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SI 649 001

Communicative Visualization - Interactive

Learning Objectives

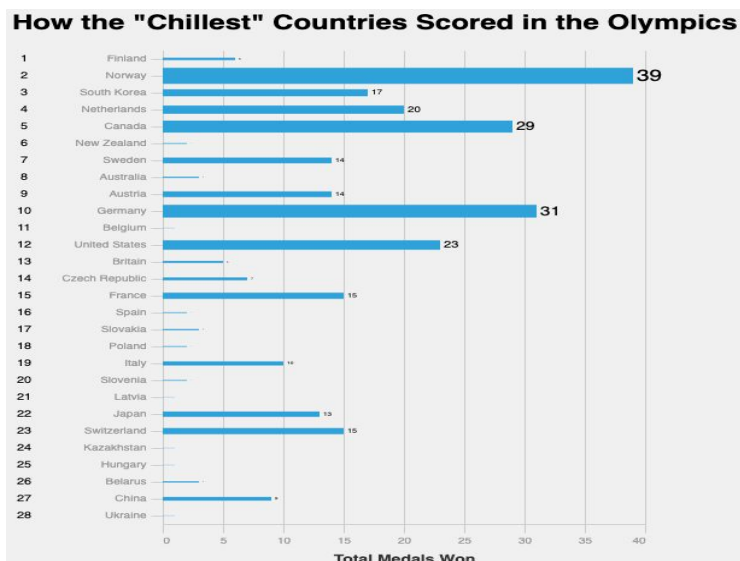
The viewer will gain clarity into the variety of factors that contributed to Norway's success in the 2018 Winter Olympics through the following objectives:

1. **The viewer will recognize** Norway's ranking in the 2018 Winter Olympics
2. **The viewer will be able to extrapolate** the correlation between the success of Norway, and other high olymping scoring countries, and their human development index.

Design Process

To begin the second part of our communicative visualization project, I started with the visualizations I created in the first assignment. I wanted to address some of the feedback I received from the assignment so as I was designing, I tried to keep in the need to make my encodings clear and relevant. To do this, I decided to avoid double encoding as much as possible and focused on having enough variation in my visualizations so that their purpose was easily understandable.

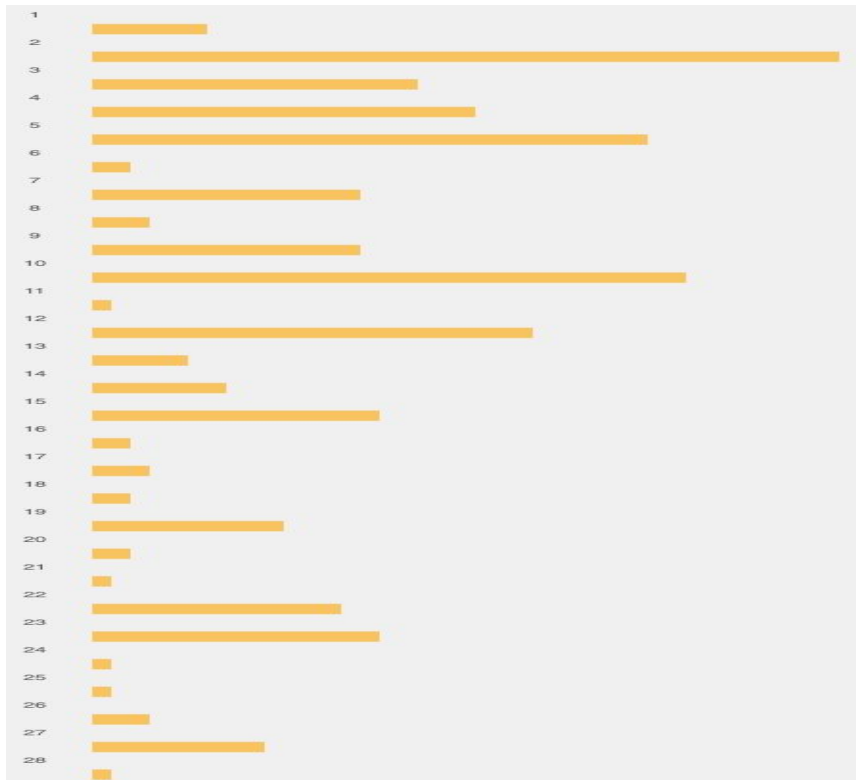
Visualization 1



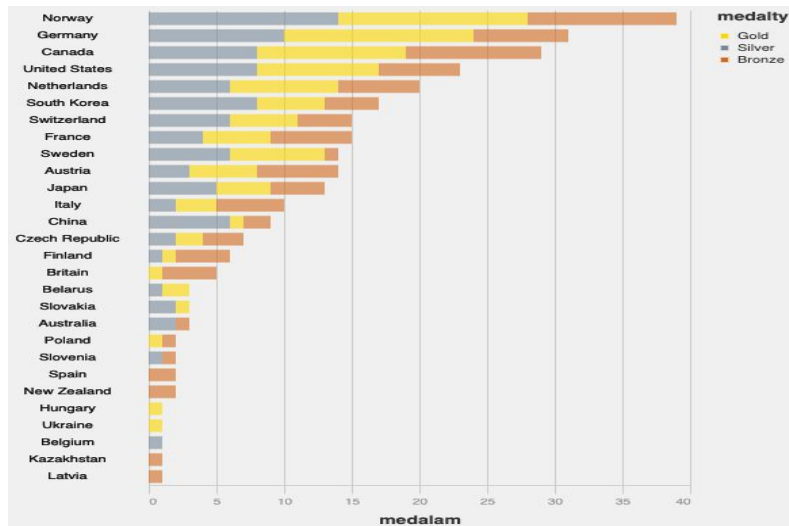
This visualization was based off of the previous chart "How the chilliest countries scored in the Olympics". The original purpose of this chart was to show which countries scored the highest in

the olympics. I realized however the extra encodings I added for happiness and gross national income only served to further convolute the visualization. The additions I made to this visualization were also redundant as happiness, income, etc were already shown in other charts. I decided to make my primary focus Olympic ranking.

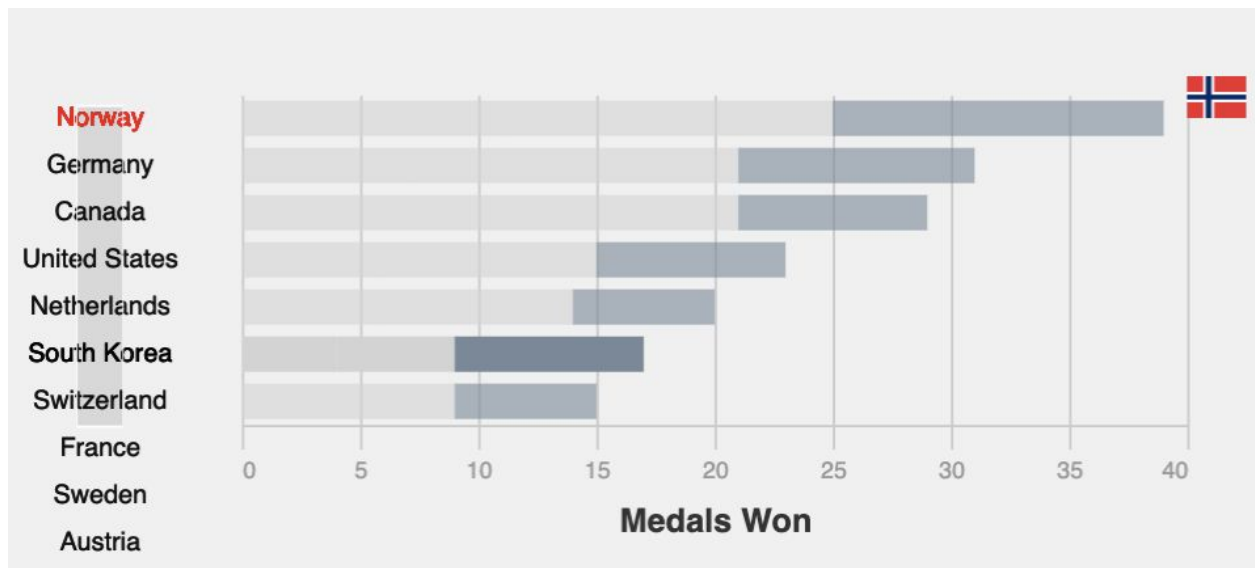
To start, I removed the size encoding from the previous visualization. Then, I borrowed inspiration from the interactivity lab to attempt to make a visualization that would allow you to filter the bars by scrubbing through the text layer on the right side. I made a simple visualization to see if I could take what I learned through that lab and add it to the project.



I was successfully able to implement interactivity in the visualization but I realized that a bar graph that simply shows how many medals were won by each country is a little too simple to stand out on its own. I decided to try to create a layered bar graph so the viewer would be able to see how many gold, silver, and bronze were won by each country. This implementation proved difficult at first, but I soon realized my data table was in the incorrect form to be used for layered graphs. Thanks to one of our previous videos, I was able to use transform fold to correctly group medal types.

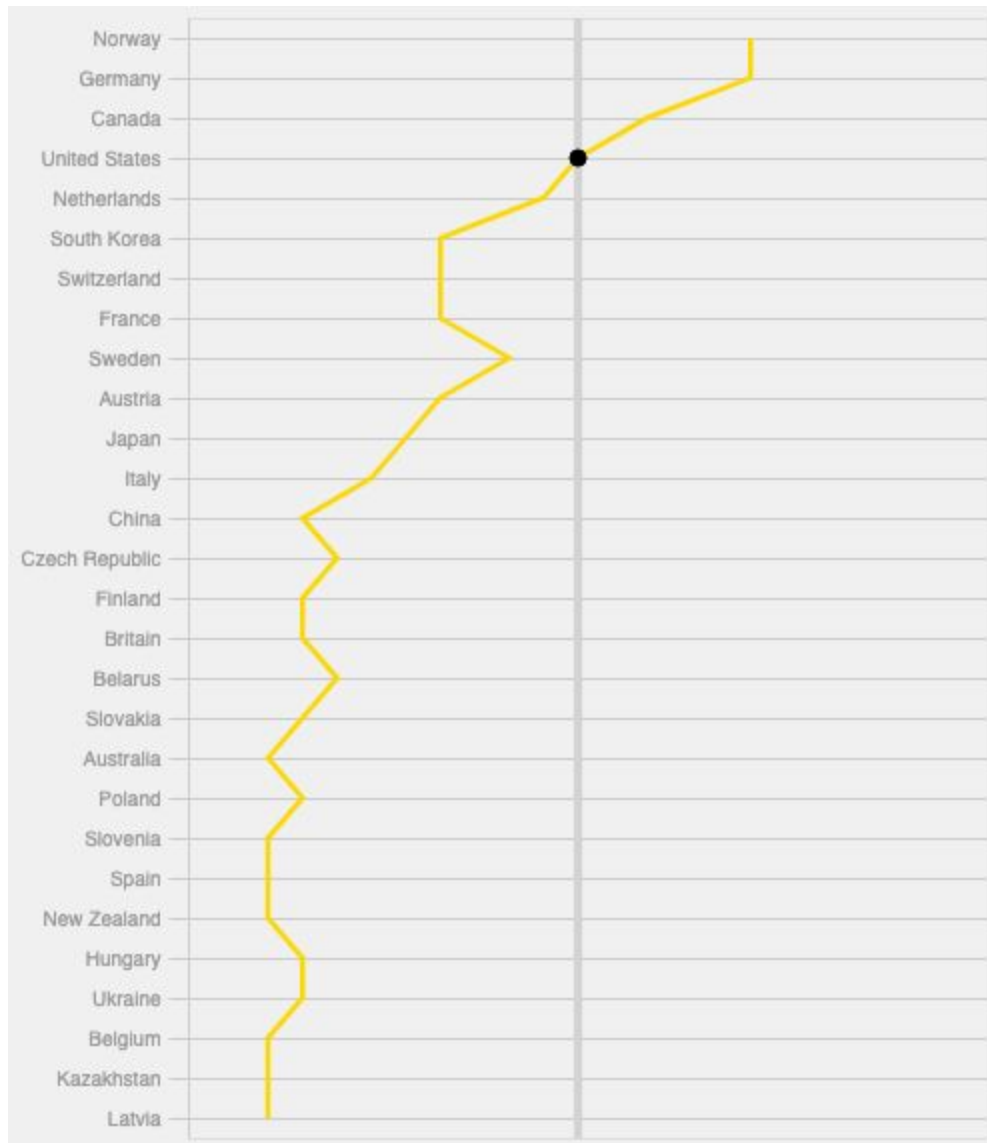


With this visualization I knew I was on track, but there were just a few things I wanted to improve. Keeping in line with learning objective 1, I wanted Norway to be seen by users immediately. To accomplish this I added an image layer of the flag of Norway. My hope was that the variation in the pattern presented by the image would allow users to rely on precognition to bring their attention to the country. I also wanted to make it even easier for users to see the breakdown of medal types by country, so I added a dropdown that features a color condition that greys own unselected medal types.

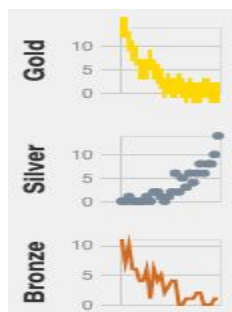


Visualization 1b

As I continued working towards learning objective 1, I wanted to add another visualization that could provide useful information to the user. As the layered bar graph can not show medal types on a shared axis, I wanted to find some way to show the spread of medal types during the 2018 Winter Olympics.



I started first by borrowing inspiration from our interactivity homework to create a compound chart that shows gold medals won as a line graph, with marks to show stats for individual countries. I spent some time playing with the look and feel of this visualization resizing the chart and trying a few different visualization forms.

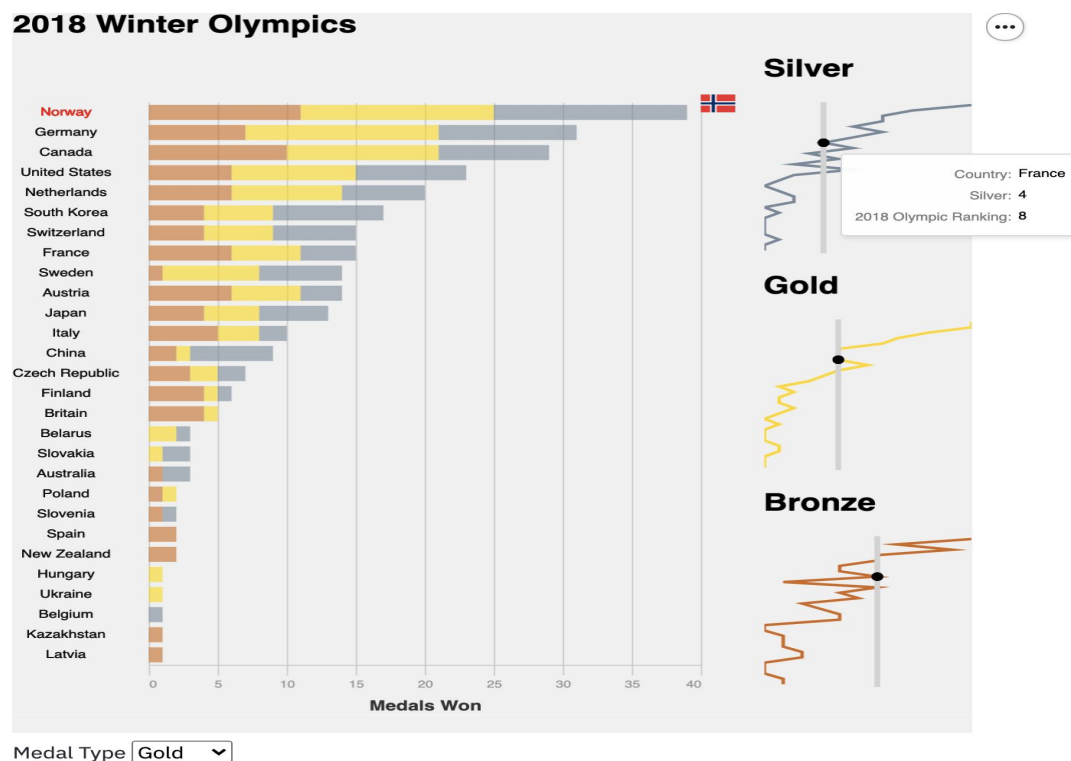


Eventually, I decided the best choice was to create a compound chart of small multiples showing each medal type as a line graph using the same interactivity mentioned above. With this visualization users are able to see the exact spread of medals., When hovering over the dots, users are able to see the score breakdown for the respective medal type. With this visualization users will be able to hover over a point in one of the compound charts and see the total number of medals for each type

Putting it all together

Finally, I decided to attach the two visualizations. My goal was to use these first two visualizations as an introductory portion of the assignment. Viewers will be able to extract some information about Norway's Olympic ranking before moving on two understanding some of the correlating factors to Norway's success.

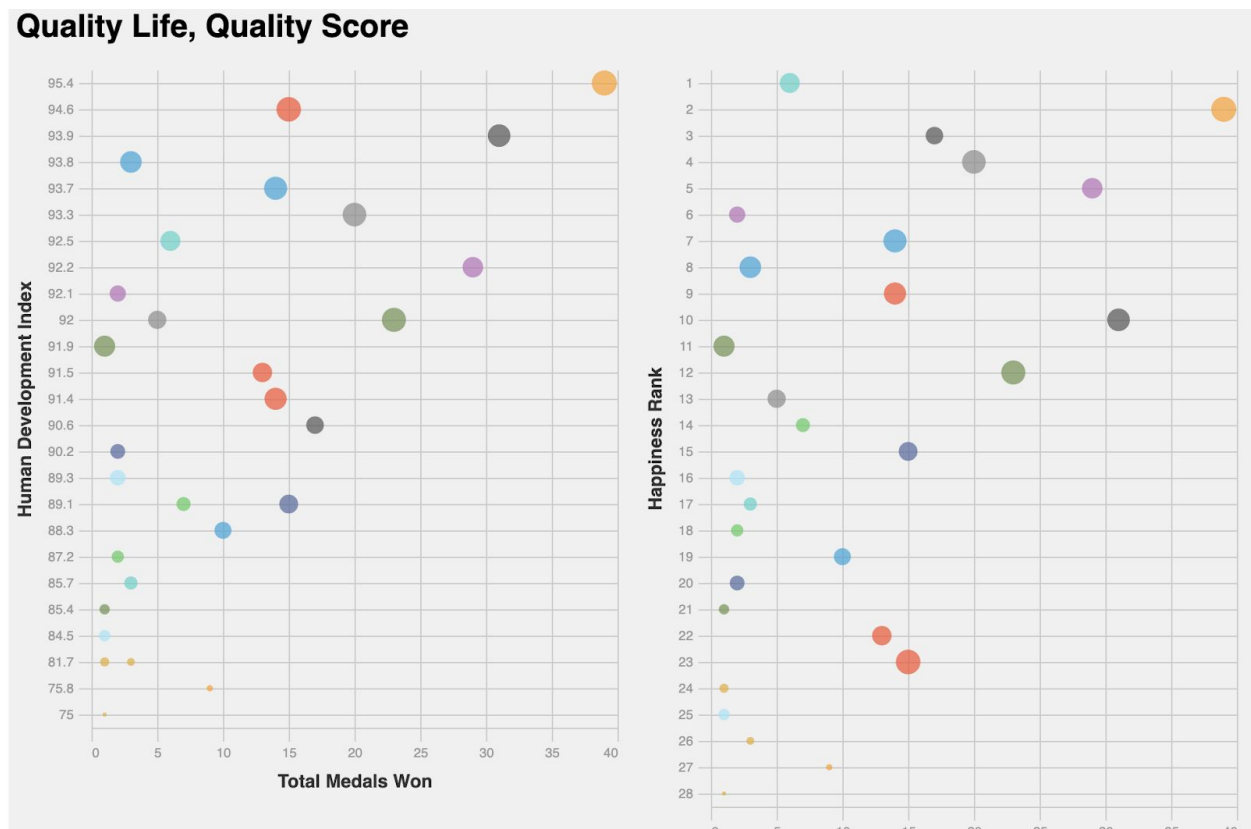
Interactivity: opacity condition on hover, filter on selection, tooltips for stats, dropdown color condition



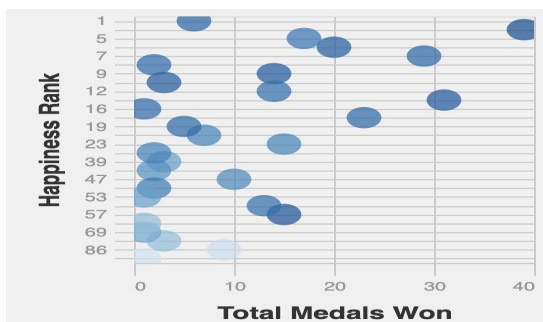
Visualization 2

My final visualization sought to meet my second learning objective. I wanted users to be able to see all of the different factors related to quality of life and how it forms an overwhelmingly positive correlation to success in the Olympics. Again I started with the charts I created in part 1 of the communicative visualization project. I think where I went wrong on this first interaction is I tried to create one chart that incorporated all the factors that contribute to a country's quality of

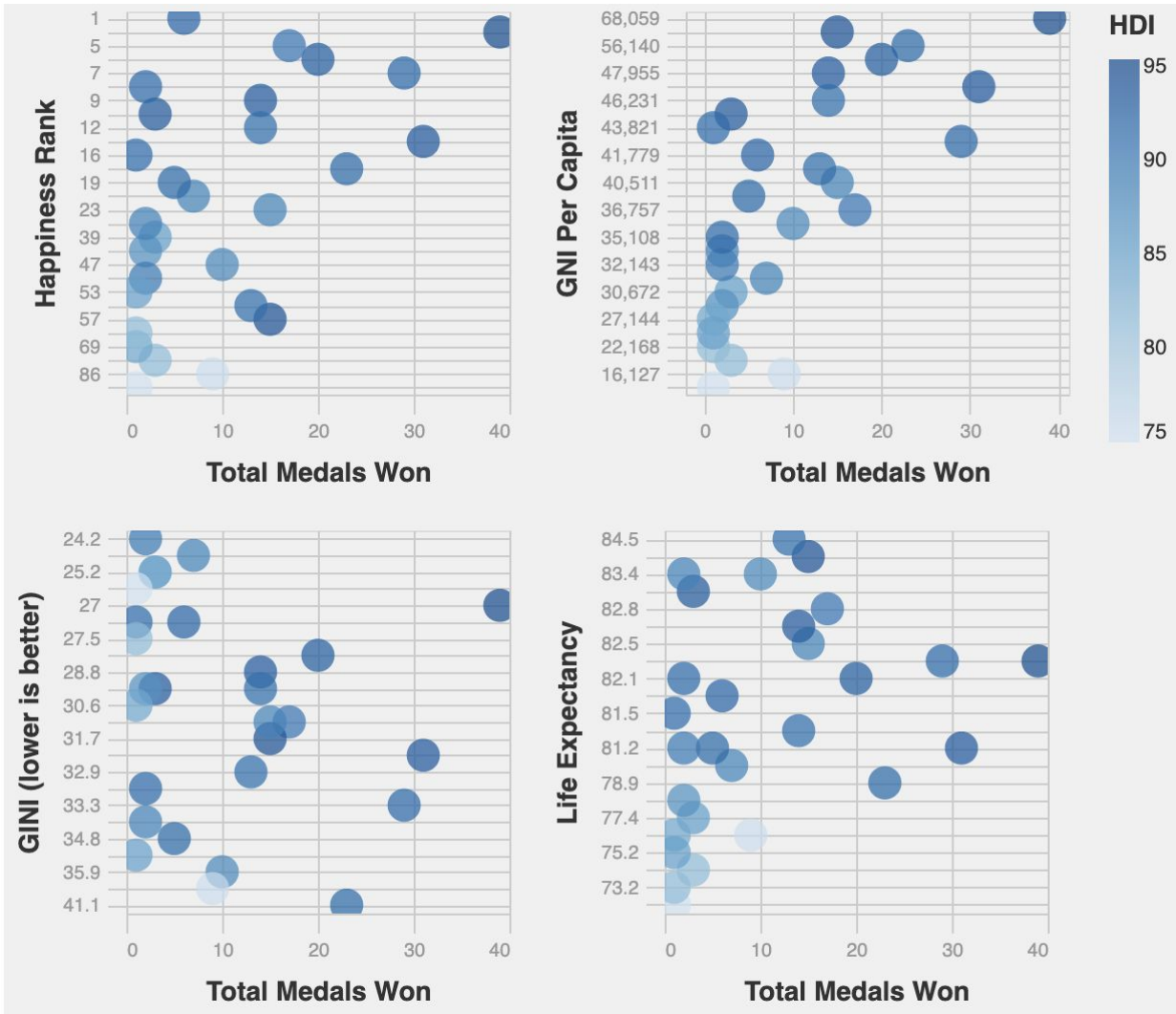
life. Because of this, the objective of the visualization could have been lost to some viewers. It wasn't immediately clear how the chart was encoded or what story it was trying to tell.



To make improvements, I started with a really simple visualization that showed happiness rank by country with the total number of medals won. I also encoded color by the country's human development index.



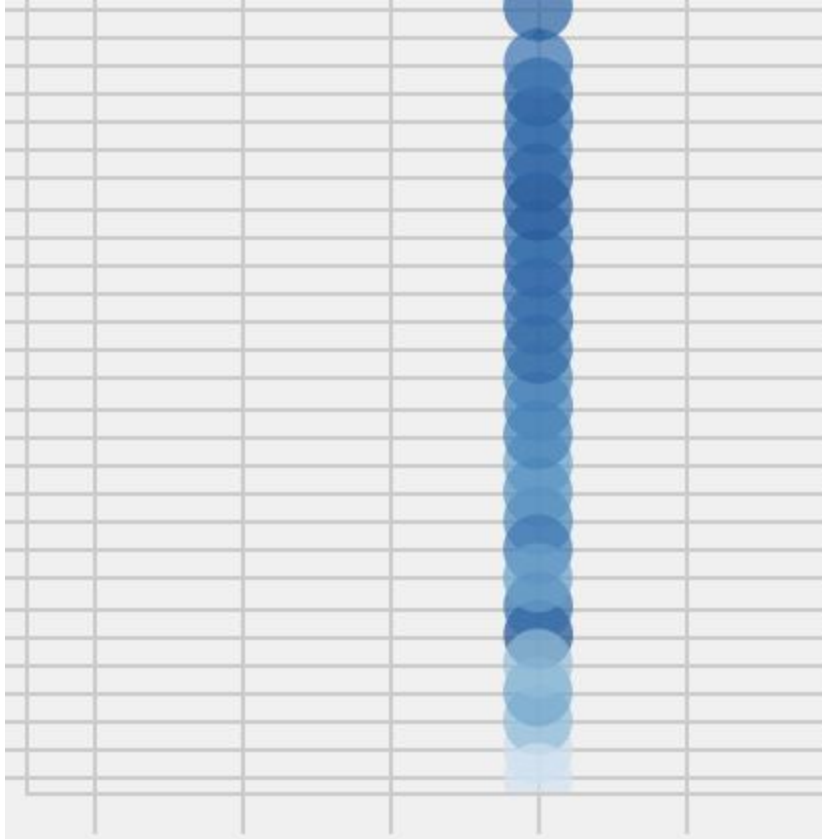
I really liked the simple look and feel of this visualization and I thought the color encoded did a great job of showing that happier countries seem to have a higher HDI and score better in the Olympics. To take this a step further, I decided to utilize more of the data I collected for the project. I decided to create small multiples that encoded color by HDI and X by total medals won, but featured different aspects of a country's human development index (life expectancy, income) while adding some additional factors that can be assumed to be attributed to a country's quality of life (happiness, income equality).



With this new static visualization completed, I decided to add some interactivity. My first step was to add tooltips that give all the relevant information for a mark when it is selected by a user. Then, I created a slider that could adjust the size of the marks in the scatterplot by HDI. Doing so allows viewers to filter their attention to specific data points in the visualization. I also added a slider that uses a color condition to gray out marks within a certain rank, allowing users to filter their attention among countries with a specific olympic rating. My goal in these two layers of interactivity, was that by giving viewers the ability to distill the data presented to them, they would be able to easily extrapolate the correlation between Norway's success and quality of life.



Finally, I decided to add zooming and panning to allow for an extra layer of interpretation from users. With the color encoding and the ability to zoom out, these scatter plots become a heatmap, of sorts, showing HDI and Olympic ranking as it relates to the 4 categories shown in the visualization.



Justification & Principles

The first visualization, featuring the bar and line graphs satisfies learning objective 1 “The viewer will recognize Norway’s ranking in the 2018 Winter Olympics”. The visualization accomplishes this through the bar graph which shows Norway's lead in the winter olympics and the line graph which allows users to see a more detailed look at that lead by medal type.

The second visualization, featuring the small multiple scatter plots satisfies learning objective 2, “The viewer will be able extrapolate the correlation between the success of Norway, and other high olympic scoring countries, and their quality of life”. The visualization accomplishes this by showing the relationship between total number of medals won by country and their human development index score along with some of the many factors relating to the index (income, life expectancy, etc).

- Salience
 - In visualization 1 the red highlight on Norway as well as the flag accomplishes target detection allowing users to focus their attention on Norway.
- Just Noticeable Difference

- Color gradient used for HDI in visualization 2 accomplishes for pattern recognition allowing users to distinguish the relationship between medals won and human development index.
- Limitations on estimation
 - One of the changes I made in visualization 1, was to forgo encoding bar width as I did in the static version of the assignment as we are much better at estimating length rather than size.
- Graphical integrity
 - Use of small multiples in visualization 2 allows for clean data dense charts. Avoiding multiple encodings in one chart, the compound charts each take on a set of encoding and variations
- Selection
 - Tool tips were added to each chart to provide more information to users upon hovering.
- Connection
 - In visualization 1 when hovering over a point in one of the compound line graph you're able to see the relationship that point has with the other compound charts.
 - Brushing in the bar graph of visualization 1 allows you to explore the relationship between the selected countries.
- Reconfiguration
 - Dropdown in visualization 1 allows you to reconfigure the bar graph to indicate the medal type you would like to focus on.
- Abstraction/Elaboration
 - Size and color sliders in visualization 2 allow you to gray out or minimize marks that do not fit the user's parameters allowing for abstraction.

Evaluation

- Domain
 - **Upstream:** The project started with the assumption that users would find it shocking that Norway is a consistently high scorer in the Olympics. The problem I designed my visualizations towards was to reveal that more factors may contribute to a country's olympic success than just it's size. Before starting the project I would've conducted research to discover whether or not people find Norway's ranking shocking or if there is an assumption from users that size is a marker for a country's success. This could be accomplished through survey questions that ask participants what factors they feel contribute to Olympic success. This also could be accomplished through interviews to ask deeper questions. One method in particular that would yield some interesting insight would be card sorting, giving

participants cards corresponding to each country and asking them to rank which country's they believe to be in the top ten and why.

- **Downstream:** To validate the domain I could again utilize card sorting in an experiment where I had one group of participants do the activity without experiencing the communicative visualization and the other group doing the activity after experiencing the visualization. This would 1. test to see if participants were able to retain the information in visualization 1 with the learning objective of retaining knowledge on Norway's Olympic ranking and 2. test if participants who experienced the visualization are able to recall the relationship between HDI and medals won in their justification.
- **Abstraction**
 - **Downstream:** To validate this layer of my visualization, I would conduct interviews on my target population comparing the visualizations I produced with a visualization that approaches the same topic by comparing different elements. I would want to know: if factoring population size into some of my charts would have been more useful, if some elements such as happiness ranking and GINI were seen as unnecessary, if it would have been more effective to show value assigned to medal type, if factors like average national temperature, access to sporting facilities, etc would have been better comparison points to use than what I chose.
- **Technique**
 - **Upstream:** In the previous section of this blog post I outlined the principles and justifications used to determine my technique and approach to my visualizations
 - **Downstream:** I would employ a variety of usability research methods to validate the effectiveness of my technique. Some experiments I might include:
 - Using eye tracking to test the salience of certain elements in the visualization
 - Error testing. Asking participants questions after viewing certain portions of the visualization. To test filtering on the bar graphs I may ask them which between two countries received less silver medals . To test the effectiveness of sliders in the small multiples scatter plot I would ask participants which of two countries had a lower HDI score.

Final Thoughts

I spent a lot of time on this portion of our communicative visualization assignment trying to figure out how to improve upon the experience of my static visualization and how to use interactivity to allow users more exploration and freedom. The goal for this project is fairly simple, to provide users the ability to know where Norway stands in Olympic ranking and to begin to start drawing

conclusions as to why. I believe my visualizations successfully reflected the simplicity of my objectives with clarity and expressiveness while giving users the freedom and flexibility to dive deeper and compare elements, such as life expectancy and income equality, that they may not have otherwise identified as relevant. I hope you enjoyed my project!