

CS765 Design Challenge 2

Evaluation Survey

December 12, 2021

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1 Background

The goal of this survey is to study how you can interpret information from a visualization as it is scaled down to tiny sizes. What kinds of conclusions can you draw from the graphics? The study will test the accuracy of your results as well as the time it takes to answer each question (I will manually time you for each question). The goal is to get the correct answer in the quickest time.

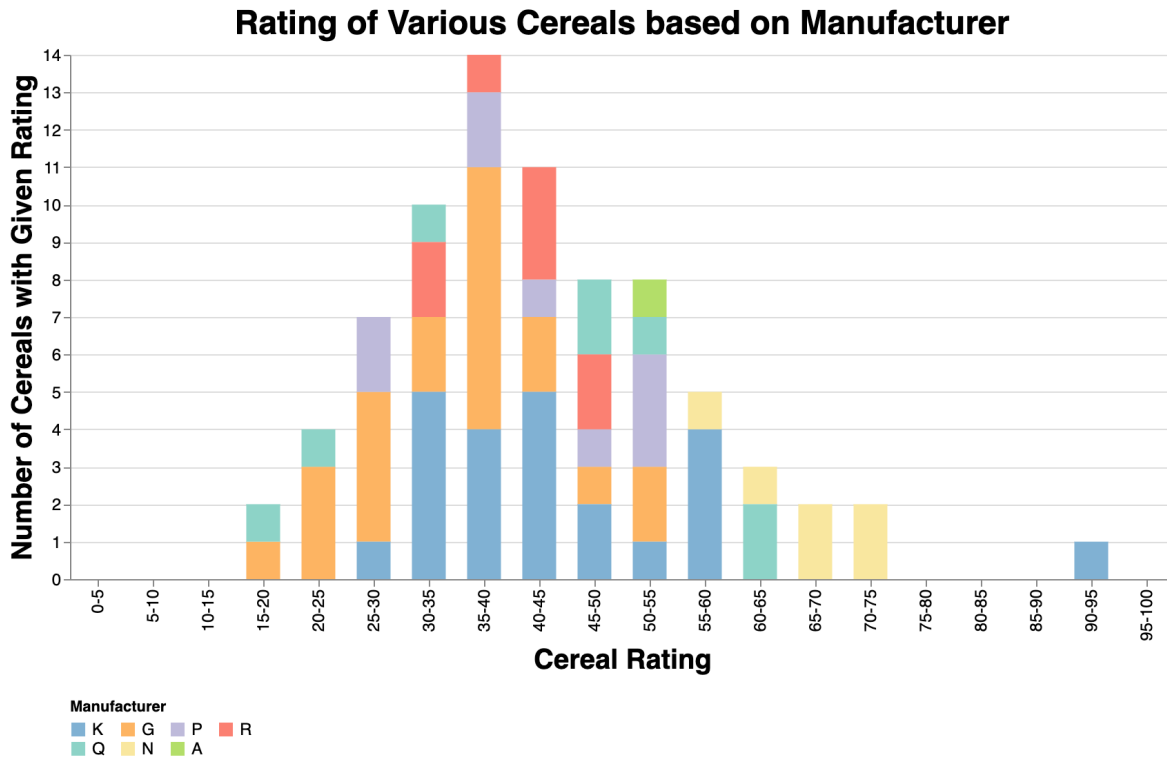
There are two versions of this survey (one for the naive baseline design and one for my project implementation). You will only see one of the versions. The questions are all shown on individual pages to make sure there is no interference between the visualizations shown. There are a total of 4 questions for each version. Additionally there is an instruction page as the first page for each version, describing the types of visualizations you will be looking at (for a different dataset).

2 Version 1: Naive Design

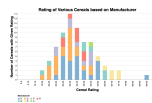
Instructions:

The naive design does a very simple vector art scaling of the large scale figure. An example is shown in the two images here below (note this example is for a different dataset than what you will see later).

The original image:



The naive scaling of the original design:

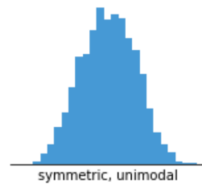


The dataset you will see in the next four questions deals with museums. The x-axis represents the different amounts of revenue buckets a museum generated through the year. The y-axis represents the number of museums that fell into each of the buckets. The categories in the stacked bar chart represent the museum type (history museum, art museum, ...).

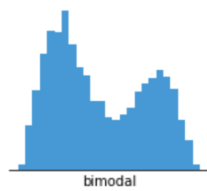


Question 1: Which option most accurately describes the overall distribution of the dataset seen in this visualization?

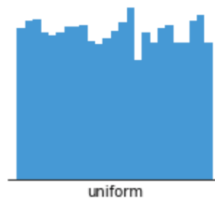
1. Unimodal



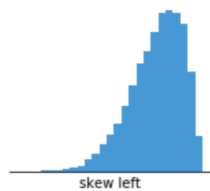
2. Bimodal



3. Uniform



4. Skewed Left





Question 2: Which area on the x-axis represents where we have a bar with the greatest proportion of art museums (red) in the stacked bar chart?



1. Option 1
2. Option 2
3. Option 3
4. Option 4
5. Option 5

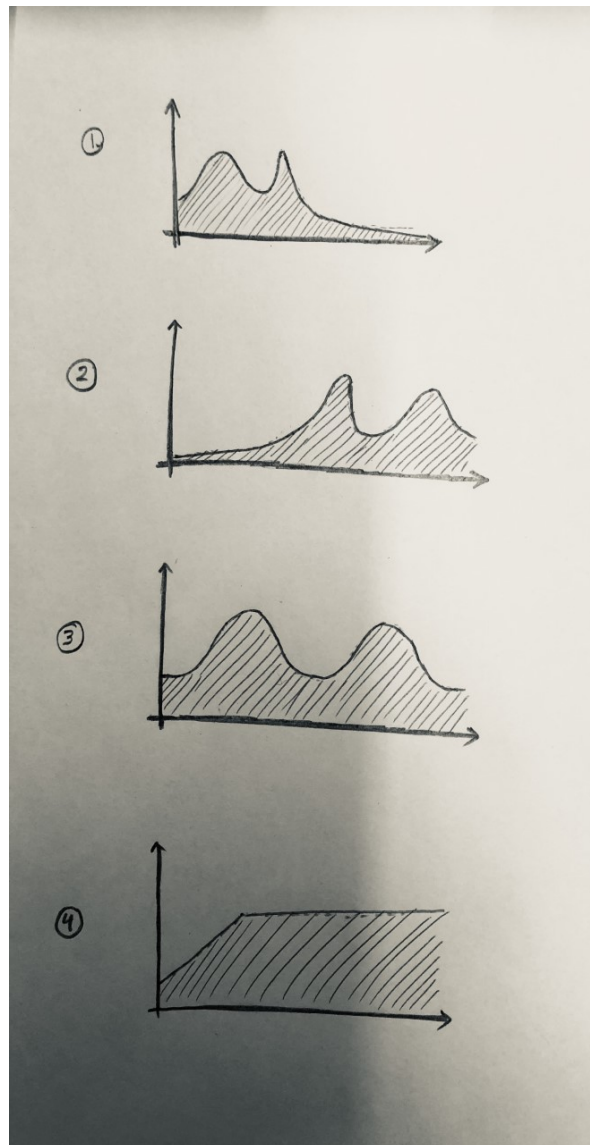


Question 3: Approximately what proportion of the data values in the first quarter of the x-values come from the "general museum" (orange) category?

1. 5%
2. 20%
3. 35%
4. 50%
5. 65%



Question 4: Which of the following most accurately represents an area graph of the complete dataset.



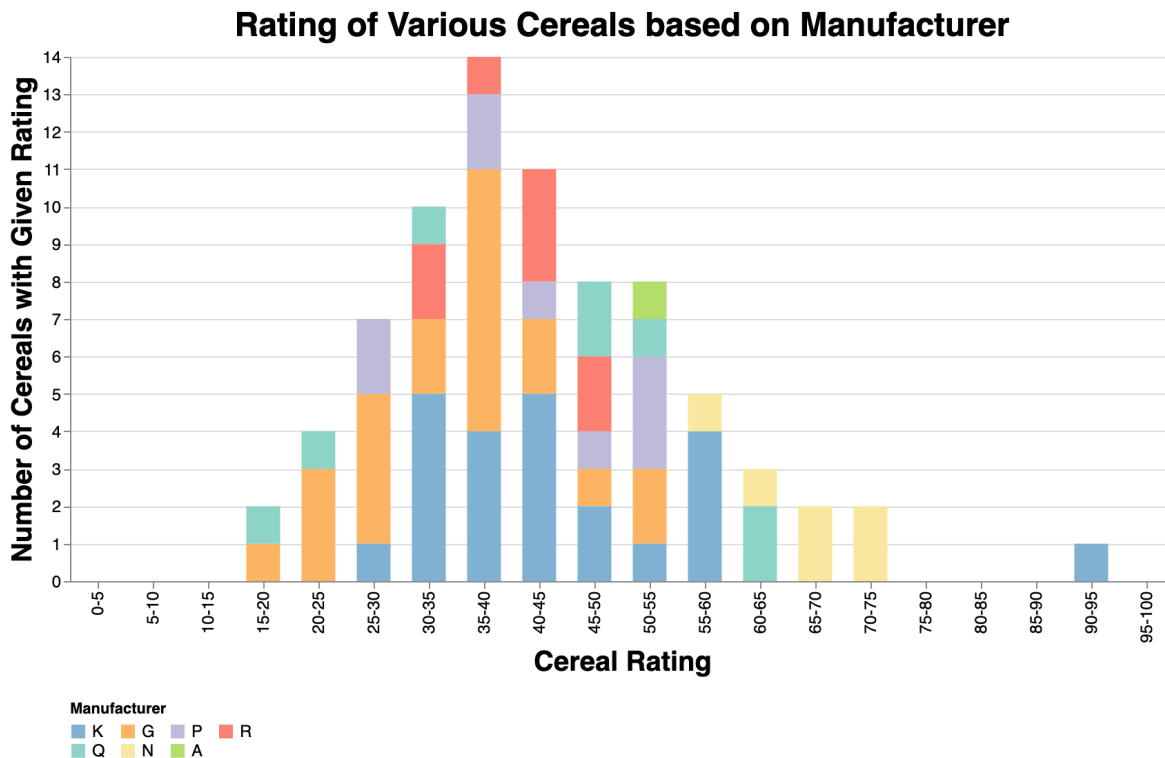
3 Version 2: CS765 DC2 Project Design

Instructions:

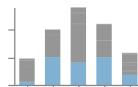
My project design does a more complicated scaling to achieve an effective tiny stacked bar chart. In particular, I used advanced clustering methods to properly reduce the number of bars while still aiming to hold the overall distribution. An example is shown in the two images here below (note this example is for a different dataset than what you will see later).

One of the unique parts of this design: for the tiny scaling of the image, we only hold the color for the desired category of study. In this example below, we are interested in the blue category, and thus have held that as our target category for our tiny scale design. The tool created for this project allows the user to input the category of interest before rescaling.

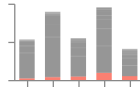
The original image:



The naive scaling of the original design:

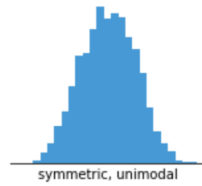


The dataset you will see in the next four questions deals with museums. The x-axis represents the different amounts of revenue buckets a museum generated through the year. The y-axis represents the number of museums that fell into each of the buckets. The categories in the stacked bar chart represent the museum type (history museum, art museum, ...). Note when a question asks about a particular category for the tiny scale design, you can assume we used this as an input in our tool to preserve and extract this information.

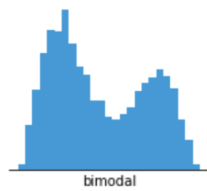


Question 1: Which option most accurately describes the overall distribution of the dataset seen in this visualization?

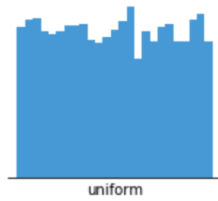
1. Unimodal



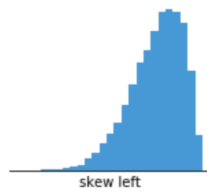
2. Bimodal

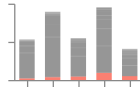


3. Uniform



4. Skewed Left

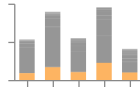




Question 2: Which area on the x-axis represents where we have a bar with the greatest proportion of art museums (red) in the stacked bar chart?

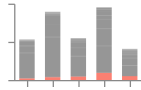


1. Option 1
2. Option 2
3. Option 3
4. Option 4
5. Option 5

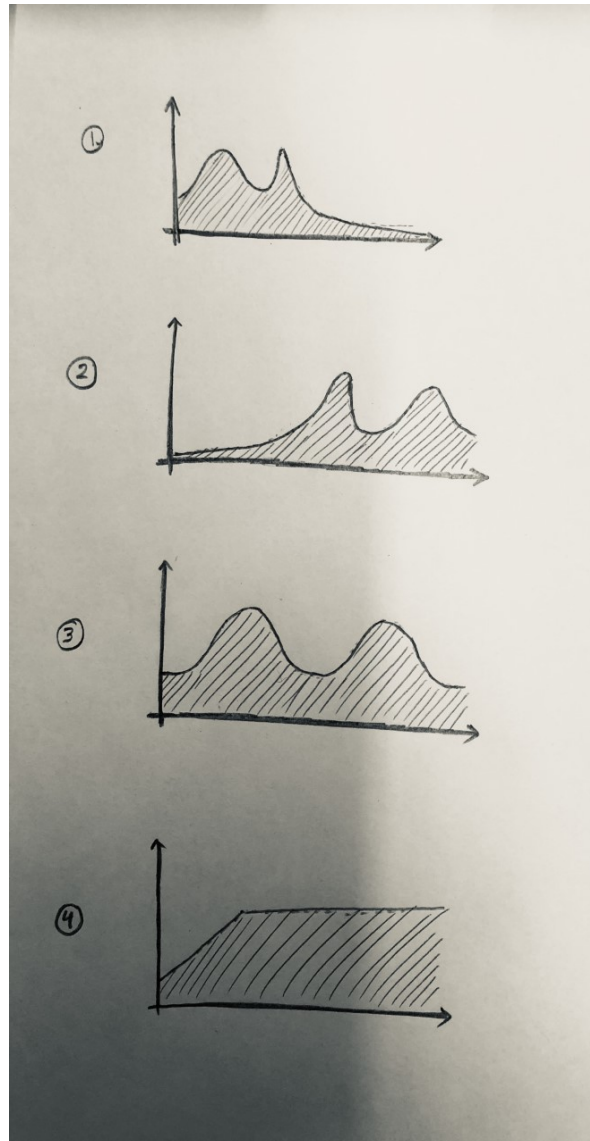


Question 3: Approximately what proportion of the data values in the first quarter of the x-values come from the "general museum" (orange) category?

1. 5%
2. 20%
3. 35%
4. 50%
5. 65%

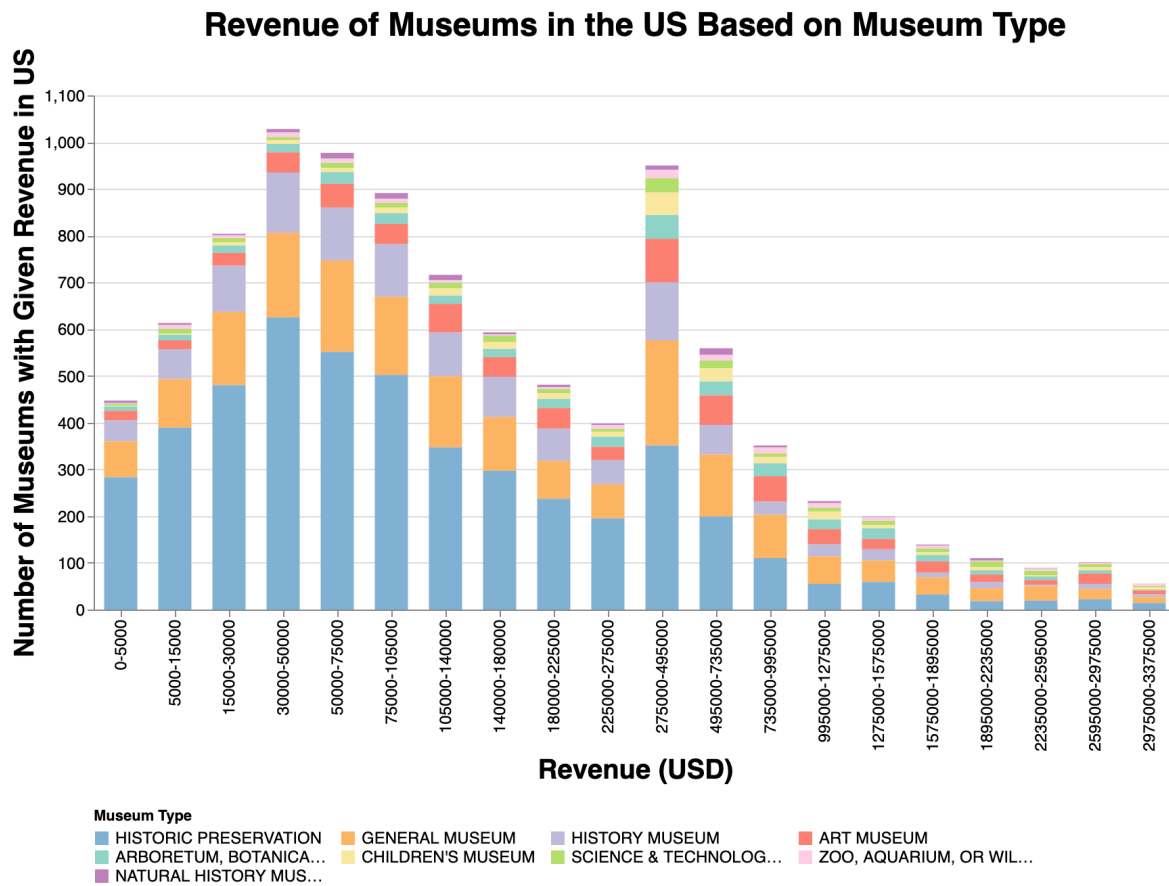


Question 4: Which of the following most accurately represents an area graph of the complete dataset.



4 Large Scale Design Visualization

For comparison (after the survey is taken), here is what the large scale design of the stacked bar chart looks like for the museums dataset shown in the survey.



5 Question Motivation and Correct Answers

Question 1 Correct Answer: #2 (Bimodal)

The motivation behind this question was to see if the tiny charts design can preserve the overall distribution/shape of the bars (unimodal, bimodal, etc.). When the original design was planned, there were a list of objectives we wanted to address with the scaling. It was noted that preserving the overall distribution shape was the top priority for the tiny charts design. The hypothesis was that even though it should still be possible to see this overall shape from the naive design, it was relatively difficult due to such small bars and the mix of colors at the top. As a result, the goal of the tiny charts was to be able to show this same curve, but with quicker interpretation.

Question 2 Correct Answer: #4 (Option 4)

The second key objective of the tiny charts design was to preserve the ability to extract proportions for a given category from the chart and find maximums/minimums. This question addresses this by specifically searching for what area of the graph has the greatest amount of art museums (one of our categories). The hypothesis was that this was very challenging to do on the naive design because of the abundance and density of so many colors at a small scale. Thus, the project design places emphasis on the category of choice and puts them all on a common baseline.

Question 3 Correct Answer: #2 (20%)

Similar to the second objective above, we wanted to further test if the tiny charts do truly preserve the ability to extract proportions for a given category from the chart. This question addresses this by specifically asking how much of the overall bar chart is made up by a given category. The hypothesis was similar to Question 2 in that the naive design is very hard to do this because of the density of colors at such a small scale and the different baselines with which the colors start. The project design hopes to address this issue.

Question 4 Correct Answer: #1 (Bimodal, skewed right)

The motivation behind this last question was to address one of the potential pitfalls of the project design. With the chosen design to scale down bars, it is known that we are losing the ability to see the overall skewed data distribution because we are largely concerned with preserving the peaks of the distribution. On the other hand, we expect the naive design to be effective at this.

6 Results

The compilation of the results for all the participants is shown in the tables below.

Question 1: Correct Answer #2			
Participant #	Survey Version	Correct (Y) / Incorrect (N)	Time (seconds)
1	V1	Y	16.2
2	V1	Y	11.3
3	V1	Y	11.2
4	V1	Y	17.8
5	V2	Y	13.0
6	V2	Y	5.7
7	V2	Y	8.6
8	V2	Y	4.9

Question 2: Correct Answer #4			
Participant #	Survey Version	Correct (Y) / Incorrect (N)	Time (seconds)
1	V1	N	24.3
2	V1	N	14.6
3	V1	N	10.9
4	V1	N	26.8
5	V2	Y	12.6
6	V2	Y	6.8
7	V2	Y	8.9
8	V2	Y	9.6

Question 3: Correct Answer #2			
Participant #	Survey Version	Correct (Y) / Incorrect (N)	Time (seconds)
1	V1	N	23.8
2	V1	Y	12.9
3	V1	N	12.8
4	V1	N	31.2
5	V2	N	18.9
6	V2	N	14.2
7	V2	Y	10.3
8	V2	Y	13.3

Question 4: Correct Answer #1			
Participant #	Survey Version	Correct (Y) / Incorrect (N)	Time (seconds)
1	V1	Y	8.7
2	V1	Y	11.3
3	V1	Y	11.9
4	V1	Y	10.8
5	V2	Y	20.7
6	V2	N	5.3
7	V2	N	9.3
8	V2	N	18.2

Cumulative statistics between all the participants has been compiled and included in the following table.

Summary of Survey Results			
Question	Survey Version	% Correct	Average Time (sec)
1	V1	100	14.1
	V2	100	8.1
2	V1	0	19.2
	V2	100	9.5
3	V1	25	20.2
	V2	50	14.2
4	V1	100	10.7
	V2	25	13.4