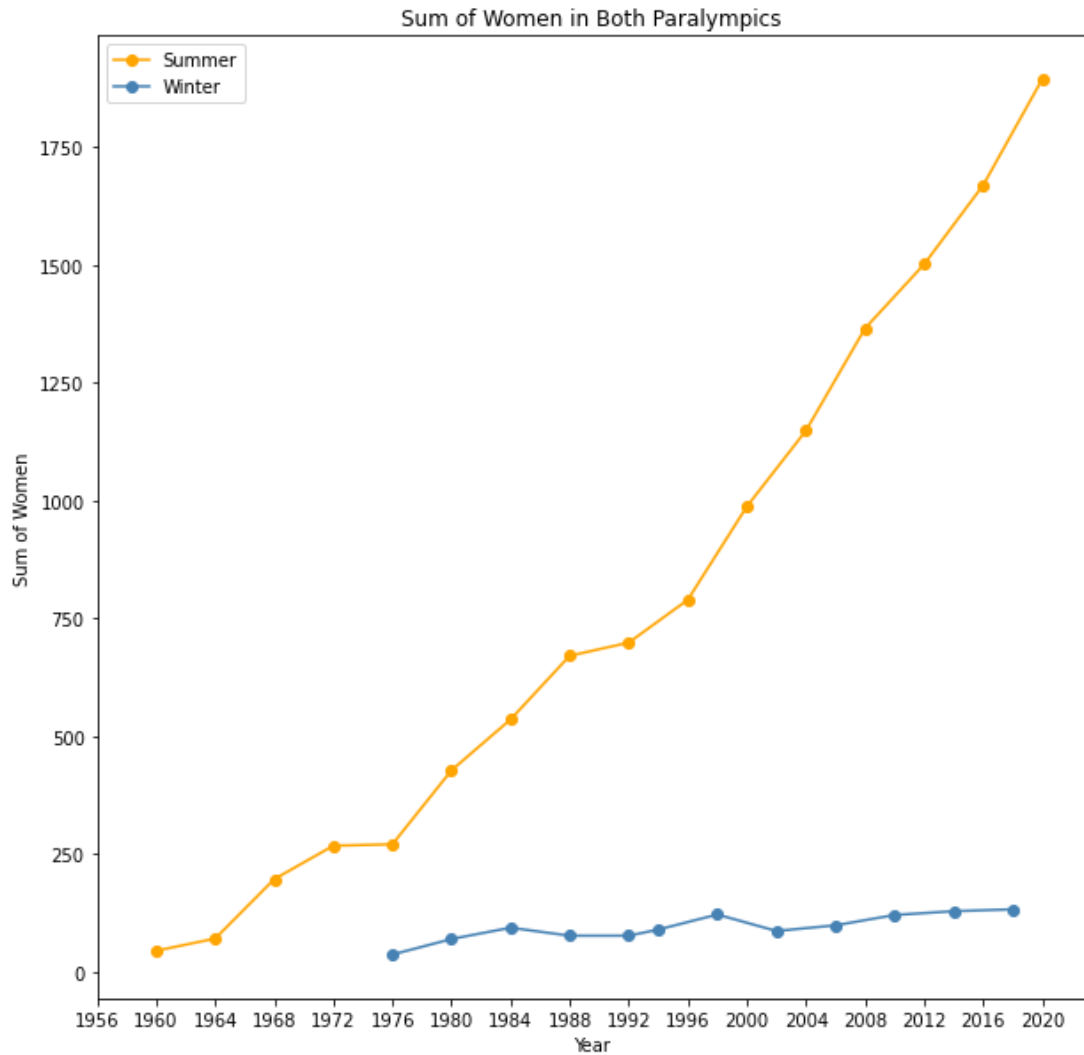


Fig 5.2.1

This graph shows the huge difference between female athlete count between Summer and Winter Paralympics, but we already spotted this trend in the previous section. In order to achieve an actual comparison between Summer and Winter Paralympics, let's compare the female athlete percentage instead.

5.2.2 Women percentage line chart side by side

We plotted two line charts, the percentage of female athletes in Summer and Winter Paralympics side by side (Fig 5.2.2).

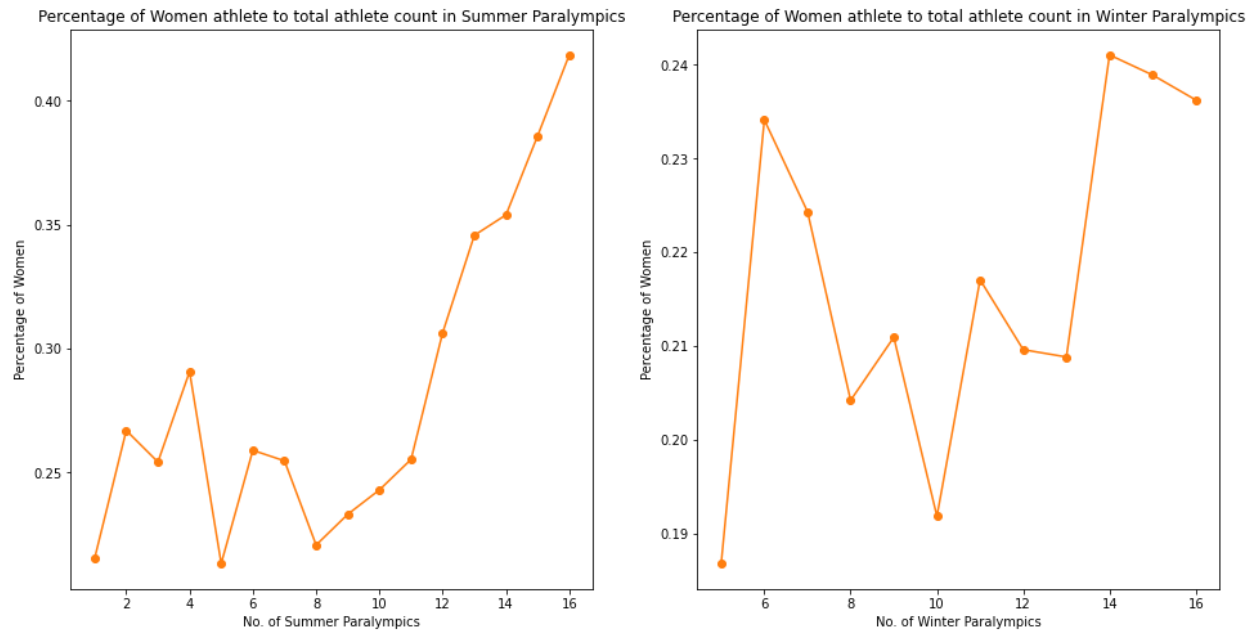


Fig 5.2.2

We can see the actual trend in both Paralympics now. However, the scale of the Y-axis is not the same. Let's try to put them together into one chart.

5.2.3 Percentage of women in summer vs winter paralympic

We put the two-line charts to one, unifying the y axis. We also scale the y axis up to 1.0 since we are doing a percentage chart and the max percentage is 1.0 (Fig 5.2.3).

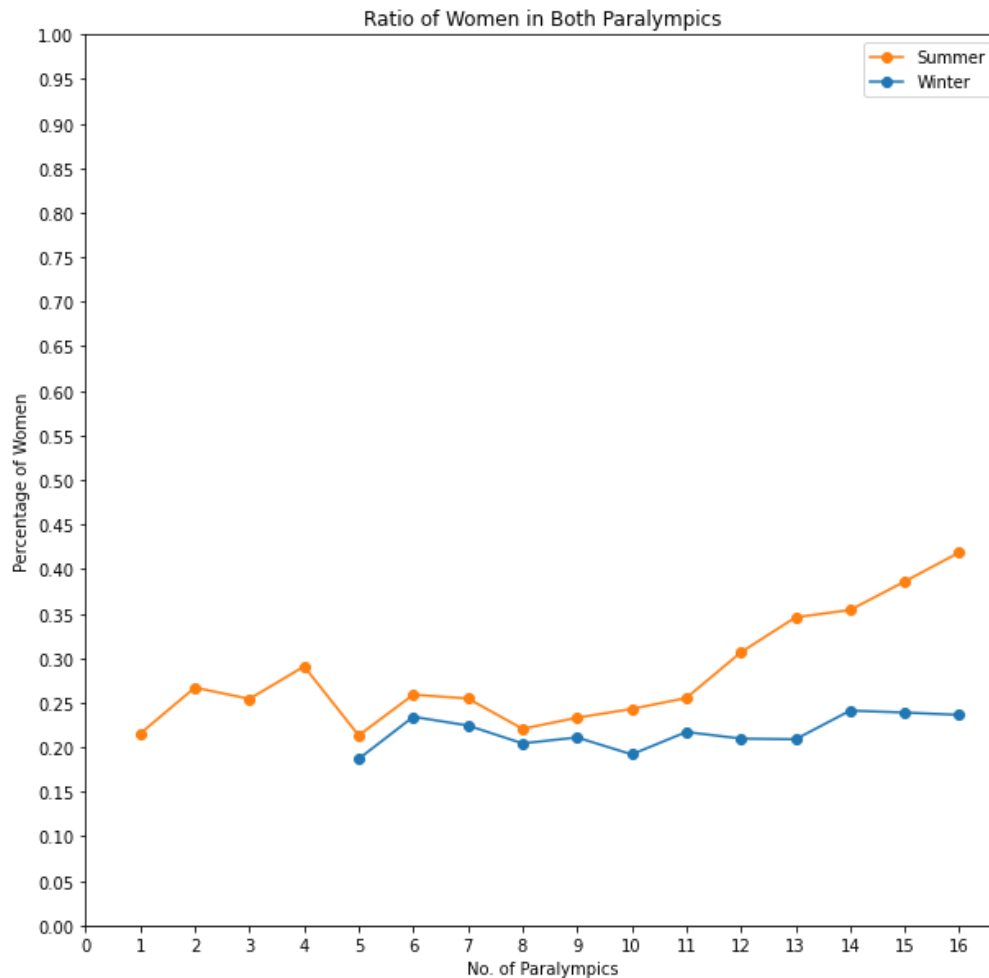


Fig 5.2.3

In this graph, we can see the trend among both Paralympics. By setting the y-scale between 0 and 1, we show that female athletes have always been a minor group in the Paralympics.

5.2.4 percentage of women in both Paralympics - grouped bar chart

Let's try to use a bar chart to visualize the data and see if it looks better side by side (Fig 5.2.4).

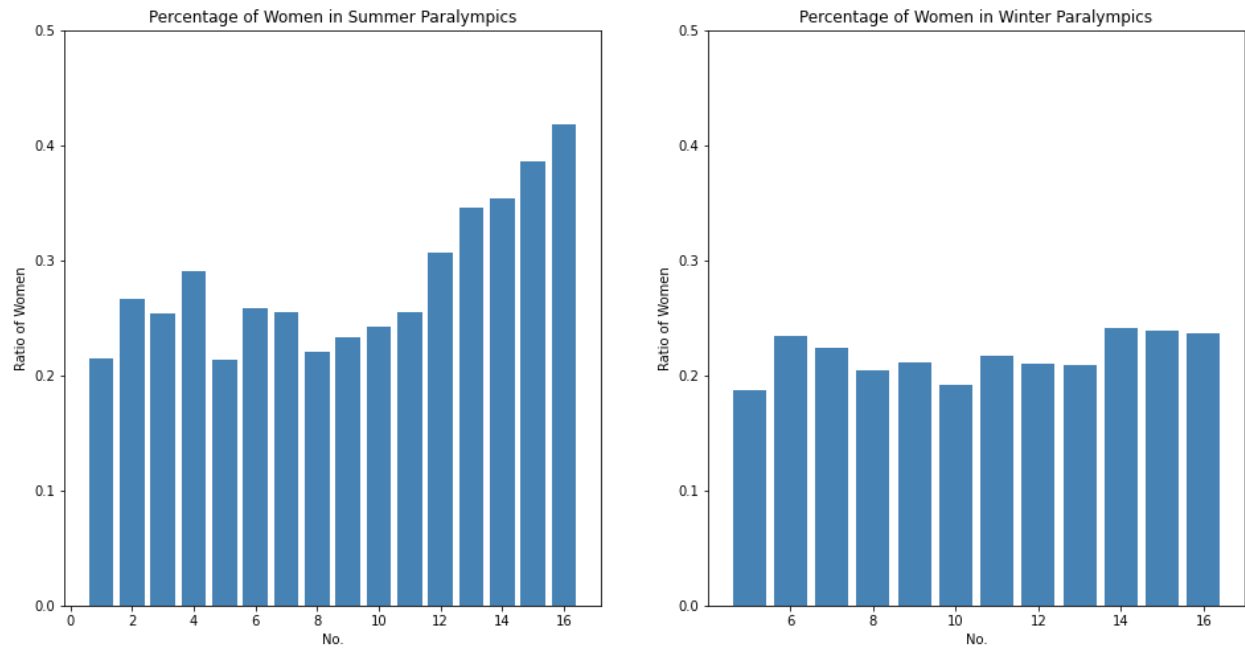


Fig 5.2.4

The barParalympics chart shows the relationship between each year's Paralympics, both summer and winter. Let's put them together and compare them.

5.2.5 Percentage of women in both Paralympics

We combined Summer and Winter Paralympics' female athlete percentage for better comparison (Fig 5.2.5)

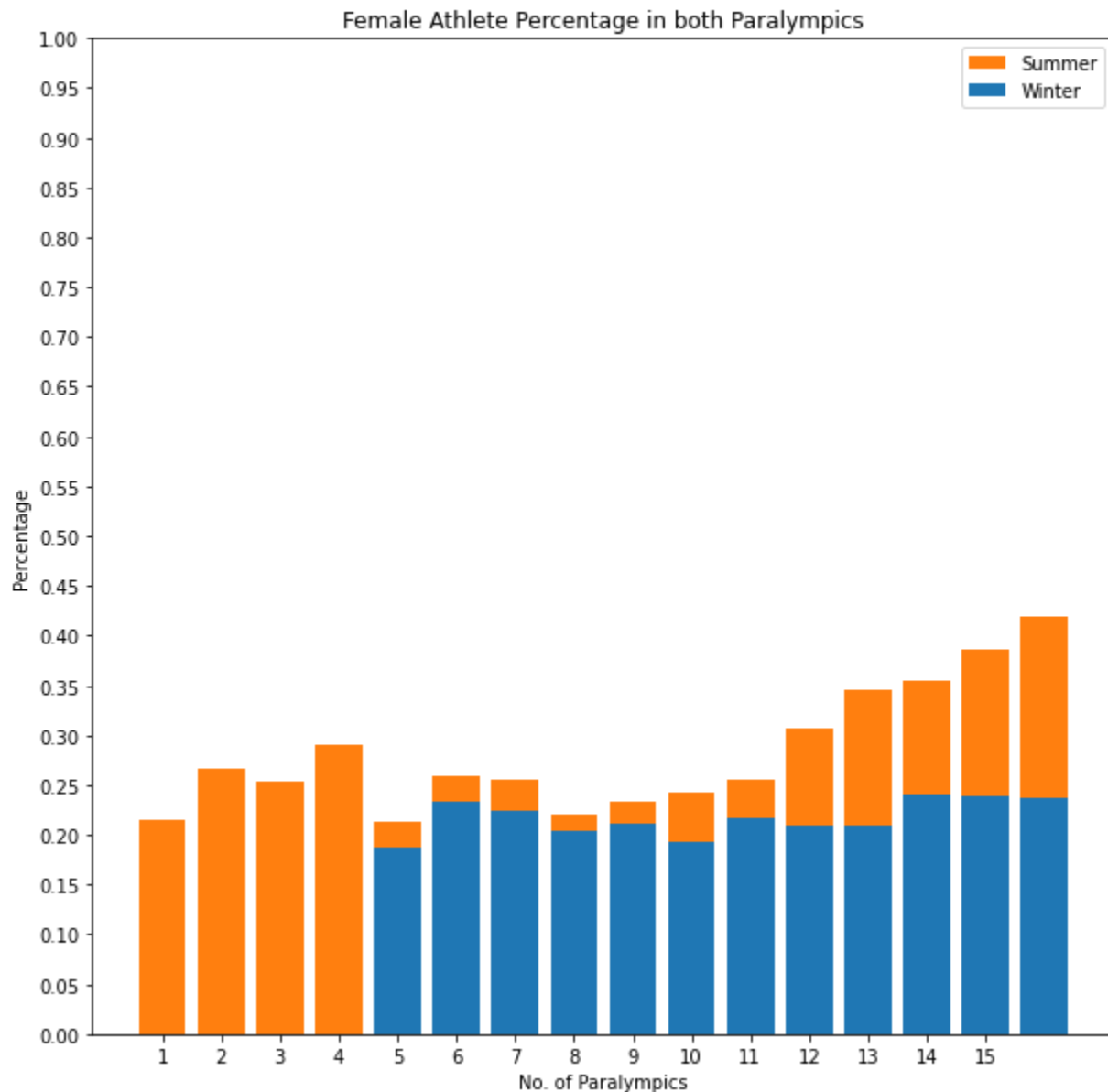


Fig 5.2.5

By putting them together, we can compare the two Paralympics better. We can see that Summer Paralympics has a larger female percentage than Winter Paralympics.

5.2.6 Pyramid Chart for Tokyo Paralympics

Except for all previous charts, we originally wanted to depict the female percentage across all the paralympic disciplines over 60 years, but we didn't find the dataset, and the only gender-discipline information we can find is about the 2020 Tokyo Paralympics.

Therefore, we only draw the women and men athletes comparison across all disciplines for the 2020 Tokyo Paralympics. The orange bar represents female and the blue bar represents male in Fig 5.2.6. This is also an interactive graph created by the Plotly package, and the users can see specific numbers when they put their mouse on each bar. The x-axis is the number of athletes, and the y-axis represents all disciplines. Generally speaking, the participation numbers of males and females are almost half and half in the 2020 Tokyo Paralympics. From the below figure, we can see that “Athletics” has the most participants in both sets male and female, and “Football 5-a-side” has no female participants.

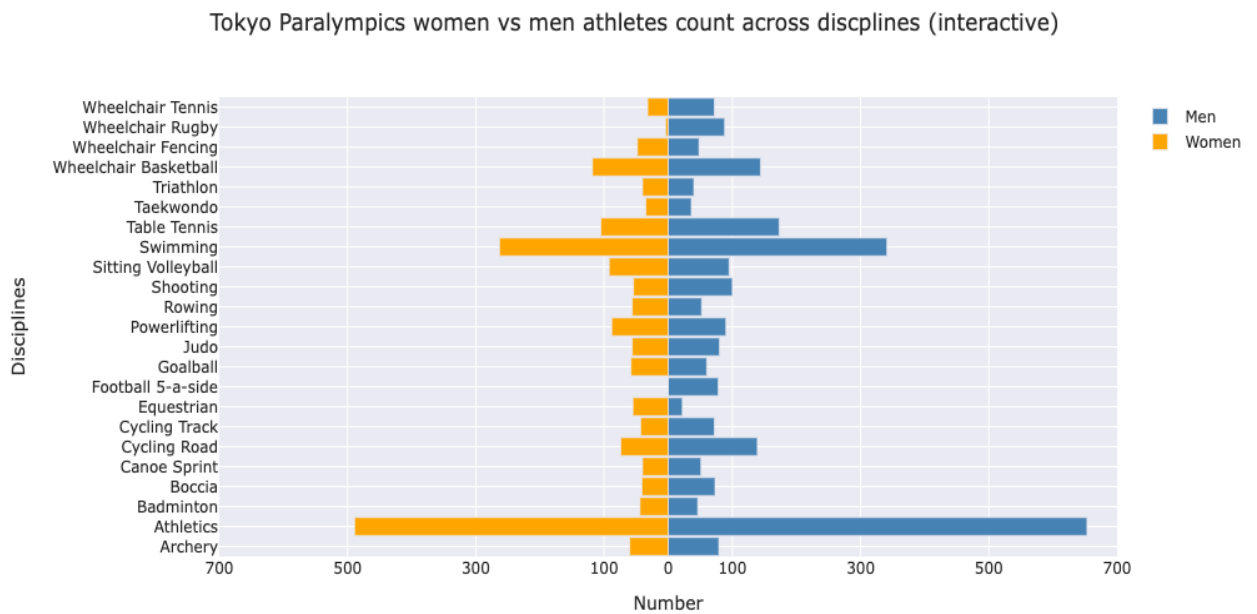


Fig 5.2.6

5.2.7 Women athletes count in top 10 countries

After comparing the total female athlete percentage throughout time, we want to see the female athlete count in countries with the most athletes in both Summer and Winter Paralympics (Fig 5.2.7.a, Fig 5.2.7.b).

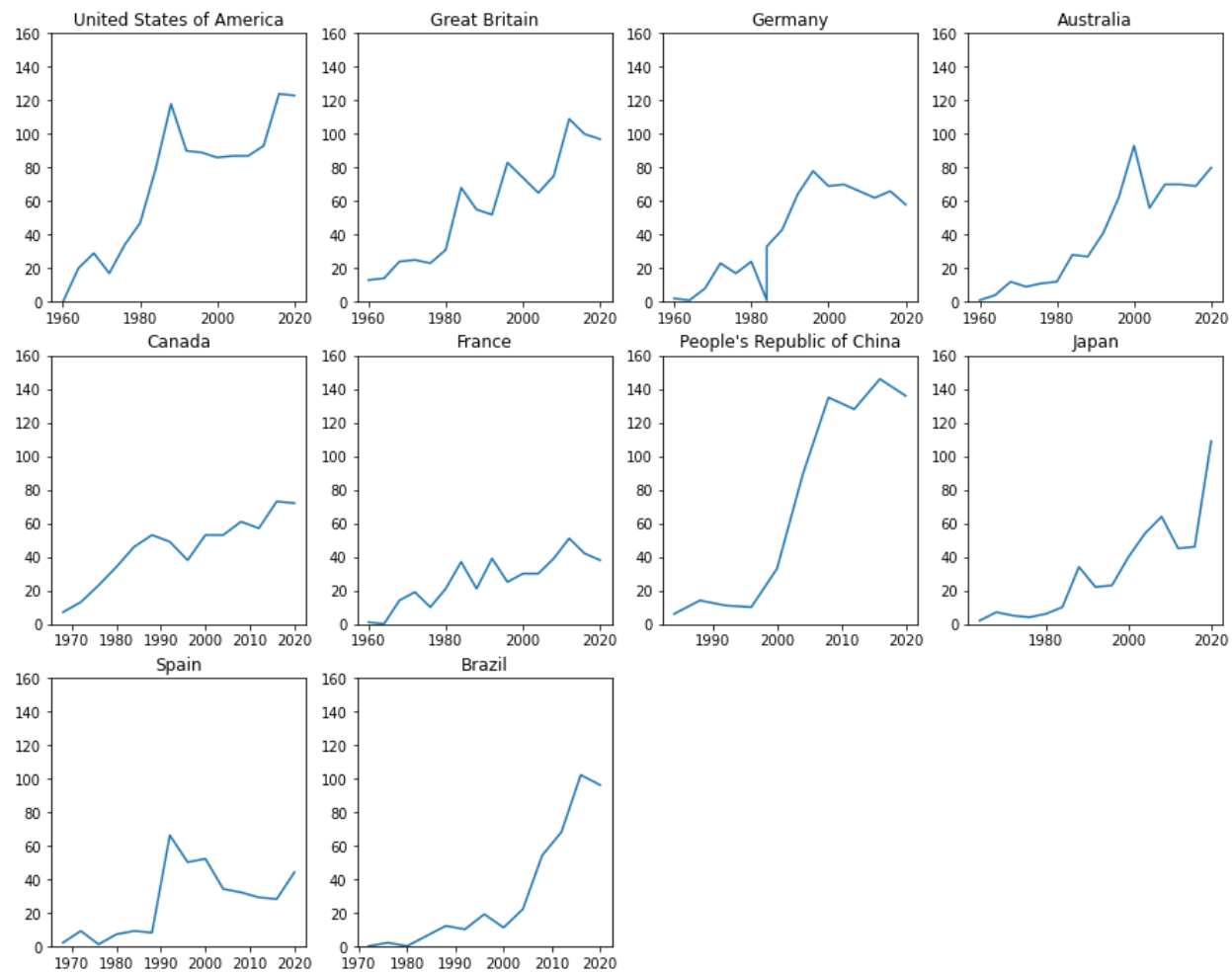
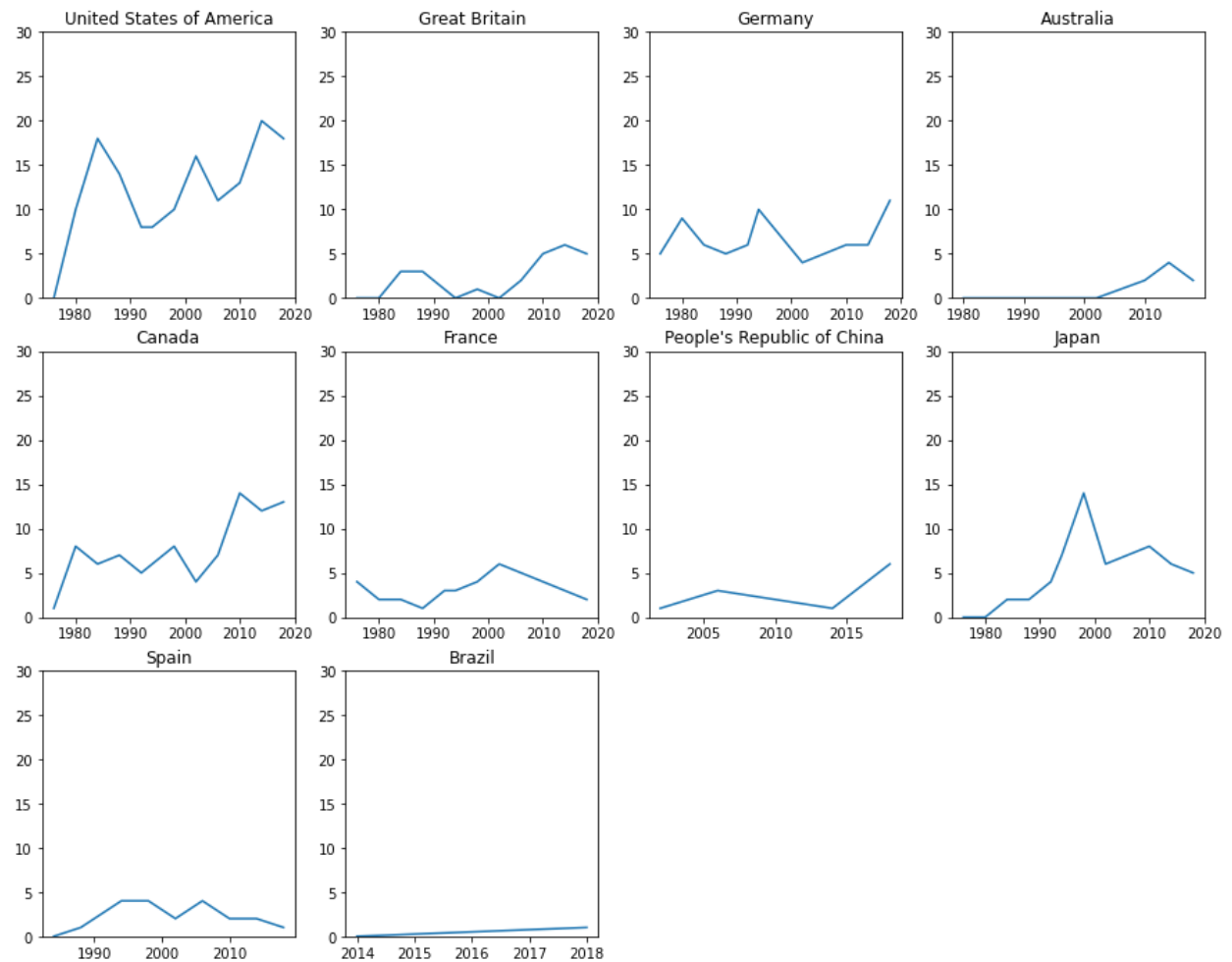


Fig 5.2.7.a



The two set of line charts showed the general trend of female athlete growth over time. However, we believe that there are some flaws in the charts, such as the line chart will go to 0 if there are no female athletes in the year.

5.2.8 Women athlete percentage - geomap

After visualizing the female athlete count in the top ten countries, we want to visualize the female athlete percentage in Paralympics across the world. The best way to do this is using choropleth maps (Fig 5.2.8.a, Fig 5.2.8.b).

Women Percentage in Summer Paralympics

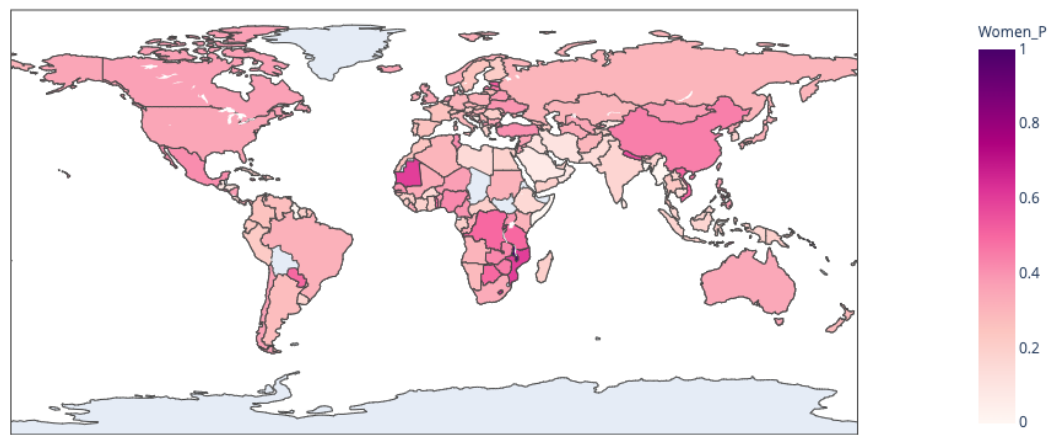


Fig 5.2.8.a

Women Percentage in Winter Paralympics

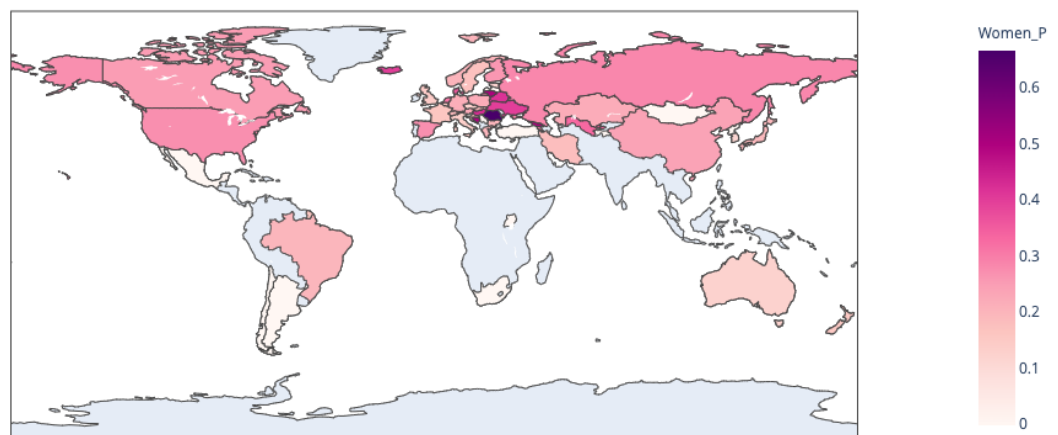


Fig 5.2.8.b

These maps showed the female athlete ratio across the world in both Paralympics. One thing that we noticed is that there are not many countries in Africa that attended the Winter Paralympics.

5.3 Home-Medal Advantages

In this section, we are going to analyze the home Medal advantage in the Paralympics. There are different ways to calculate the home-field advantage in sport. In this report, we are going to calculate the percentage of medals the host country earned compared to the total medal count.

5.3.1 host country medal ratio in summer and winter Paralympics - 1D and 2D scatter plot. We start by creating a 1D scatter plot of the host country medal ratio in Summer and Winter Paralympics side by side (Fig 5.3.1.a).

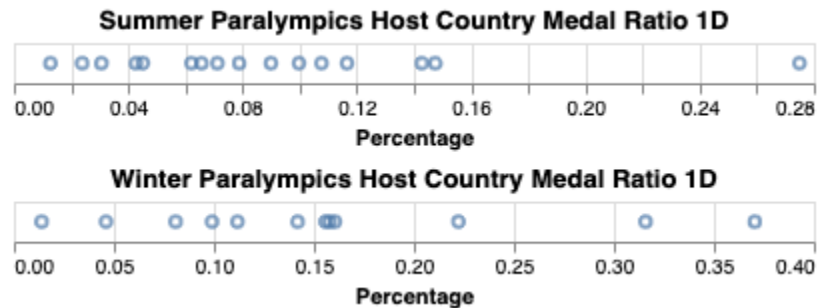
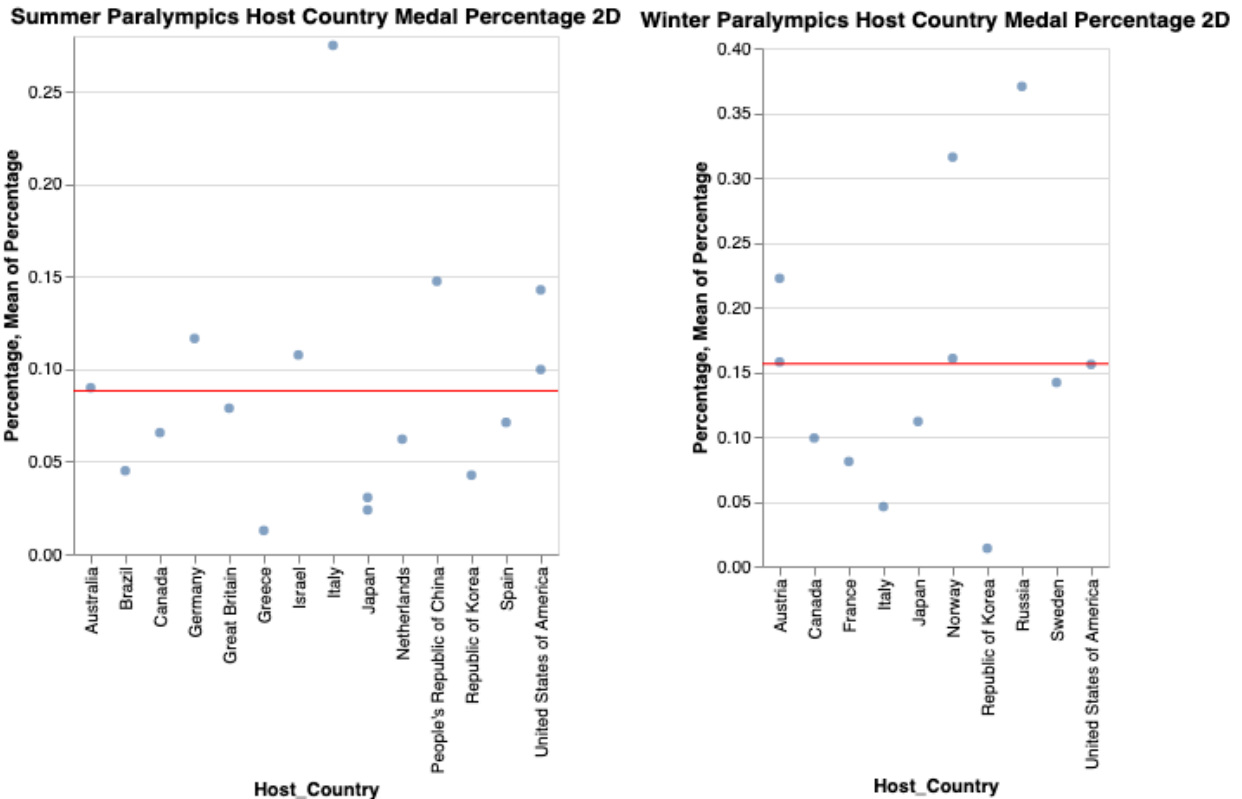


Fig 5.3.1.a

We can see that most of the host country medal percentage is around 0.1 in Summer Paralympics and 0.15 in Winter Paralympics. Let's make this scatter plot 2D with host countries as X-axis, and the average value line in the middle (fig 5.3.1.b).



5.3.1.b

We can see the medal percentage and average line among each host country. We can see that the host countries of Summer Paralympics and Winter Paralympics have an average medal percentage of 8.8% and 15.6%, which means Winter Paralympics has a higher Home Medal Advantage than Summer Paralympics. Other than that, we found interesting data in the Summer Paralympics: Italy got 80 out of 271 medals in total during Summer Paralympics 1960 as the host country.

5.3.2 Summer and Winter Paralympics medal percentage scatter plot and beeswarm scatter plot- host vs guest country

To Paralympicsthe Paralympics country's advantage, we have to calculate the medal ratio in guest countries, too. We added guest country medal percentage into the scatter plot

as jitters (Fig 5.3.2.a, Fig 5.3.2.b).

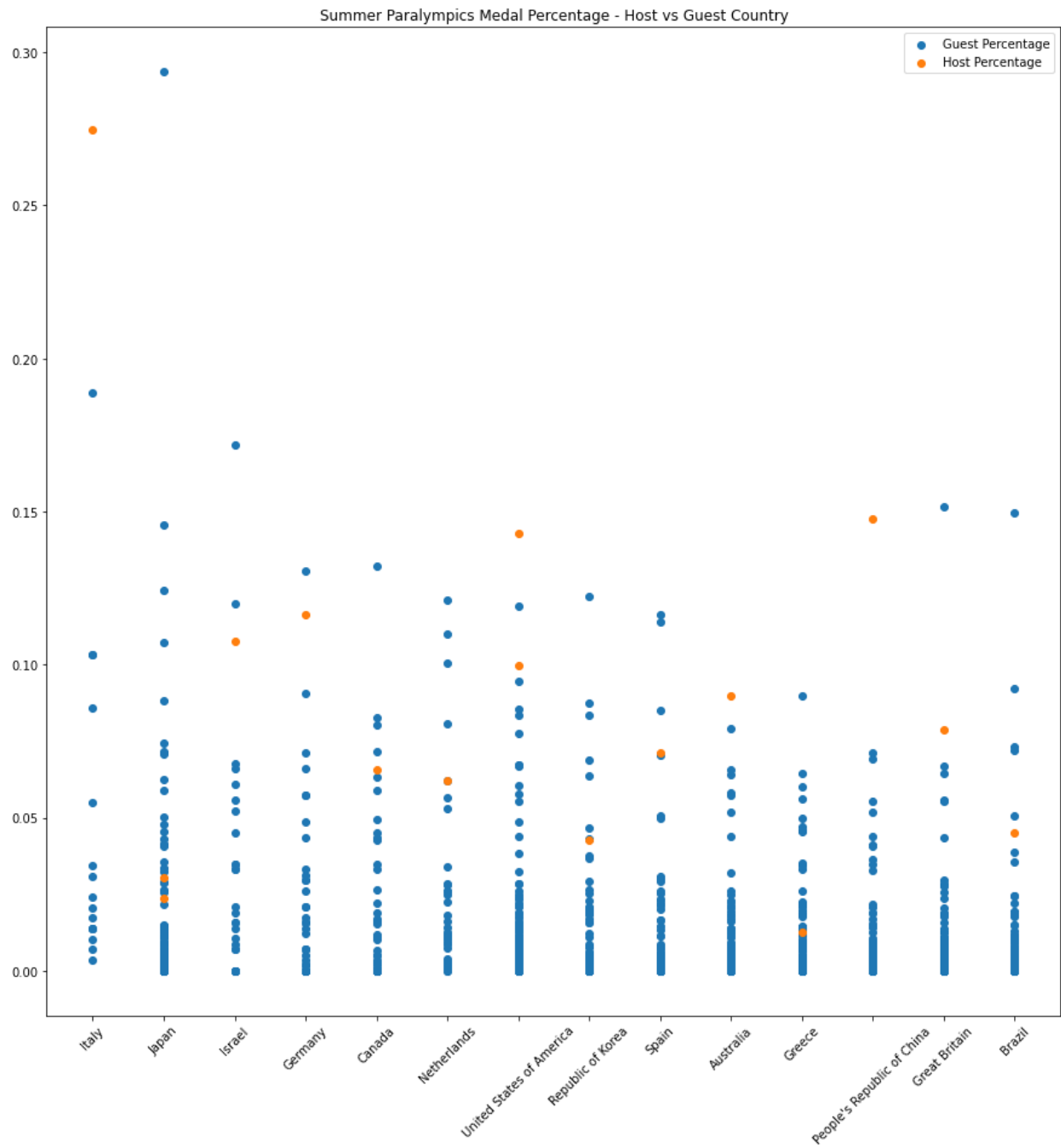


Fig 5.3.2.a - Summer Paralympics

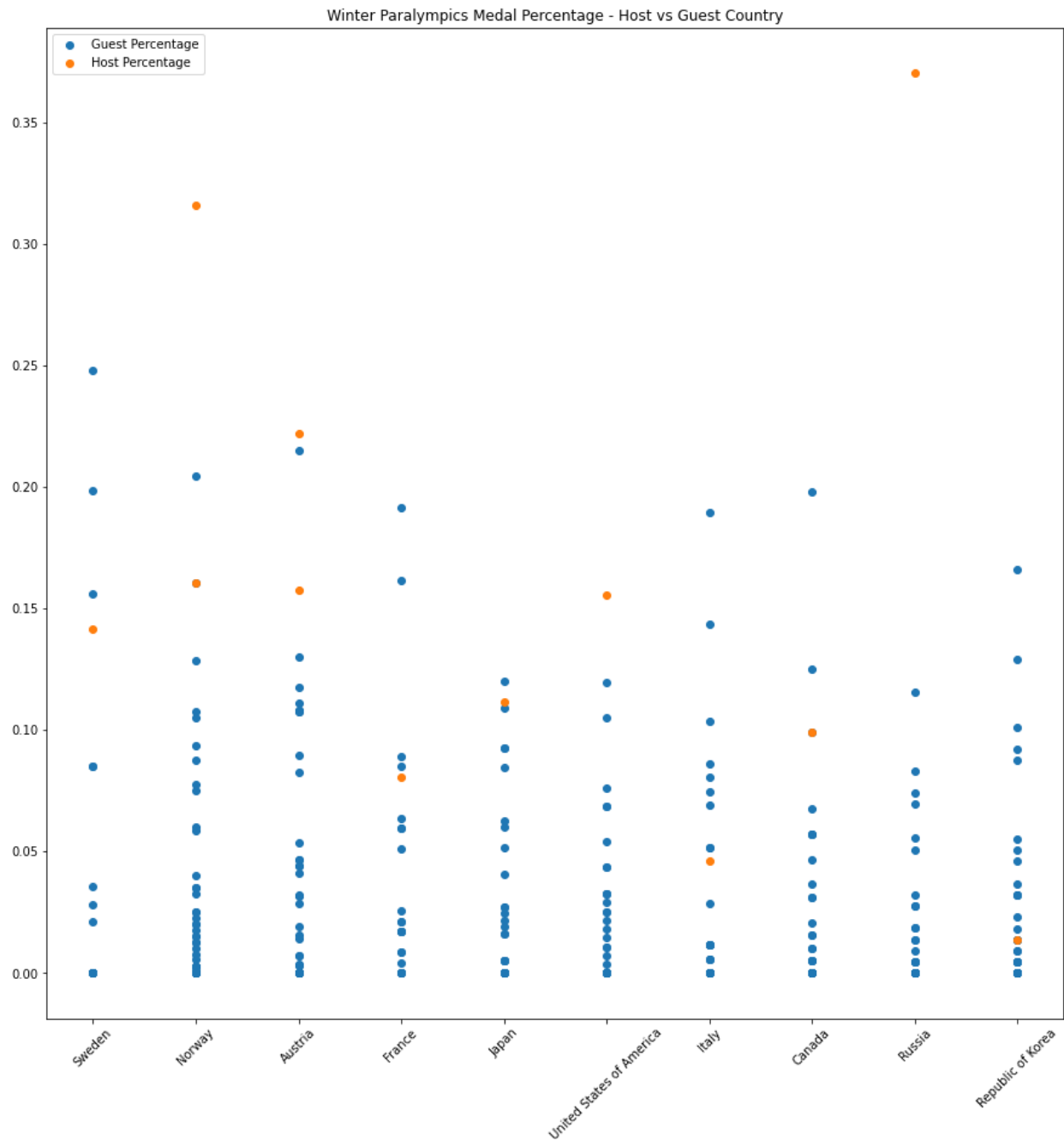


Fig 5.3.2.b - Winter Paralympics

We can now see the guest medal percentage distribution in every paralympics. However, the jitter is stacked up. Let's fix it by drawing beeswarm scatter with seaborn (Fig 5.3.2.c, Fig 5.3.2.d)

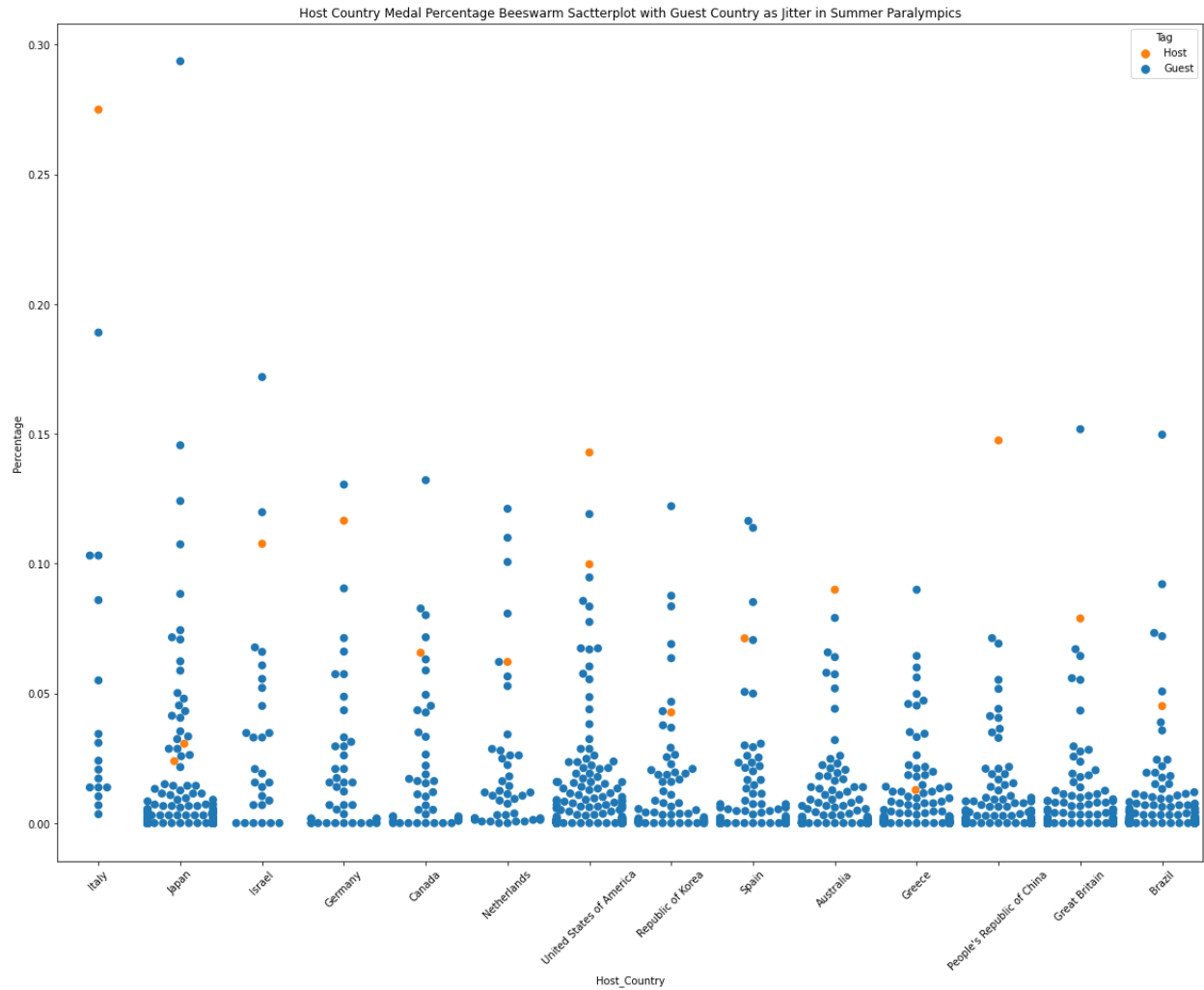


Fig 5.3.2.c - Summer Paralympics

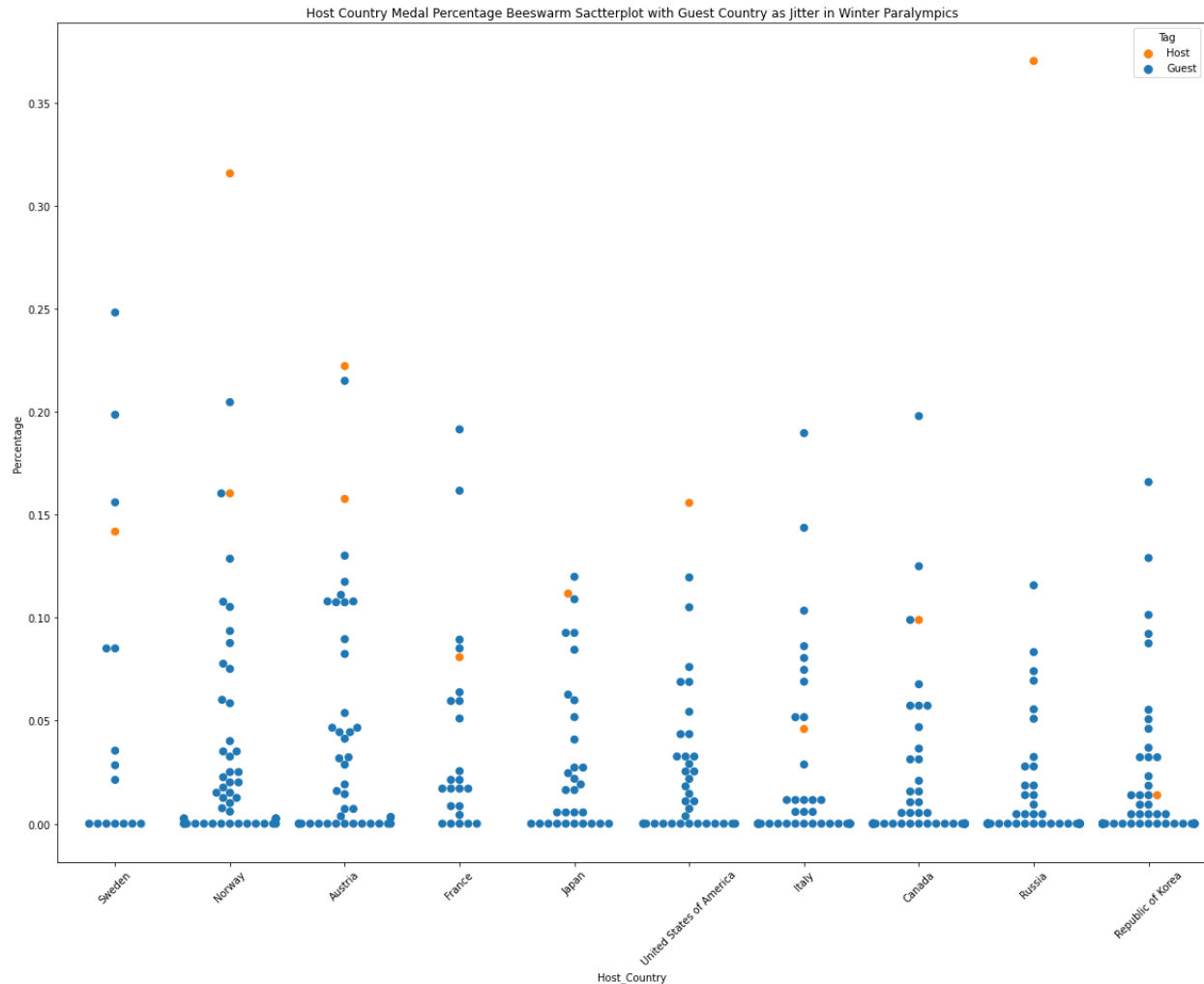


Fig 5.3.2.d - Winter Paralympics

By presenting in beeswarm, we can see the trend of each guest country's medal percentage. For example, we can see that in the Winter Paralympics, when Sweden is the host country, a lot of the guest countries have a medal percentage of 0 (didn't get any medals).

5.3.3 host medal percentage KDE in summer Paralympics, host medal percentage KDE in winter Paralympics

After seeing the host country vs guest country medal percentage, we figured that we can also see the distribution of the host country medal percentage using KDE. We are trying to find the average medal percentage of host countries throughout the Paralympics (Figure 5.3.3.a, Fig 5.3.3.b).

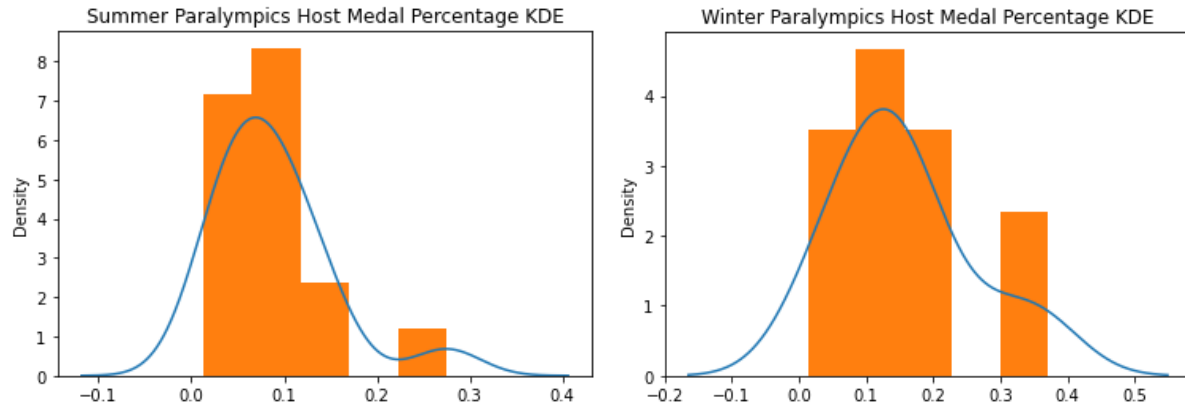


Fig 5.3.3.a

It shows the Histogram-KDEplot of Summer and Winter Paralympics, where host countries for Summer Paralympics mostly have the medal percentage around 0.08, and Winter Paralympics around 0.12. Let's combine the two Paralympics' KDE together (Fig 5.3.3.b).

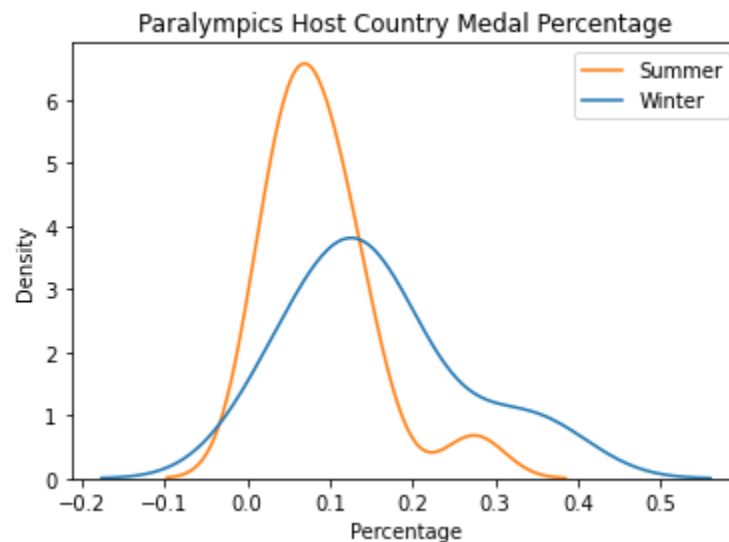


Fig 5.3.3.b

5.4 Medal Dominance

In this section, we want to explore how medals won by different countries changed over time, like which country owns more gold, silver, or bronze medals in summer and winter Paralympics over 60 years. Based on our datasets, the summer Paralympics begins in 1906, and the winter begins in 1976. The visualizations in this section show the Paralympics medal dominant difference between the countries near the Earth's poles and

the equator. Further, we also created interactive graphs to provide a better interface for readers to select specific countries based on their interests.

5.4.1 Medal Count Distribution

To better visualize the specific medal count distribution, we used a stacked bar chart instead of a regular bar chart because it extends one numeric value bar to several categorical variables. This way includes more information and presents more data in one chart. We separate the bar chart into two to present the differences between summer and winter, and each bar contains the number of medals information for gold, silver, and bronze medals separately. The legend shows specific colors used in the graph. The y-axis is the number of medals and the x-axis is different countries. From the chart, Fig 5.4.1, we can see the top 10 countries which won the most medals, and the United States of America wins the most medals and golds, and the total number of medals is above 2000, but the USA didn't keep top one in the winter Paralympics. Instead, the top countries in winter are mostly from Northern Europe, like Germany, Austria, and Norway, which might be explained by the cold geographic location.

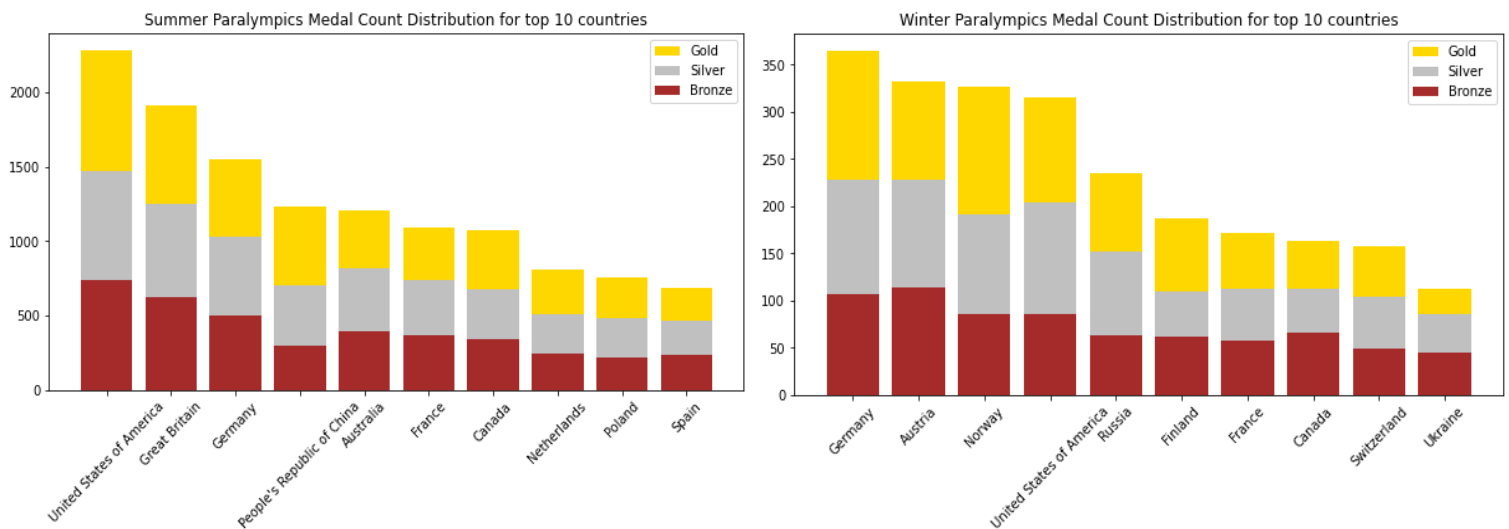


Fig 5.4.1 Summer/Winter Paralympics Medal Count Distribution for Top 10 Countries

5.4.2 Gold Medal Trends Line Charts

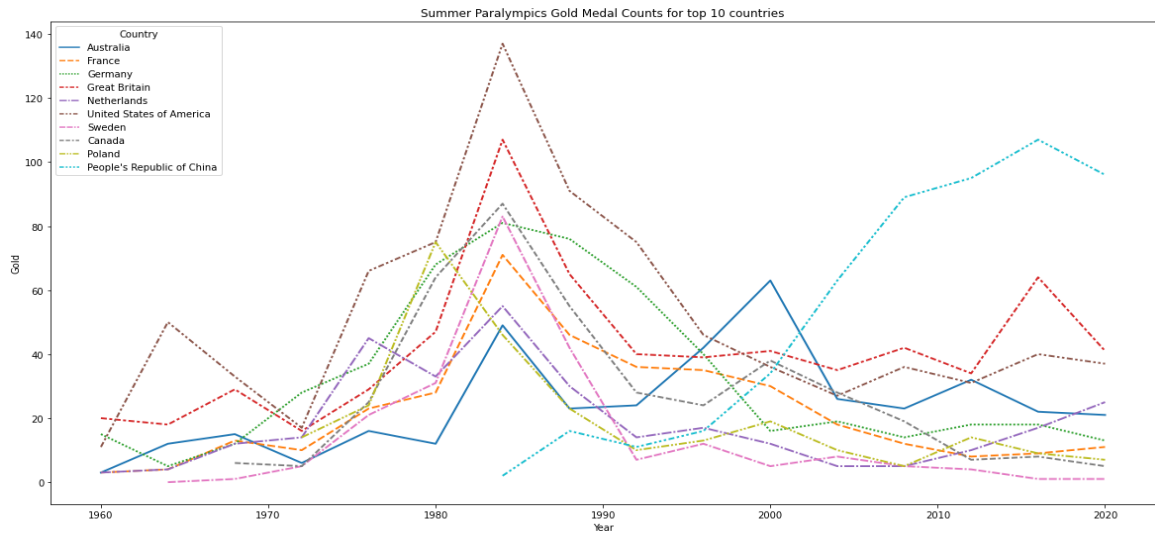


Fig 5.4.2 a

To visualize the gold medal earned trends, we draw two line charts including 10 countries with different colors. As can be seen below, Fig 5.4.2 a, 8 countries reached their peaks between the year 1980 and 1990 on summer Paralympics; China joined this contest in 1984 and has an increasing trend for the following years. As for the winter contest, from Fig 5.4.2 b, Austria also reached its peak in 1984 and has a decreasing trend later. Except for Russia and the USA, most of the top countries have a downtrend on their gold earned. We can also see from Fig 5.4.2 b, that Poland squeezed to the top 10 in 1988 and China began to win gold in 1984.

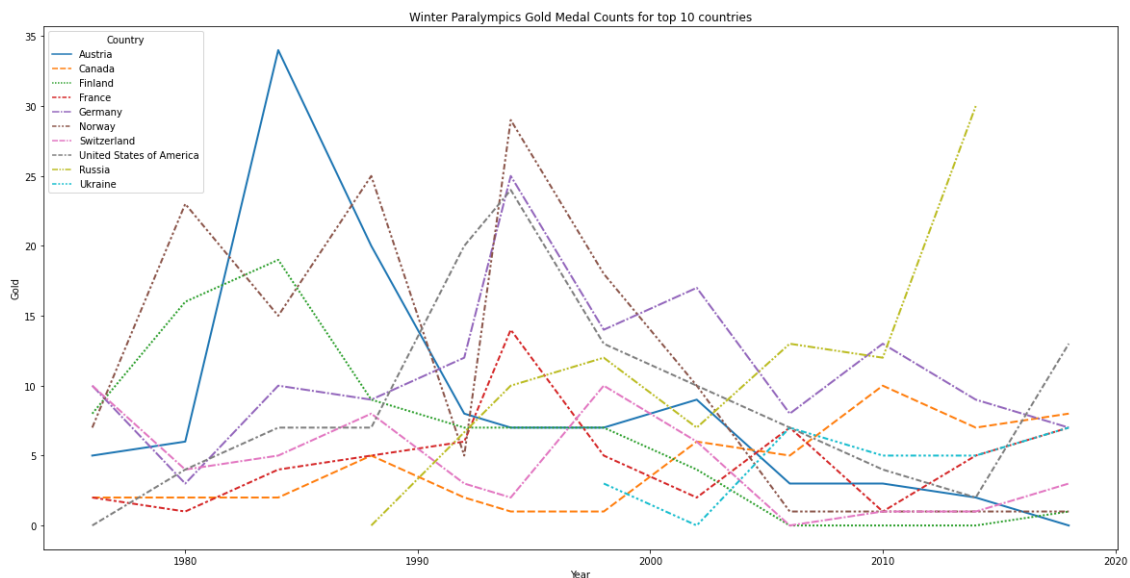


Fig 5.4.2 b

5.4.3 Interactive Visualizations

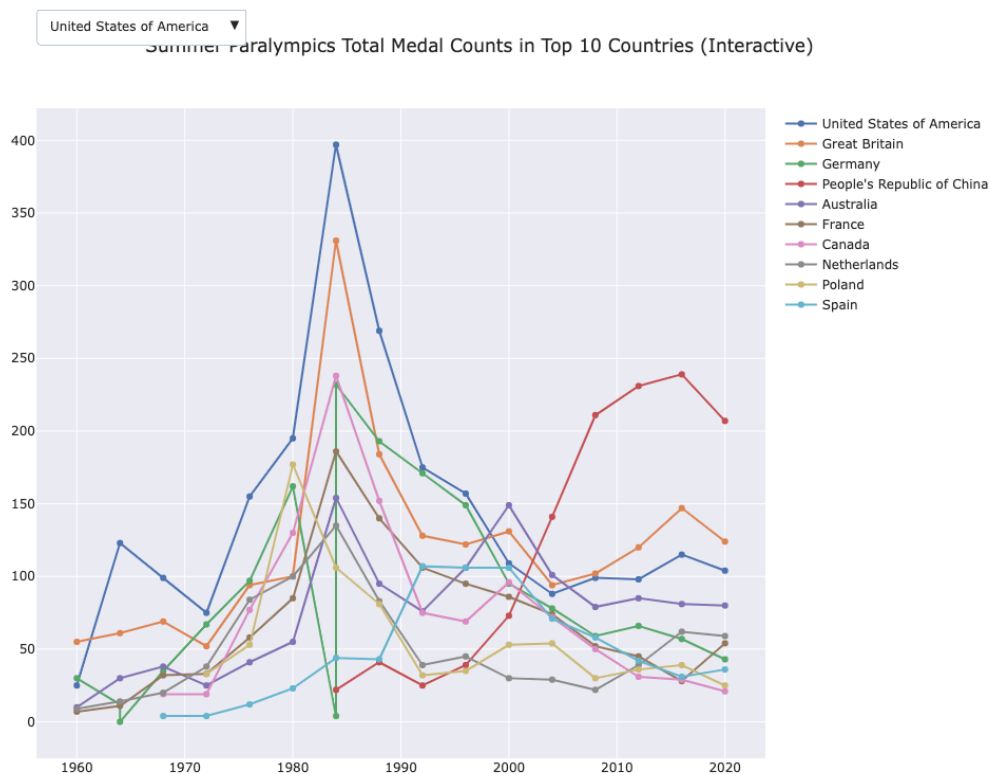


Fig 5.4.3

To provide a better experience for people to see the overall trends of all the countries or one specific country, we added two interactive line charts, summer and winter Paralympics, using the Plotly package. The x-axis is the year of holding the Paralympics, and the y-axis is the number of total medals. Each country is separated by different colors and each dot presents the number of medals this country earned in that contest. People can select different countries in the dropdown list and put their mouse on each dot to see the detailed number and labels. As displayed in Fig 5.4.3.

6. Discussions

6.1 Limitation

This project focused on gender (mainly female) ratio, medal dominance, and home medal advantage in past Paralympics. However, we only acquired the summarized data for the Paralympics, such as the total medal and player count for each country. This limited our data analysis and visualization from analyzing individual athletes in Paralympics.

6.2 Future Plan

First, we created multiple useful data frames that could be contributed online during some of our visualization processes. After cleaning those data, we will contribute it on Kaggle for people to use.

The To

Second, some of our charts could be visually improved. Around half of our charts are visualized by Matplotlib. Matplotlib is a very powerful library in python, but we believe that some of the charts could be drawn better using different tools, such as seaborn and Altair.

Lastly, this project can be expanded. Using the current database, we can visualize the average medal count for countries, medal efficiencies (athlete count vs. medal count), etc. If more data is available, visualizations like most viewed sports and most popular sports among athletes could be presented in the future.

6.3 Failed Experiments

During this project, we started by analyzing Olympics and Paralympics data and Twitter data. We underestimated the complexity and time of data cleaning and cross-comparing, and most of the related topics have already been visualized. If we insist on visualizing all three topics, our project would be shallow and disorganized. After realizing our limitations, we decided to narrow to only Paralympics and dig deep into the data. Our team learned a valuable lesson from this failed attempt. It's important on how deep you can get from data, not how much data you can get.

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