

Contextual Filter Visualizations

Summary

We need to be able to show both the original and filtered data in a way which describes the filter in the context of the data.

Requirements

The original chart is more-or-less unmodified, but layered on top is the data after filter. Since it's a filter, most of the time, we don't have to worry about the data being "bigger" than the original slice.

Graphs

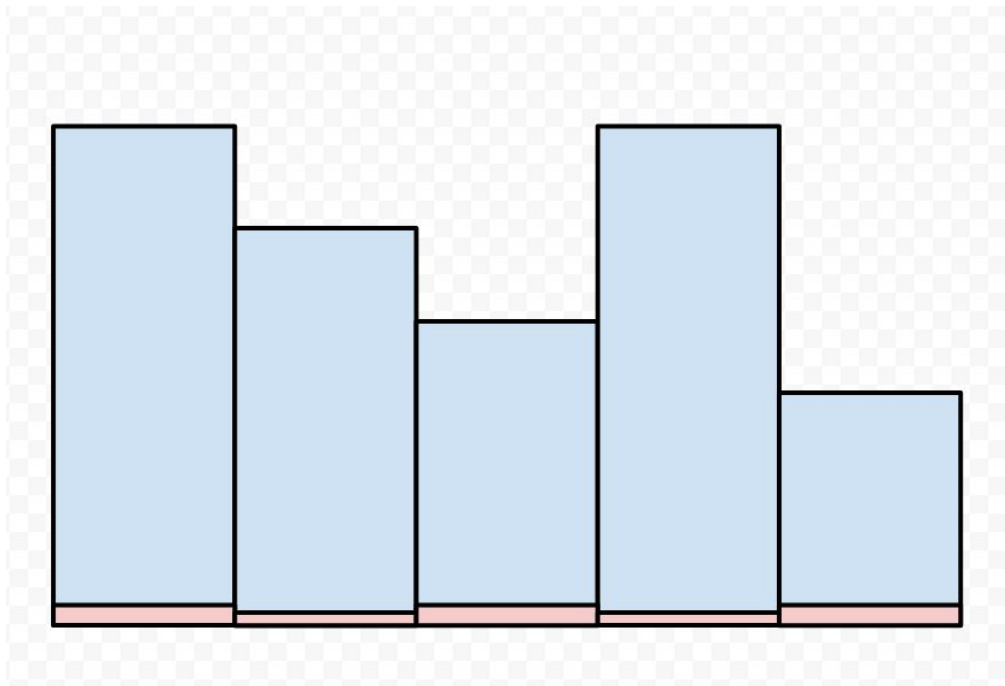
Histogram/Bar

I would expect the bar chart and histogram to handle the context visualizations the same way, so I've used histograms for this description.

Showing context in histograms and bar charts is not difficult; draw the new data on top of the old data.



A problem arises when the original and new values are very far apart, that is, the new value is very small compared to the original.

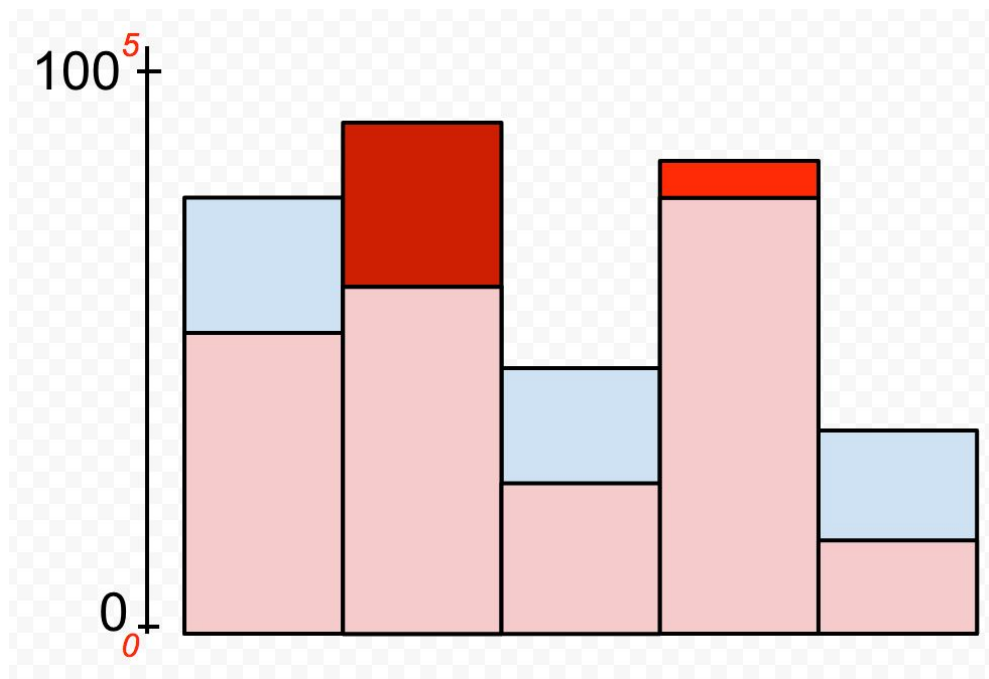


Graphs like the one above do little to contextualize the filter other than show that there's not much of anything. We don't really have a sense of what the red population looks like.

In situations like this, changing to log-scale may **or may not** fix the issue.

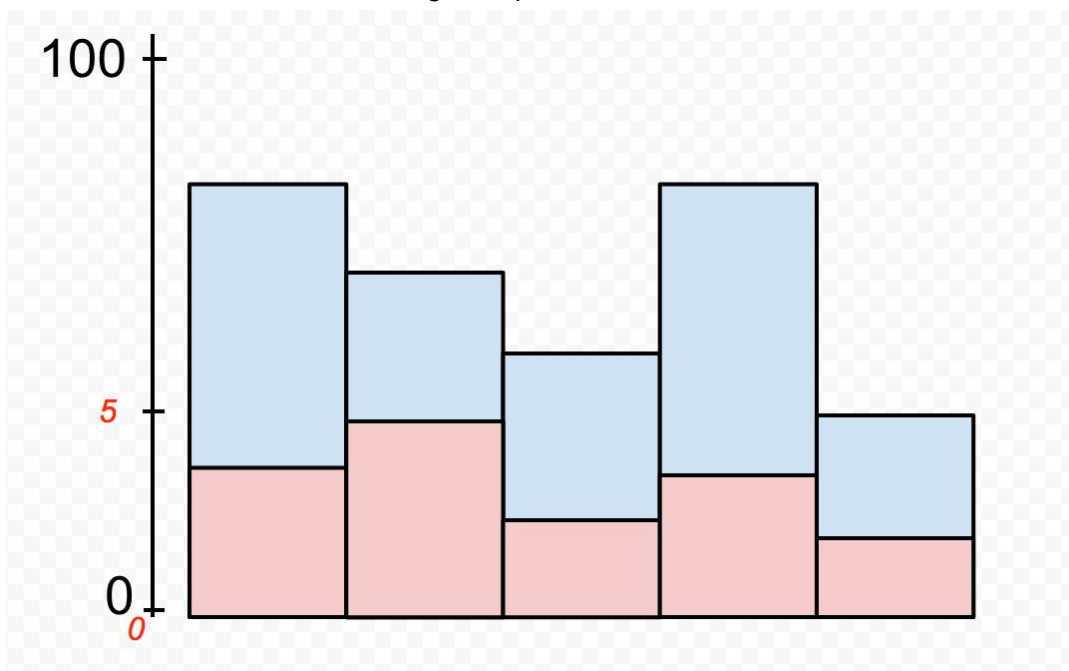
There are some ways to fix this, but an important unresolved question is if we want fixes of this nature to be toggleable or default. In any case, some options:

Option 1 Add a second value axis using the whole space. (Dark red represents red and not blue)



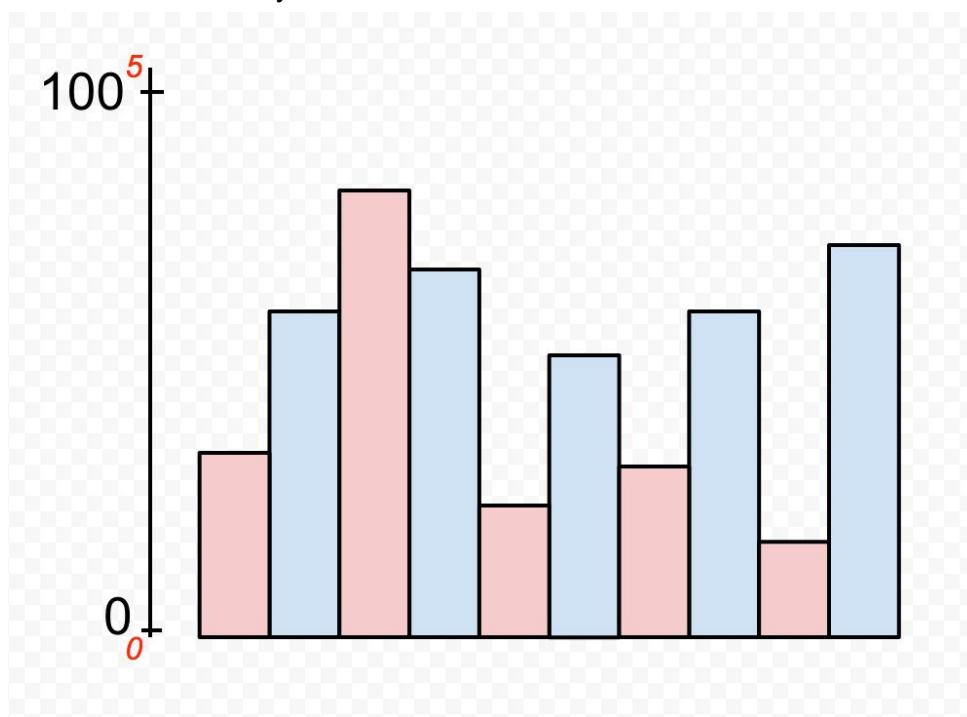
Option 1 shows the added context, but has the issue that the red bars can be longer than the blue bars, and showing red but not blue is a new thing to try to convey, and creating a natural conveyance may be difficult.

Option 2 Add a second value axis using the space to the smallest of the bars.



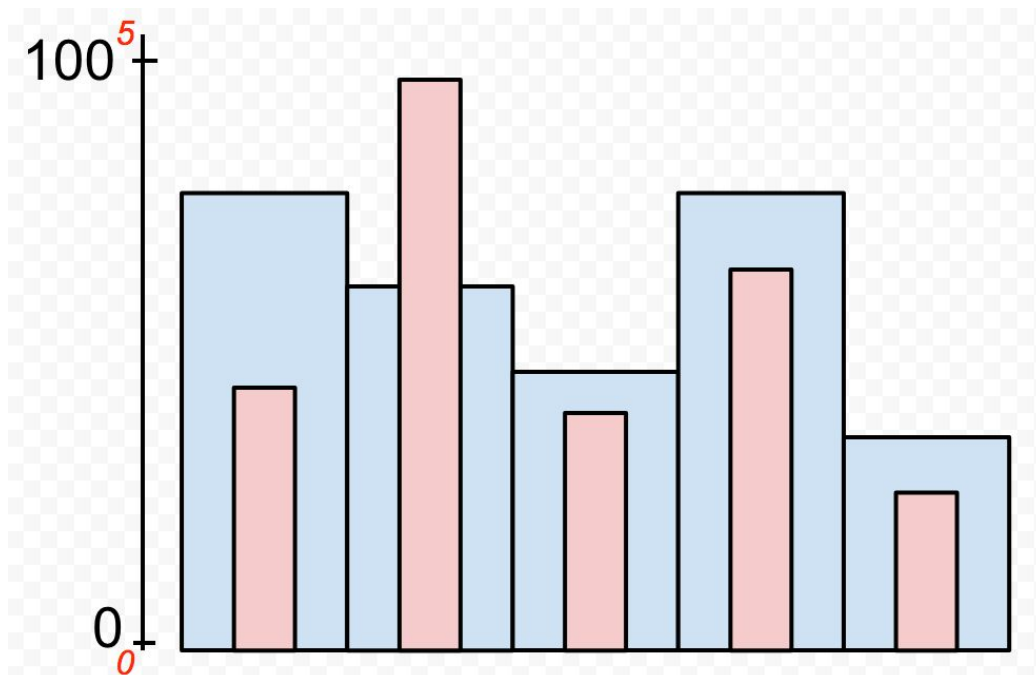
Option 2 solves the issue in option 1 by disallowing red to ever be larger than blue. However, if one blue bin is small, then the issue is not solved, as all red would be scaled smaller than that.

Option 3 Show two bars side by side, half width.



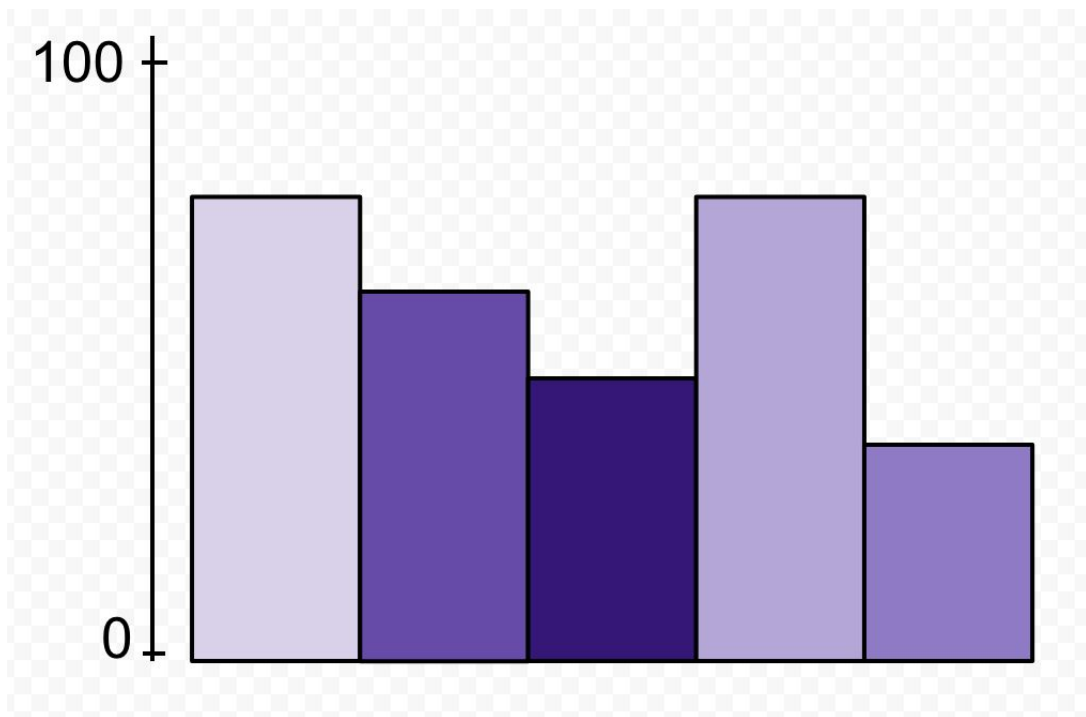
Option 3 allows for us to have red and blue coexist regardless of height, but removes some of the easy side by side comparisons between bars of like colors by proximity. In addition, twice the space per bin is needed.

Option 4 Show a small bar within the original bar.



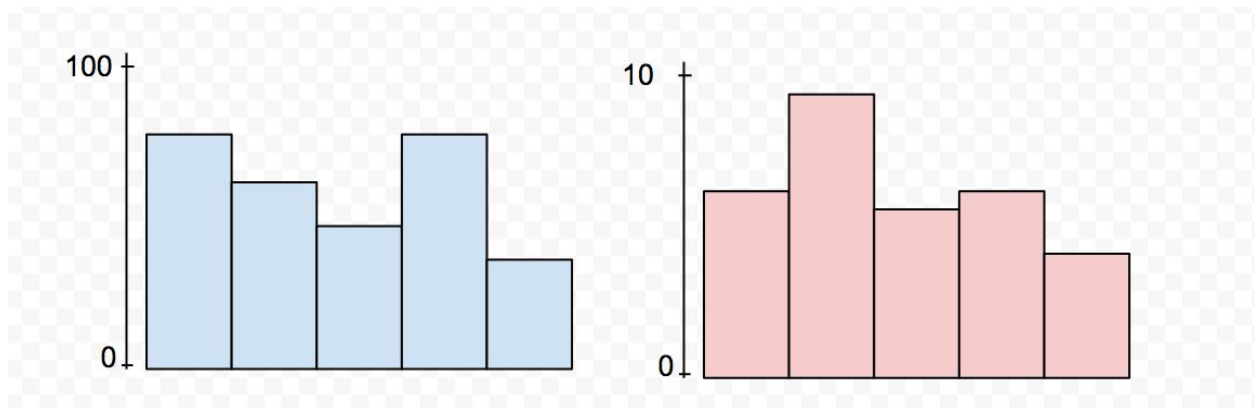
Option 4 gives us the ability to show context and maintain the proximity between bars of one color, and potentially both. However, it is unlikely to scale well to a large number of bins, since three times of the space per bin is needed.

Option 5 Use texture density or color gradient



Option 5 uses color gradient, which can give us context to the relative amounts of red within each bin (here denoted by shades of purple). However, this does not show any numerics, and requires a good color comprehension.

Option 6 Two Graphs

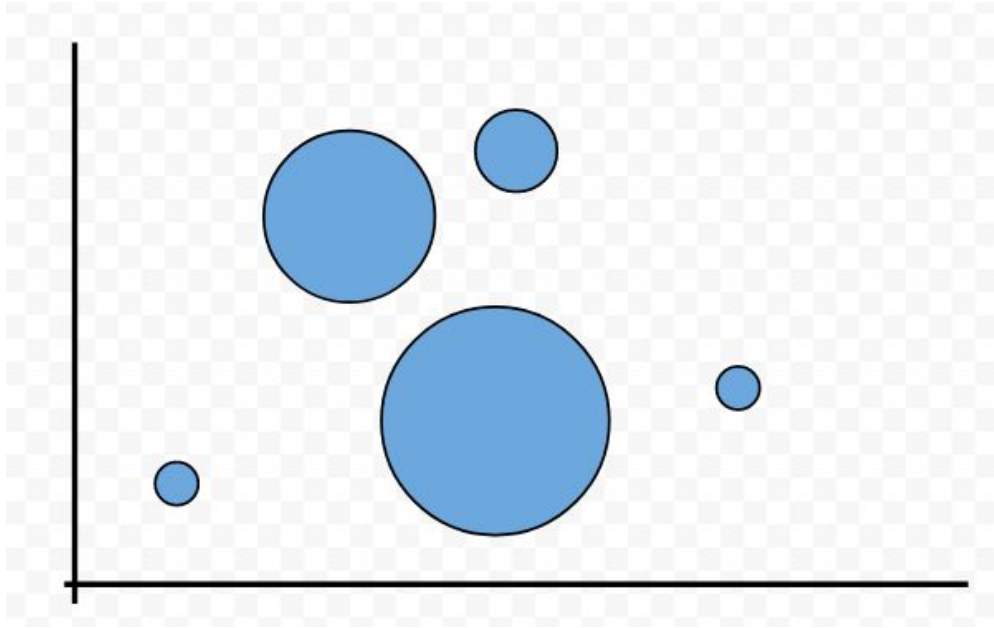


Adding a second graph, as shown in option 6, sidesteps the issue altogether, but requires slightly more than double the space, and does not convey any connection between the data pre and post filter.

Scatter

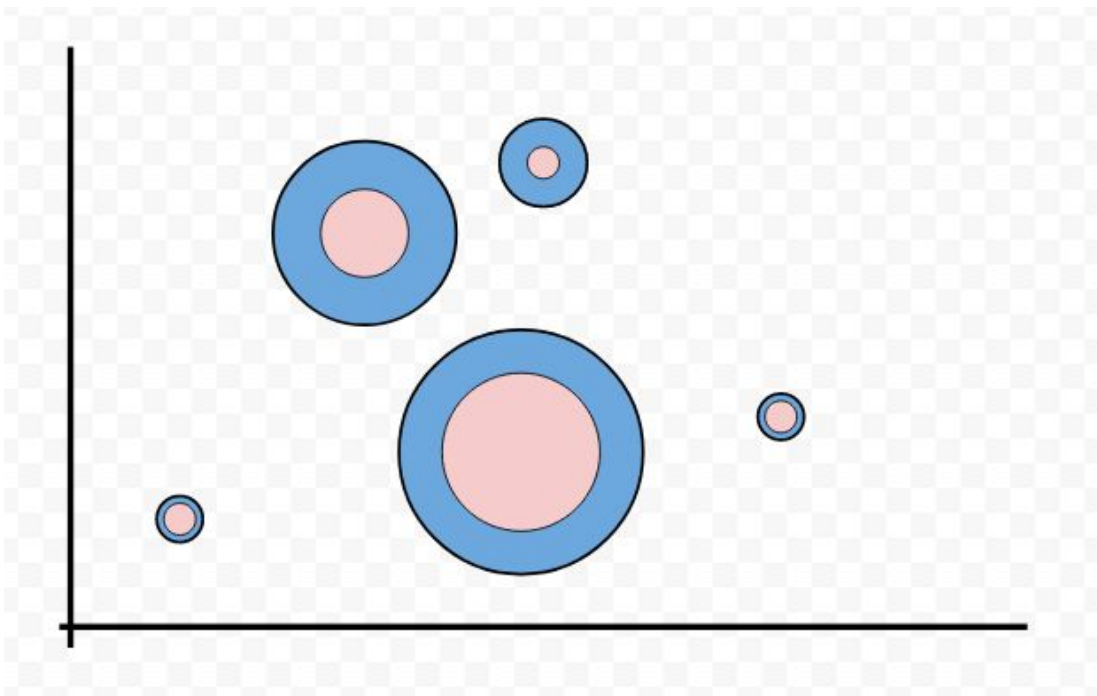
Grey/fade out elements not present in the filter selection.

Bubble

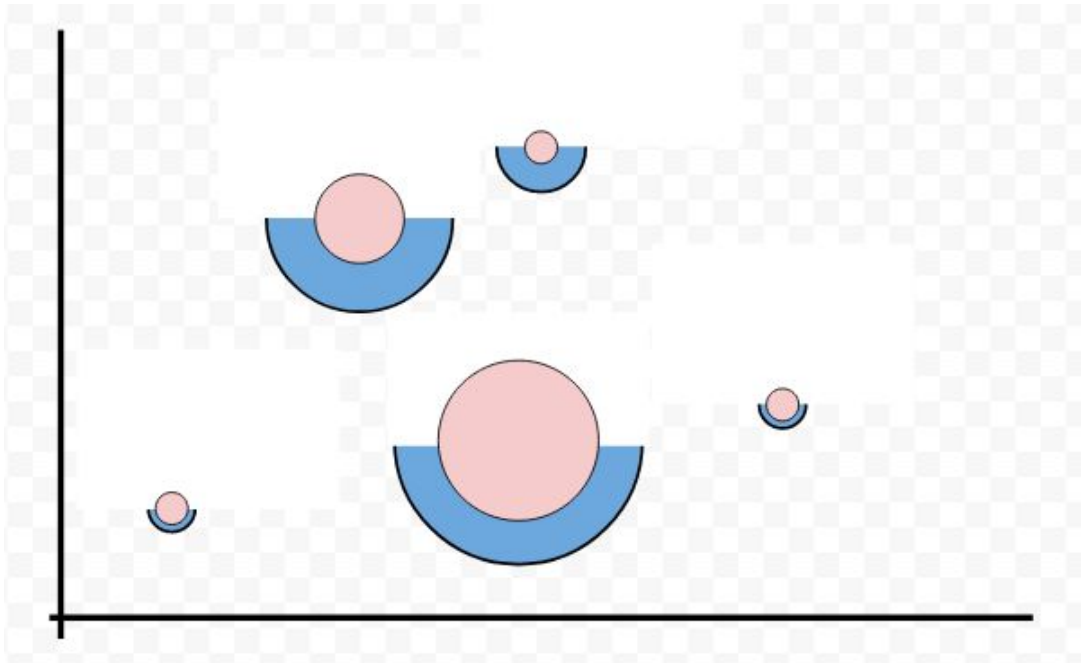


Two dimensional plots have the possibility of having a filter impact from the x, y, or “z” dimensions. The most reasonable cases for showing a filter on a scatter plot involve a change to some part of the “z dimensions”, that is size, shape, or color.

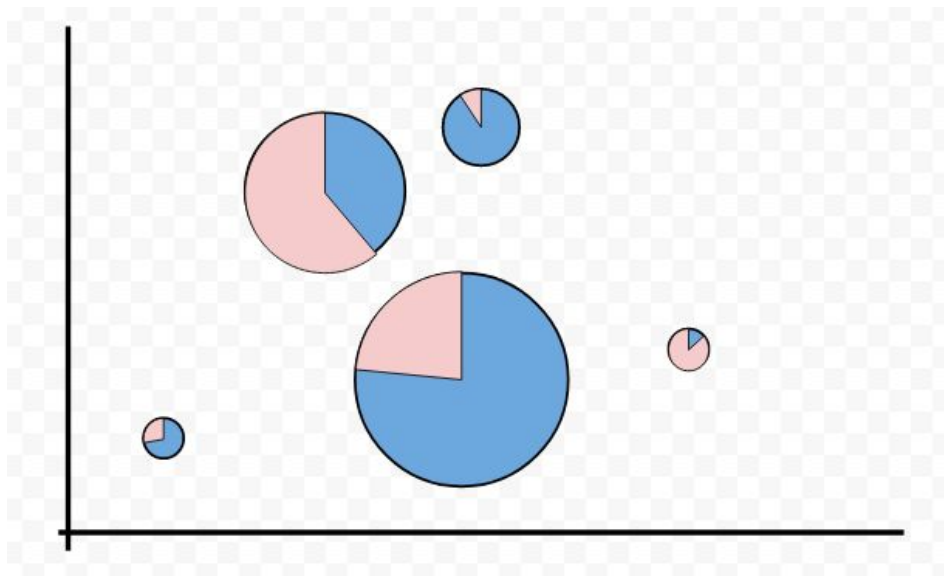
Option 1 Radial area



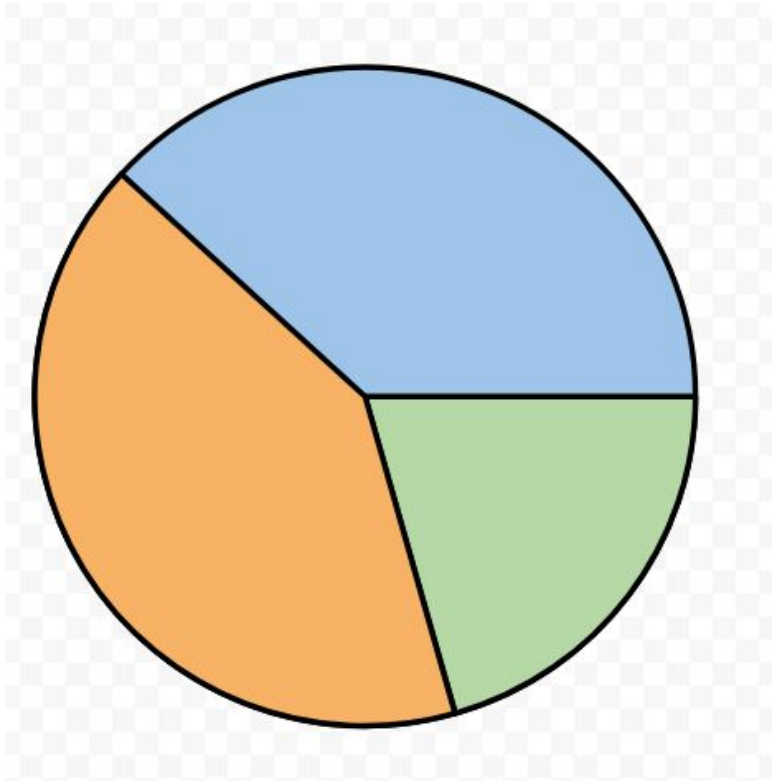
Option 2 Split Circles



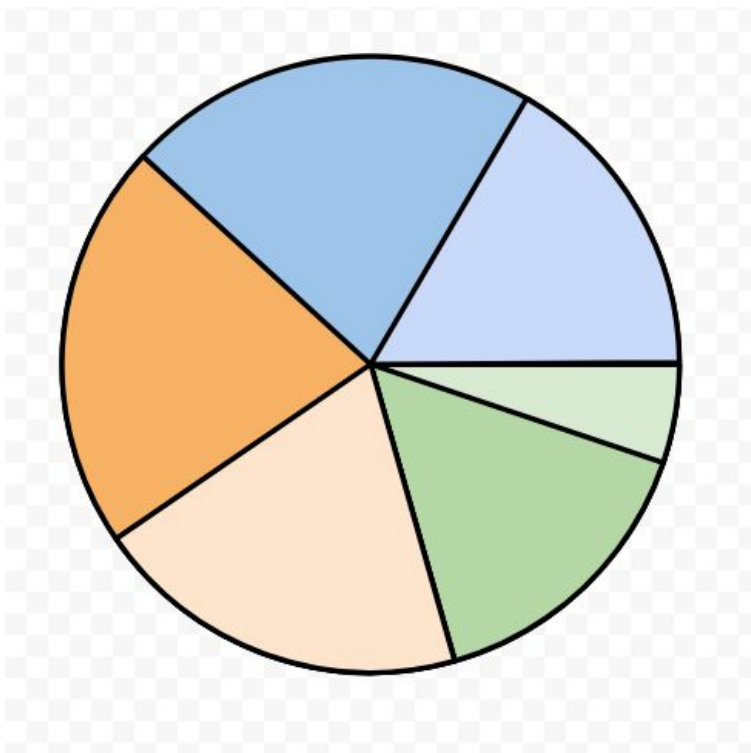
Option 3 - Pie Slices



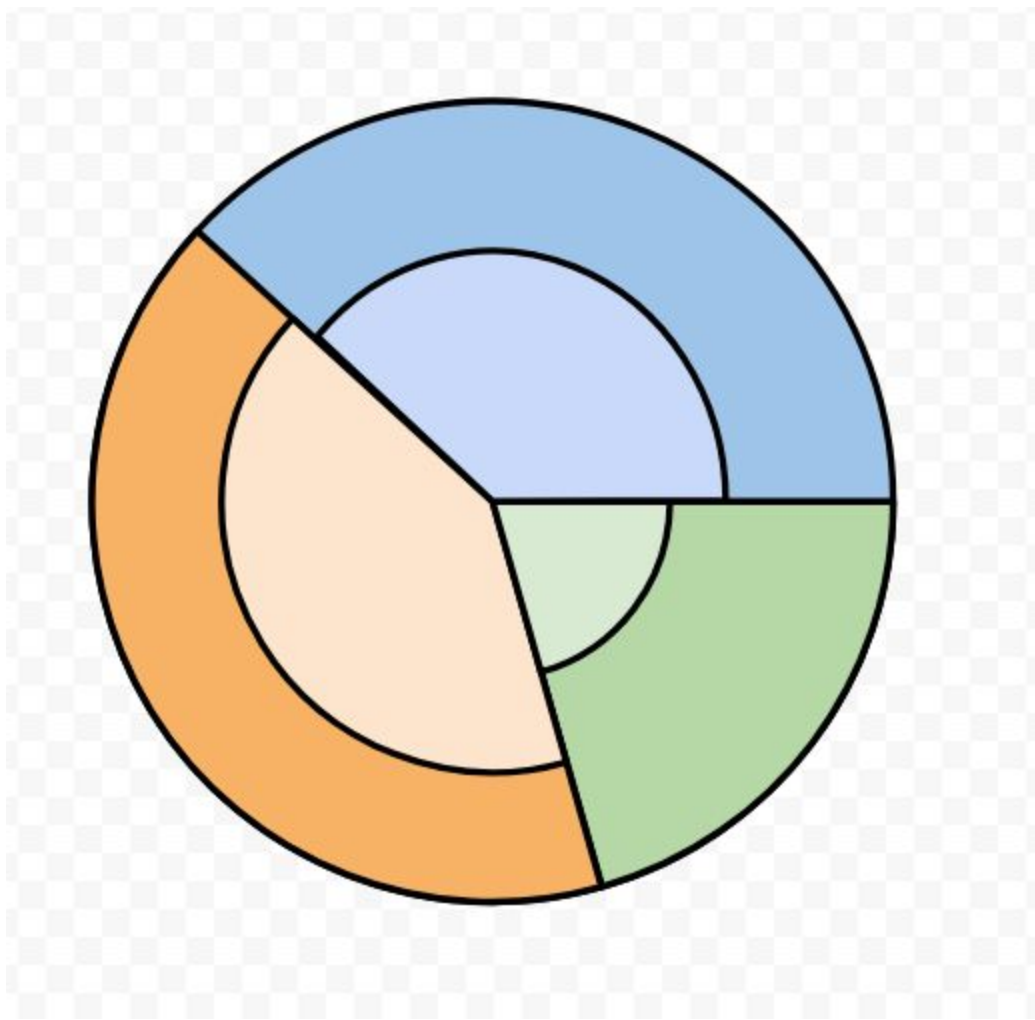
Pie



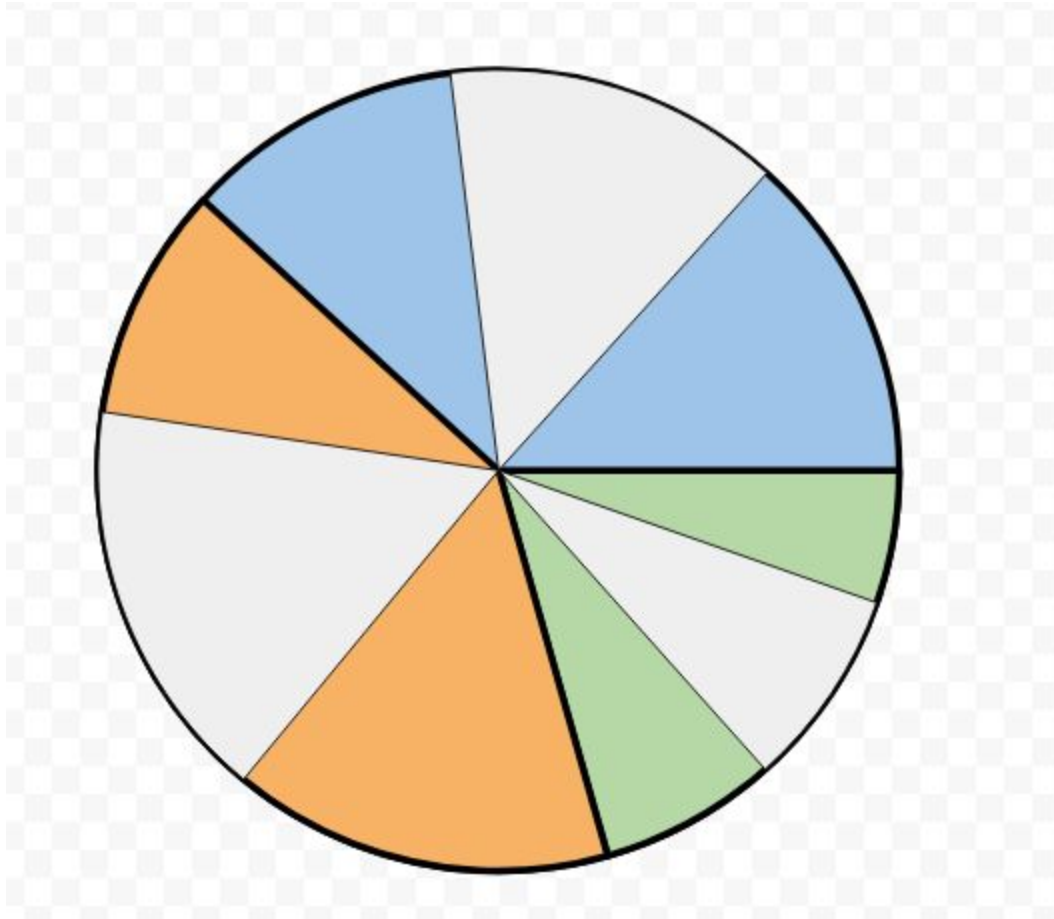
Option 1 Difference as a slice



Option 2 Radial in/out



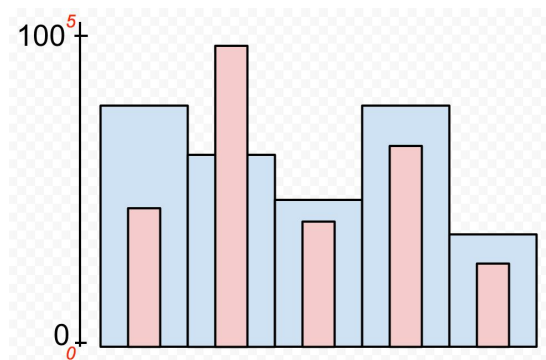
Option 3 - Difference as slice in center



Recommendations

Bar/Histogram

USE: Option 4 Show a small bar within the original bar.



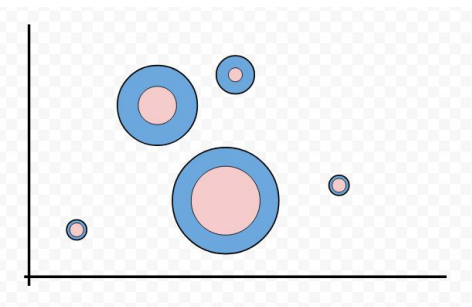
This option requires minimal interference with the original plot while still providing context of the change. While it requires more space, coloring the inner (red) bars' lines the same color as the internal should prevent loss of visibility when many pieces of data are present.

Scatter

USE: Color Change of points. This seems to be the only option for a two dimensional scatterplot. I would recommend a change of alpha (for all points, not just the inactive ones) so that the influence of the change can show in a color strength.

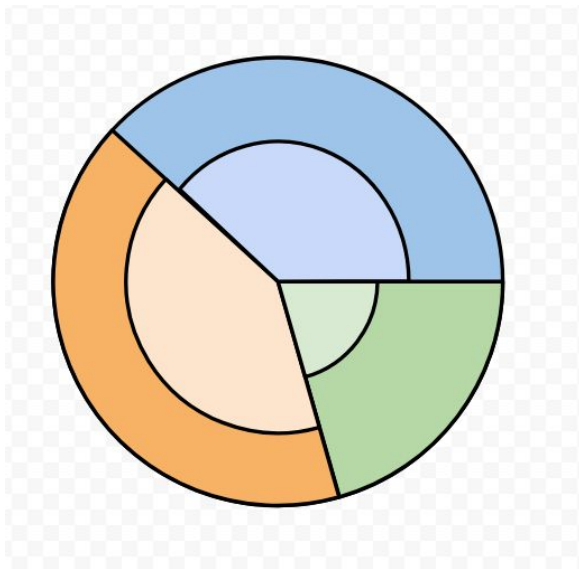
Bubble

USE: Option 1 Radial area



Pie

Option 2 Radial in/out



This option takes the best elements of the line graph, and (with a reasonable color gradient) works well at most sizes.

Pre-Implementation Questions

General

- Should these be a new layer? They can be.

Bar/Histogram

- How to pick scale for new axis
- Where to draw new axis labels
- Which color(s) to draw
- What size relative to the original bars
- How to clean/update the new bars
- Should we have a toggle same axis button (e.g. both on same scale)

Scatter

- Best way to update a color dynamically
- What alpha to set for present points
- What color to set for absent points
- What alpha to set for absent points
- Should we consider changing the size of scatter plots
- I think scatter needs two ranges but only has one

Bubble/Pie

- What size should the line be
- What color/alpha should the center be?
- Should the inside or outside be more dull (outside should be more dull as that's absent data with filter)