

Introduction

Our goal is to effectively visualize voter trends of the 2016 US Presidential election. We gathered data at both the state and county levels detailing the split between republican and democratic votes, which political party won for each region, and the margin that they won by. We decided to show this data using an interactive map where users can see an overview of the election on a national level as well as more details on results at the state and county levels.

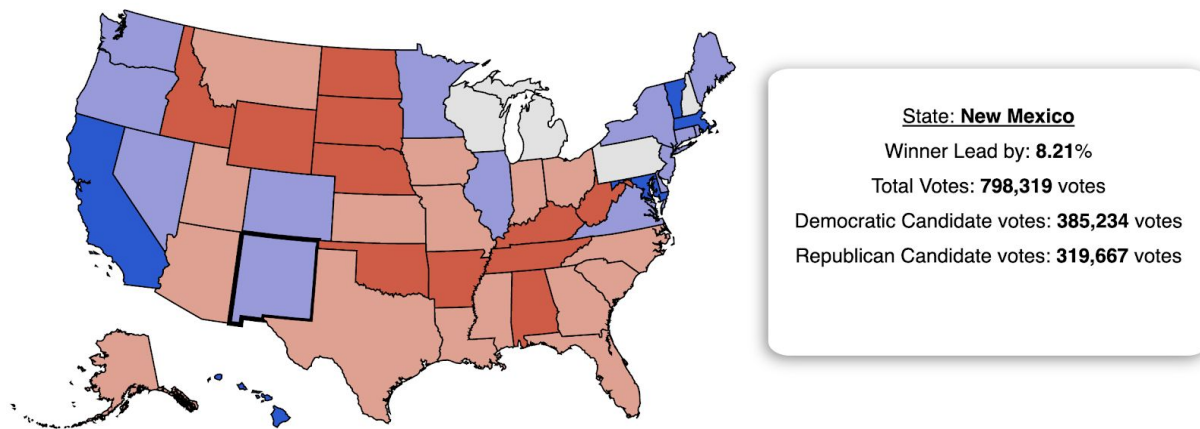
Use Cases

In designing our interactive map, we kept the following use cases in mind:

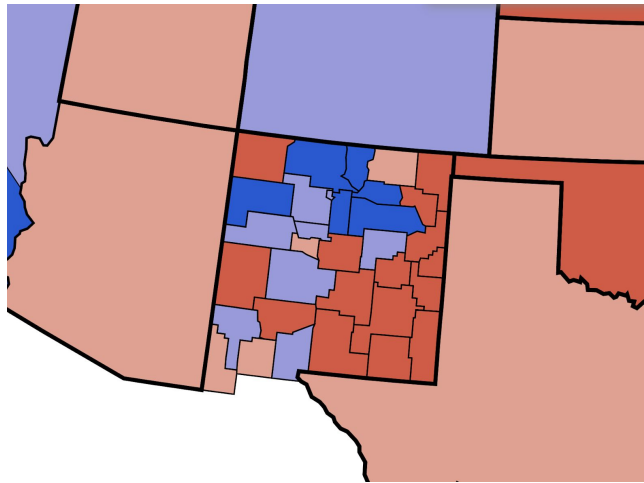
1. A user wants to see details of popular vote margins, distribution, and results for a particular state.
2. A user wants to see an overview of the popular vote results for every county in a state. In other words, a user wants to see a map of a specific state's counties and how its counties' popular votes compare to each other.
3. A user wants to see the popular vote margins, distribution, and result for a specific county in a state.
4. A user wants to return to the map overview to select another state.

Storyboards and Interactions Used

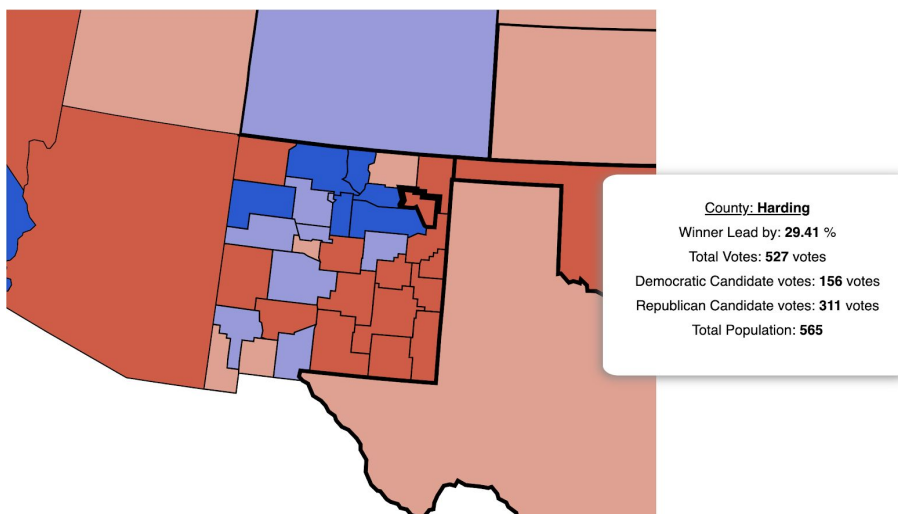
1. **Hovering over states for their state details.** We chose to use the hover function to make it separate from clicking on a state for details. Hovering over a state is something that would be intuitive for the user and would invite people to click for more information on counties. Hovering over a state is also an action that is quickly reversible; in other words, a user can hover over several states in a matter of seconds to decide which state they want more details on.



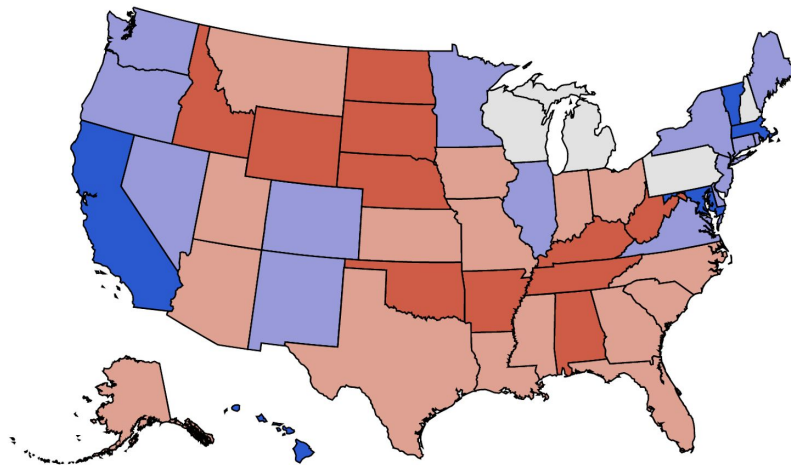
2. **Clicking to zoom into the state map showing county lines.** We implemented the click and zoom feature on the states so that users can get a glimpse of how county results lead to the overall result for that state. Using zoom makes sure that county lines and smaller counties are more visible. It also gives the user a sense of gradually being able to see finer details, which is their end goal. We also felt like using the click interaction to zoom would be more commonly understood amongst users as many people resort to clicking images when looking at maps.



3. **Hovering over county for their county details.** We used hovering over counties to show their details, similar to what we did with states, to remain consistent. By the time a user gets to this interaction, they will have known what to do based on how they interacted with the states. Additionally, this type of interaction allows users to derive quick side by side information and make quick comparisons between state and county voter statistics.



4. **Clicking the county to zoom out of the map.** We chose to use the click function to navigate between counties and states when zoomed in as well as to zoom out of the map because we felt like this was more intuitive to the user. We considered adding a reset button in our design phase but later decided against it as we felt that it would take away from the visualization aesthetically, and (worse) potentially interrupt the user's *flow*. For instance, If a user was clicking through states and counties to zoom to them, traversing the map a little more tedious if they had to hover over to a reset button to go back to an overview; with our design the user is just a click away from zooming in or out of their desired region.



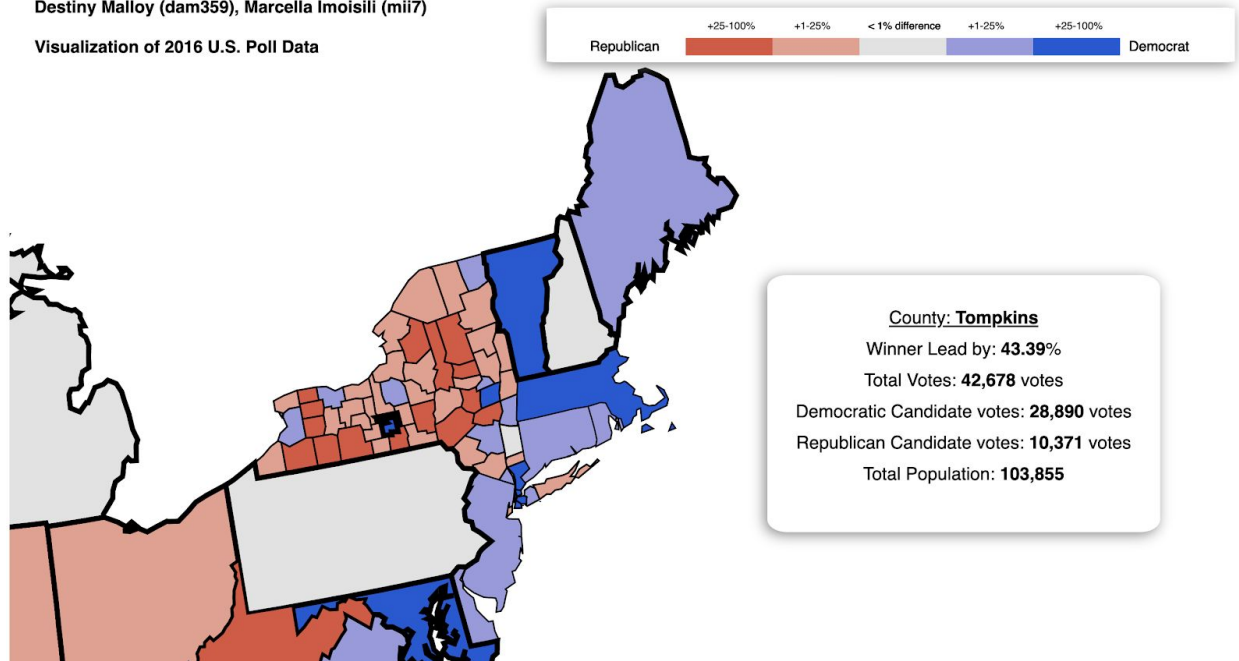
Final Interactive Visualization Application

Our interactive map allows users to explore details of the popular vote for the 2016 United States Presidential election on demand. At its default stage, viewers are shown an overview of the popular vote results by state. Our map of the 50 US states is color coded by the percentage lead by the major party that won that state (e.g. a darker red state would imply a higher republican lead in that state). Users can hover over a state to see its state card, which shows the percentage of popular votes that each major political party won.

If a user wants to see more details about a particular state, they can click that state in order to zoom into the map of all of the counties in that state. At this view, the user can see a county map also color coded by the percentage lead by the major party that won that county. Users can hover over a county to show its county card, which shows the percentage of popular votes that each major political party won, as well as who won for that county's state.

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Visualization of 2016 U.S. Poll Data



Issues and Trade-offs of Interactions Used

One of the decisions that we spent a lot of time on with our visualization was whether or not to have a separate map on the side that shows state maps of counties when a state is clicked on. This design would allow the user to click and choose other states without having to use the zoom feature. It would have also helped us avoid instances where a user may become disoriented when zooming in and out of the map or moving from state to state. In the end, we chose to go with using the zoom function to show other states because we recognized that showing both could easily subject our users to an information overload. Additionally, we wanted to filter out some of the data (other states) when the user chooses to go into the more detailed view. By implementing the zoom feature, we are essentially narrowing our user's focus onto the state they choose. This ultimately helps them better understand/control how they can use the visual.

A downside of using our zoom feature is that if a user was zoomed into one side of the map (California) and wanted to then go to the other side (New York), they cannot get there by simply clicking around California the way one may get from Georgia to North Carolina; they instead would have to click the county map to get out of the state and then make their way to the other side of the map. This, in a way, can be disruptive to the user if they are trying to compare data from New York and California or their counties. This could be alleviated by implementing a way for users to save the cards for the states/counties that they want to compare in a bottom or side panel. We considered this feature and given more time would incorporate it into our visualization to help improve usability.

A misconception that users may have about our design at first is thinking they can click on counties to see further details. We agreed that if a user were to make this mistake, they would realize that clicking the county takes them out of the map and that their action is easily reversible. Since we used simple clicks and hovers, the user is easily able to find their way back to the county they were looking at before being zoomed out on accident.

We also went back and forth over whether or not to use a separate fill color to indicate when a state/county is being hovered over (as opposed to having the border width increased on hover). We decided that our hover should only change the style of the border so that users would not get confused by a change in the color scale simply because they are selecting a state/country. We also figured this would allow users to see the fill of a county/state (indicating the lead of the winning party) in case they want to compare the region to the shades of other nearby regions.

Development of the Visualization

Our first step in creating this visualization was to find, filter, and clean poll data at the county and state levels. Next we created the map outline and created a color scale that we could use based on the percentage lead of the winning candidates. After using our color scheme on the states we implemented our zoom feature so that we could see counties and added the color scheme to the counties as well. Later we decided to add more details about each region using the state/county cards that pop up when a user is hovering over the map. Then we added our legend and made sure it would be visible at all times, like the detail card.

In our early design stages, we thought that we would position the detail cards for counties and states near the mouse as the user was hovering. As we got closer to completing our final implementation of our design, we realized that the card would block other counties or states that the user may be interested in seeing. For that reason we decided to make the state/county cards stay in a div to the right side of the map, but remain visible while zooming. We felt like this was a much more user friendly solution. We ran into a similar issue with the map legend. Originally we thought we would just have it on one of the sides of the map, however, after implementing our zoom it was clear that if we did not put the legend in a separate div element, it would get covered by the map when the user zoomed in to see counties. Thus, we put our legend in a div that would be visible no matter where the user was on the map.

Another feature that changed constantly throughout the design process was our colorScale. Having a color scale made by d3 was difficult because of the data we chose to show. When we tried to use many of the d3 scale functions, they did not split our data into buckets that best showed all five of the colors on our divergent scale. When we analyzed the data, it was clear to see that the issue with the color scale (i.e. why nearly every state was red) was because in the 2016 election year the democrats did not have a huge lead in many states. As a result, the data looked like it was skewed, with the darkest of the blue colors not even being used. To alleviate this, we decided to set our

own boundaries for the color scale manually so that users can really see how far left or right a state was leaning.

Our zoom feature also changed as we developed our final visual. In the beginning stages, we were imagining a zoom/pan feature that would change the users view as they scrolled over the image. We did not think this would be helpful to the user, as scrolling can often be hard to control (e.g. scrolling and getting a view of half of a state instead of having the whole state in view). We thought users would appreciate our decision to set the scroll boundaries for them in order to help them navigate around the map quicker.

Towards the end of our developing stages, we chose to add population data. We did this because after exploring the map we could see some states that were blue as a whole with majority red counties. We thought that a population count may help give users more insight and, generally, a better understanding of how a state that looks mostly red might actually end up favoring the democratic candidate.

Distribution of Work

Destiny handled most of the filtering, cleaning, and organization of the data used to populate the map. This took a lot of time because we wanted to be sure that we had all the fields necessary to code all of the data. Furthermore, there were a lot of peculiar issues with the data that needed to be smoothed out before being able to connect all sources of data to the map, such as identifying county FIPS codes and understanding how the csv file should be formatted to create the scale that we needed. She also created the color scheme used as well as the legend that shows the color scheme. Destiny also helped create sketches throughout the development process when we had to reconfigure our thoughts or when we came into an obstacle with our design.

Marcella implemented the interactivity features on the map. She added the click and hover functions for each of the geographies and used a lot of online/class sources to configure the zoom interaction to the way we thought was best. This took a considerable amount of time to figure out since she had to combine knowledge from multiple sources, while keeping the visualization's design goals in mind. Marcella also found, filtered, and added the demographic data pertaining to counties to the visual and implemented the detail cards for the counties/states, which appear on the right of the screen. She handled much of the styling, including an implementation of a map of the United States using topojsons. Marcella also helped throughout the design and developmental stages of this project by providing ideas, resources, and sketched solutions to the design problems we faced while implementing our application.

Both of us spent a tremendous amount of time researching interactive maps and other visualizations to identify how to best implement the plan that we envisioned from the beginning. Overall, the two of us spent approximately 30 hours a piece to do research on trends and best practices, design our visual, implement our application, troubleshoot errors, and fine tune our final product.