

# Know Your Beers!

## ABSTRACT

For this project, we used Tableau to create an interactive visualization for beers produced in the United States. The primary goals of this visualization is to engage users to learn more about the different types of beers and to educate consumers about the various beer characteristics and their relationships with each other. Prior to creating the interactive visualization using Tableau, we conducted research by finding other related works, conducting interviews, and creating personas. This was followed by sketching out ideas onto paper and conducting usability tests on our final design. Due to the limitations of Tableau and the challenges we faced in finding and combining the raw data for beers, we recognize the visualization can be improved through additional work. Our user research specifically found that future iterations of the visualization requires an additional dataset for prices of each beer as well the location data of beer vendors. Adding these two datasets can dramatically raise the usefulness of the visualization to beer enthusiasts.

## Keywords

Beers; Exploratory Visualization; User Centered Design; User Testing;

## INTRODUCTION

Beer is one of the most popular alcoholic beverages consumed by the public; it's found in restaurants, bars, clubs, home fridges, barbecues – everywhere human-human interactions occur. According to the Brewer's Association, the overall net worth of the US beer market in 2013 was over \$100 billion [1]. With the overwhelming growth that the brewery industry has been experiencing in the past few years, craft beers are gaining nationwide popularity [1]. With the growth of the beer market, beer aficionados are experiencing a golden age of taste cultivation.

Numerous archetypes of beer drinkers exist, among them are those who mainly drink local beers, those who choose beer based on a preferred taste, those who drink beer as a way to socialize with others, and those who love to explore different tastes and styles of the enormously large beer landscape. In addition, certain individuals who are new to the experience would simply like to learn more about the complex topic of beer in order to develop their own preferences and unique beer-drinking lifestyle.

The Beer Advocate, a trusted source for beer enthusiasts, features reviews and ratings of over 32,000 different beers. Each beer has distinct differences in its appearance, aroma, flavor, and alcohol content, and these characteristics are often difficult to remember for non-hobbyists. The appearance of the beer refers to the type of glass it is served in, the head (foam formation) and head retention, lacing (residue from foam), color, and clarity. Aroma refers to the smell of the beer (i.e: fruity, floral, spicy). Beer flavor is one of the most distinguishing characteristics between the different styles and brands, and plays a large role in how a particular beer is received by the drinker. Finally, the alcohol content varies widely between different brands and styles, ranging from 2% alcohol by volume (ABV) to one with 65% ABV, the beer with the highest alcohol content currently on the market [2].

So far, we have introduced the problem space, and highlighted some potential areas of difficulty in identifying and exploring the diversity of beers. With those details in mind, our primary goal is to create an interactive visualization for new beer enthusiasts who would like to explore the large beer landscape and find recommendations based on their favorite beer flavors. With the visualization, we aim to engage users

to learn more about the different types of beers and to educate consumers about the various beer characteristics and their relationships with each other.

In the following sections, we first introduce some previous work done to visualize beers and its many characteristics; we draw inspiration from them toward our own visualization. Before starting the design process, we conducted preliminary interviews and built personas. Next, we discuss our design process, including brainstorming, paper prototypes, high-fidelity prototypes, and implementation. Then, we discuss the user testing conducted to evaluate our first implementation of the visualization, and the results obtained. Finally, we present our redesigned visualization followed by a discussion of our learning process and future work.

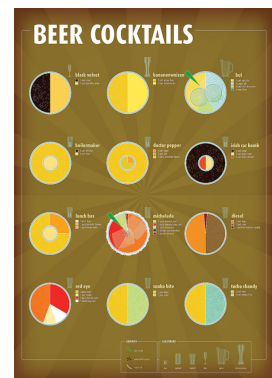
## PREVIOUS WORK

As we began conducting research on our topic, we found visualizations specifically designed for beers. In this section, we will discuss the strengths and weaknesses of four visualizations. These visualizations have also inspired some of our sketches and wireframes.

### Related Work 1 Beer Cocktails

Resource: <http://infographiclist.com/2012/03/19/beer-cocktails-infographic/>

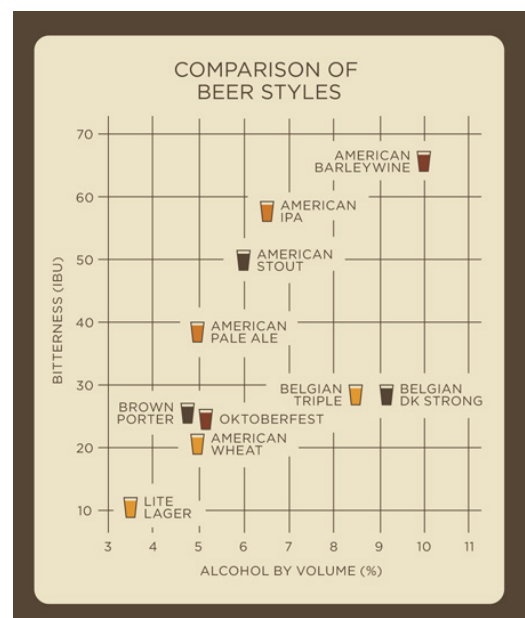
This visualization looks at the different types of beers. We think this is a poorly created visualization; firstly, it uses pie charts, and it even integrates pie charts inside a larger pie chart, which makes it difficult for the users to compare the proportion of different types of ingredients. This visualization also doesn't have a consistent color scheme: same colors stand for different ingredients in different pie charts. This prevents users from being able to compare the types of ingredients among the type of different beers. The visual design of this graph distracts and distorts the users' perception of information to a large degree. Finally, though the legend with icons of all types of glasses is pretty and comprehensive, they put it in the bottom of the graph which makes it hard to discover.



### Related Work 2 Comparison of Beer Styles

Resource: <http://siptemberfest.files.wordpress.com/2011/07/beernumberschart.jpg>

This is a clean, visually attractive, and creative scatterplot. Because of the effective use of space and beer icons, this visualization is able to clearly communicate the relationship between bitterness (IBU) and alcohol by volume (%). On the other hand, this graph does not provide a legend that describes what each color represents and the axes don't begin at zero which distorts the presentation of the data. Additionally, because the length of the beer names are long it would be difficult to display a larger database using this encoding method.





### Related Work 3 The Best Beer in America

Resource: <http://septemberfest.files.wordpress.com/2011/07/best-beer-infographic.jpg>



This crams lot of information in a tiny space. Though some of the dimensions are interesting, its format prevents us from understanding it completely. In each graph the icons are too small for viewers to see, and the graphs are slanted which makes it difficult to read. It's also ineffective, according to Tufte and Mackinlay, to encode value using area and color. What's more, the description uses such a small font size that it's hard to read. Furthermore, the decoration doesn't enhance the viewer's understanding of the data.

### Related Work 4 Feeling Thirsty??

Resource: <http://seekshreyas.com/beerviz/>



“Feeling Thirsty??” is an interactive visualization that targets individuals who are interested in finding beers that match their preference and who want to compare different beers based on aroma, taste, and appearance. This visualization provides the necessary descriptions to guide the user in understanding what the visualization is trying to communicate. It enables filtering of light / medium/ and dark beers and provides the ability to highlight the beers that are similar to each other. Overall, this visualization is highly interactive and visually appealing. However, “Feeling Thirsty??” does not provide the overview of all the data, meaning it doesn’t display the light, medium and dark beers all in one visualization. Also, because the information is displayed in a circular orientation, it is difficult to read the names of the beers. In addition, the sizes of the dots are too small, making it difficult to differentiate and compare the popularity between beers. On another note, there is no way to sort the data to enable viewers to quickly find a particular beer.

## EXPLORATORY USER NEEDS STUDY

Before embarking on the design process, we needed to learn more about our potential users. Thus, we began with an exploratory research phase in which we conducted five one-on-one interviews with potential target users to determine their needs and wants. The feedback from the participants were used to guide our work. We asked the participants general questions concerning their individual beer-drinking behaviors and the characteristics of beer they’re most interested in. With this preliminary, informal user research we gained insights into the dimensions of beer that are important to our target users – the alcohol content of beers, the flavors of beers (especially its bitterness), the ranking of beers, and where the beer was produced. All of our interviewees wanted a way to find beers akin to their current favorites, and one explicitly said, “It would be awesome if you could make a ‘Pandora’<sup>1</sup> for beers.”

## PERSONAS

By talking to potential users of the visualization, we created two personas to help us resolve important questions and guide us in the development of the visualization. We have included them below:

**Ben** is a social drinker who likes to go out with friends on the weekends. He lives in Capitol Hill so there are a lot of bars accessible within a block of his house. Ben is a know-it-all when it comes to food...including beer. When he goes out with his friends, he wants to be able to impress his friends

<sup>1</sup> Pandora Radio is an internet radio station that automatically recommends music to users based on musical selections of a certain genre, artist, or style.

by talking about the different aspects of beer – taste, color, and style. When he goes to the bar and gets a few beers, he wants to be able to distinguish one beer from another in the different beer properties. Ben wants to use our visualization to help him accomplish these goals.

**Penny** is a picky drinker. There are a lot of things Penny doesn't like; for example, she doesn't like spicy food or things that are too sour. When it comes to beer, Penny is very particular about the tastes that she goes after. She admits that she's a 'lightweight' and typically tries to go for something less alcoholic and very light. She also hates bitter beer and won't drink beer that looks remotely dark. She generally sticks with the 'safe' brand names, like IPA and Stella Artois, but would like to try out some craft beers. She wants to use the visualization to find the highest rated beers and find some other light beers to try.

## DATASET

Below is a chart describing the dimensions, data types, and the encoding methods we used.

Dimension	Data Type	Encoding Method *these are shown in our final iteration
Individual Beers	Nominal	Dot on the map
Beer flavor	Nominal	Color of the dots found on the scatter plot
Alcohol by volume (%)	Quantitative	Tooltip
Names of the beers	Nominal	Tooltip
Color of the beer (standard reference method)	Nominal	Color of the beer bottle
States (brewery location)	Nominal	Geographic map
Beer ratings	Ordinal	Numbers
Beer style	Nominal	Tooltip

We faced many changes in collecting the data needed to create our visualization. The dimensions that users said would be helpful to them – cost of the beer, and location of the beer vendors– were near impossible to find in a database that also contains information about flavors, alcohol content, ratings, and beer styles. To exacerbate the problem, beer names differ by region, which made it extremely difficult to combine multiple datasets. For example, we had originally intended for the visualization to include beer from around the world, but the names of the beer in the different countries vary by language and name. Thus, we are only able to cohesively gather data for beers produced in the United States.

Furthermore, we experienced much difficulty in converting .JSON data into .CSV data, the appropriate data type used in Tableau. We originally wanted to combine two datasets, but one is in .JSON and the other is in .CSV. The difficulty to combine them lead us to eventually forgo the large database in .JSON and proceed with the smaller .CSV database.

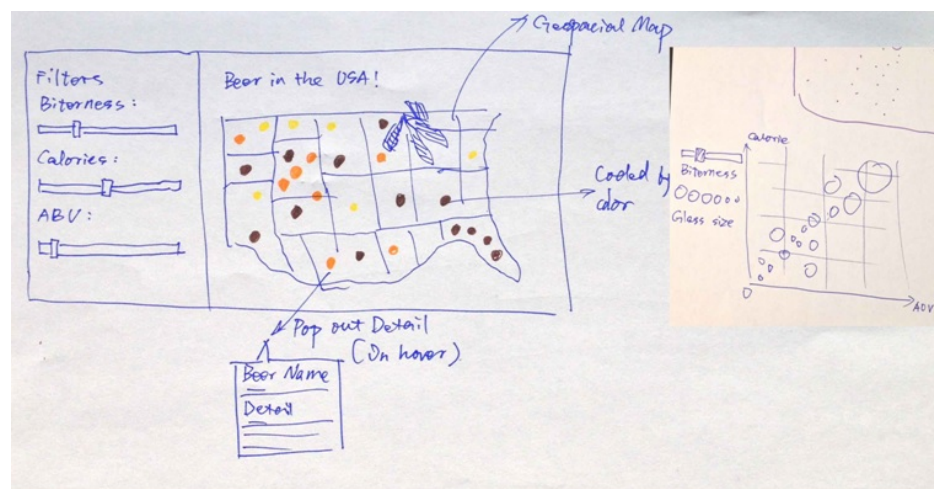
Despite these challenges, we employed some creative efforts in developing our dataset. The user interviews revealed that one desired feature for the visualization is to be able to browse the beers and find recommendations based on flavors of beer. Therefore, we really need to include flavor as a dimension in our dataset. We did some research on beer flavors and the relationship between their flavor to the beers. We found that we could map flavors to individual beer brands based on their style characteristics. Thus, we manually mapped beer flavors to individual beers in our database.

## DESIGN PROCESS

The design process we went through to arrive at the final visualization has a special focus on the users. The user needs study that gathered important insights into our target users and allowed us to create personas based on initial interviews. We went through an iterative brainstorming process by creating paper prototypes individually and then combining them into a coherent idea through whiteboarding. Next we created high-fidelity static prototypes to showcase at the midterm presentations to receive feedback and guidance from peers and professors. Finally, we implemented our vision with tableau.

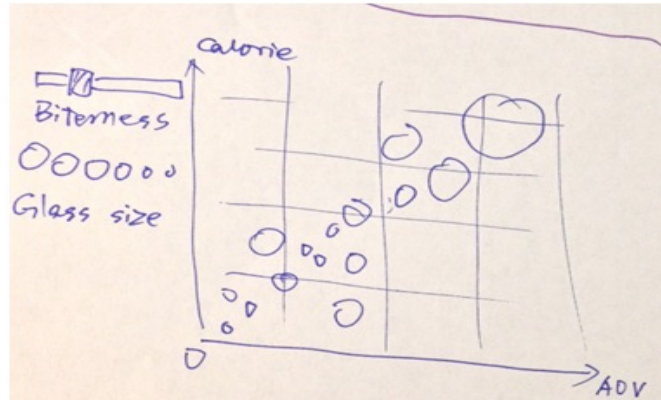
### Brainstorming & Prototyping

We began brainstorming for the visualization by sketching on paper individually and then coming together to showcase designs within our team. Afterwards, we combined our design solutions through an extensive whiteboarding session. We present our low-fidelity sketches below, and discuss each view in detail in relation to Sneiderman's infovis tasks.



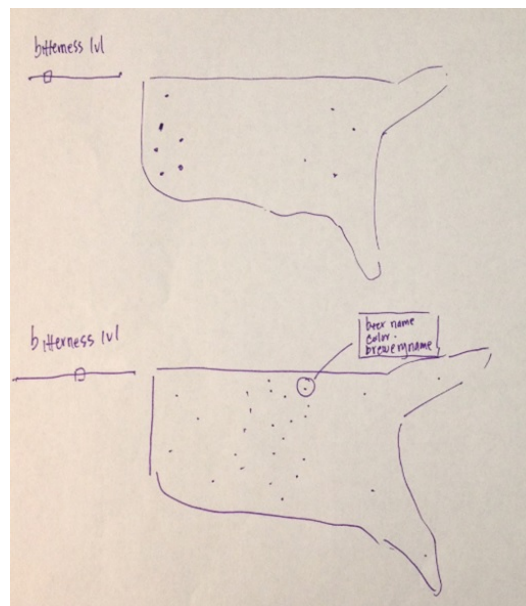
**Sketch 1: Overview of the Visualization**

Sketch 1 shows the broad view of our visualization. We used a geospatial map to display the brewery location of each beer (Sneiderman's overview task [3]). Each dot on the map is colored based on the actual colors of the beers. Hovering over each dot displays details of the specific beer such as its name and origin (detail's on demand). On the left of this visualization, the users can filter the dots on the geospatial map via bitterness, calories, alcohol, and volume. The graph on the right is discussed in the next paragraph.



**Sketch 2:** Graph relating bitterness level, glass size, calories, and alcohol by volume (ABV)

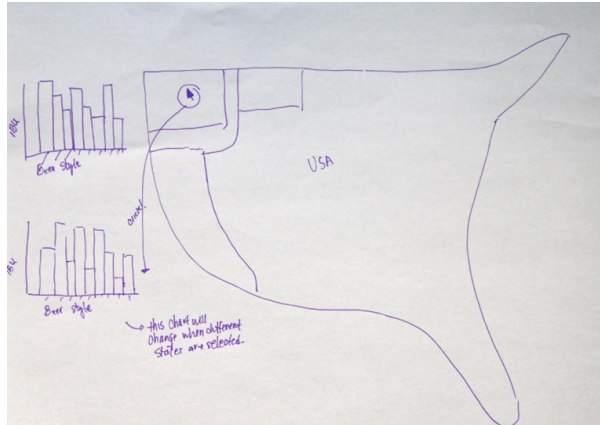
This graph (sketch 2), located on the right in the broad view of our visualization, displays the relationship between calories and alcohol by volume (ABV) of all the data points. The users can refine the data points through the use of the filters found on the left of the visualization based on calories, bitterness level, and alcohol content (Sneiderman's filter task [3]).



**Sketch 3:** Bitterness Filter

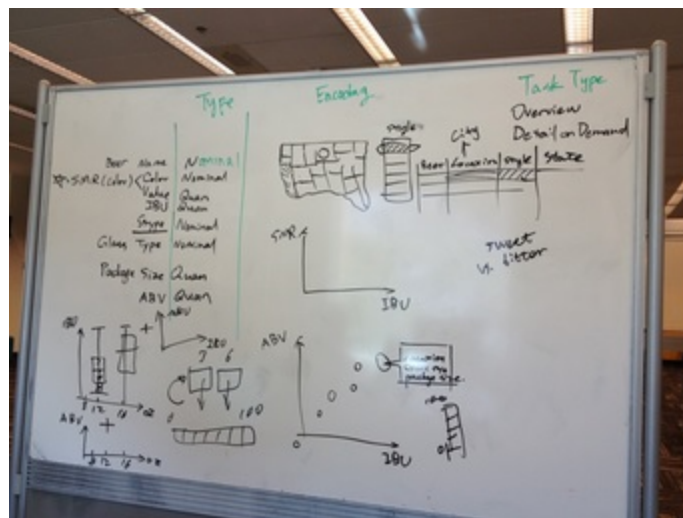
Sketch 3 illustrates the functionality of the bitterness level filter. Moving the bitterness slider will change the number of dots on the map to reveal beers with the desired bitterness level (Sneiderman's filter task [3]).





**Sketch 4: Pop-out Interaction**

Sketch 4 shows how the users will be able to click on the individual states to find more information about the beers found within that state (Sneiderman's zoom and details-on-demand tasks). For example, by clicking on a state, the users will be provided with a bar graph that shows the beer style and its relationship with bitterness level. Additional graphs are still to be determined.



**Sketch 5: Dashboard Sketch**

Sketch 5 shows our brainstorming process to create the interactive dashboard. It was during this session that we determined the dimensions we will include as part of the visualization, their data type, and how to encode them. A larger discussion of the data and how we obtained them can be found in the data section of this paper.

### High Fidelity Prototypes

We showcase the result of our brainstorming session and combined our individual ideas in high fidelity prototypes created using Adobe Illustrator. We presented these static images to the entire 511 class during the mid term presentation to receive feedback from peers and professors.





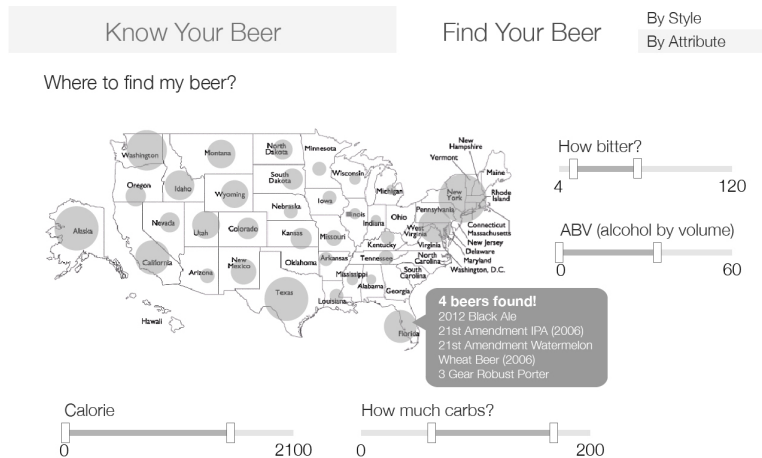
### High Fidelity 1: Overview of the Visualization

Users of the visualization begins their visual journey on this overview (High Fidelity 1). The visualization is split into two parts: know your beer, and find your beer; users can toggle between these two sections. However, based on our feedback, we decided against this layout because the users will not be able to see any changes made in the other tab. In order to allow users to see corresponding changes, we decided to put all the graphs and tables into one canvas above the fold (based on Sneiderman's coordinate task [3].)



### High Fidelity 2: The Visualization Filters

High Fidelity 2 shows a geospatial map allowing users to find beers based on the bitterness level, alcohol content, calorie content, and carb content. The size of the circles on the map refers to the number of beers that match the specifications from across the United States.

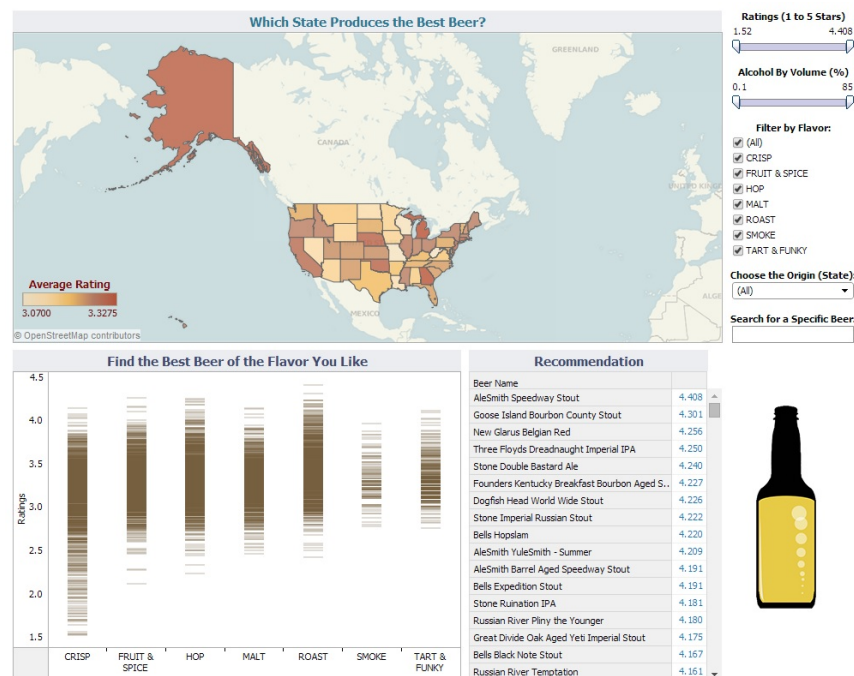


### High Fidelity 3: Details on Demand

High Fidelity 3 shows the ToolTip view on the map shown in *High Fidelity 2*. When users hover over a dot, more details emerge (Schneiderman's details-on-demand. [3])

### Implementation In Tableau

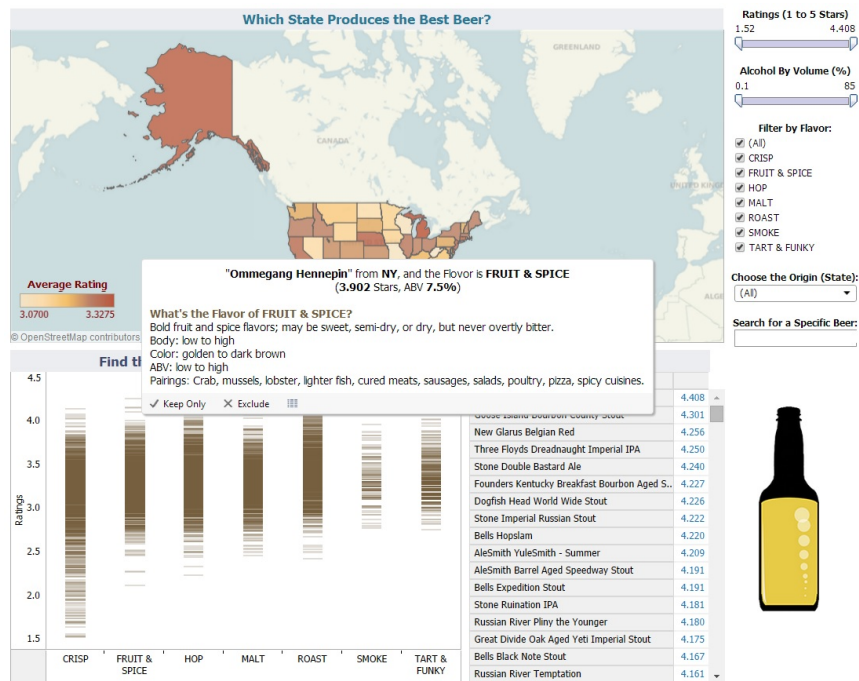
Based on high fidelity prototypes, we implemented the visualization in Tableau. Due to the limited overlapping among databases, we had to choose the data dimensions that matter the most to target users and determine which data sets we would use. Therefore, we had to discard some of the data dimensions, which include bitterness, calories, and carbs of beers.



### Implementation 1: Initial Design Dashboard

Implementation 1 shows our first try at implementing our ideas into Tableau. This canvas is an iteration of our high fidelity prototype based on feedback we received from peers and professors. The top view in

Implementation 1 shows an overview of the beer ratings across the US states. The bottom left view relates the beer flavor to beer ratings. The bottom center shows a list of recommended beers, and the bottom right depicts an image of a beer bottle with changing colors based on user selection. Filters for ratings, alcohol content, flavor, state, and beer name are located on the right hand side of the visualization. All views are related and connected through user filtering selections; for example, if a user clicks on a specific state, the other views will respond by eliminating irrelevant data and only show beers produced in that state.



**Implementation 2: Details on Demand**

Implementation-2 shows the tooltip that pops up whenever users hover over a beer on the bottom left view. The tooltip contains specific information for a beer, including its flavor description, production state, rating, alcohol content, color, and food pairings.

In creating our first implementation, we know that the visualization is far from perfect. Therefore, we ran a usability test on it to test its effectiveness. We describe the usability testing in detail in the next section.

## USABILITY STUDY TEST

The goals of the usability test were to find errors and to obtain feedback on how we could improve the design of the visualization. We specifically wanted to learn if our target users were able to successfully interact with all the features and if they were able to learn from our visualization. For this particular usability test, we used the Concurrent Think Aloud protocol; we asked our participants to complete 6 different tasks and to answer two post reflection questions. We conducted this usability test on Implementation-1 and Implementation-2.

## Participants

We recruited two female and three male participants, aged 22 to 28. Their drinking experience ranged from twice a week to a few times a year. We had a combination of both students and working professionals.

## User Scenarios and Tasks

We created scenarios and tasks based on the features found in our visualization which includes the search bar, sliders (which are the filters based on alcohol by volume and ratings), checkboxes (which is the filter for beer flavor), and the drop down menu (which is the filter for location). We also asked our users if they could define and identify specific beer flavors. For the post reflection questions, we asked our users if they had any recommendations on how to improve the visualization and if they learned anything from the visualization. Here is the list of tasks and questions we asked our participants:

**Task 1:** Take a few minutes to explore this visualization and tell me everything you find.

**Task 2:** Find the beer called “Shorts the Wizard” and tell me what the sub-flavor of this beer is.

**Task 3:** Your friend who is a light-weight drinker and prefers roast flavored beers, one day sent you a message asking you for a beer recommendation. Can you use this visualization to find her a beer that is low in alcohol percentage, specifically beer with 4.5% alcohol and that is roast flavored? Please pick one with the highest rating.

**Task 4:** You want to find the highest rated beer that is produced locally (Washington State).  
*Question:* Can you explain to me what the average rating bar, found on the map, means to you?

**Task 5:** You really like crisp flavored beers. Find some beers that fit this requirement.

**Task 6:** Say you don’t know what the flavor “Malt” is, could you find the definition of the flavor “Malt” using this visualization?

*Question:* If they had troubles finding the definition of “Malt”, ask the user if they think there is a better way to display this or if they had expected this information to be somewhere else.

### Post Reflection Questions

1. Do you have any recommendations on how we can improve this visualization?
2. Did you learn anything from this visualization?

## RESULTS

### Positive Findings

From our usability test, we found that 2 out of 5 users said they liked the beer bottle image which dynamically changed colors when a user clicked on a beer that had a different tint from the previous one. Another positive finding is that all of our participants successfully used the search bar to find the drink “Shorts the Wizard” and used the map to find beers located in the Washington area.

### Software Errors (Tableau)

As we were conducting the usability test, our participants ran into several software errors. For example, when one participant clicked to filter out the flavor “Malt”, the recommendations list was slow to update and the beers with the flavor “Crisp” still appeared in the list. In addition, when the user filtered out beers by selecting Washington on the map, the visualization didn’t update and hence beers for other states still appeared.



Another user couldn't find the highest rated beer on the bar graph (which appeared on the recommendations list). A final software error is that one of the participants clicked on the "exclude" button which caused the graph to freeze.

## Findings and Recommendations

Here are the findings and recommendations from two or more participants:

- 3/5 participants failed to find the sub-flavor of the drink "Shorts the Wizard"
  - *Quote from participant 5: "what's the definition of sub-flavor?"*
- 3/5 participants experienced difficulties with using the Alcohol by Volume slider; 2 participants didn't know they could type in the number to move the slider
- 2/5 participants were curious as to where the ratings came from
  - *Quote from participant 2: "there should be some information that explains what the rating means."*
- 2/5 participants were confused as to why the bar with the average ratings turned a solid color (instead of the default gradient) when they clicked on a specific beer
- 2/5 participants didn't understand what the beer bottle image represented
- 2/5 participants thought that Alaska on the map was too large and hence took up too much too much viewing area
- 2/5 participants had a different expectation

Here are the remainder findings and recommendations made by the participants that may not be as significant but is just as important:

- Expected to find the definition of "Malt" either by hovering over the "Malt" label or by hovering over "Malt" on the x-axis
- Interested in finding information on the types of food that are best paired with specific drinks
- Suggested that there should be a reset button so the participant didn't have to refresh the visualization to complete some tasks
- Suggested that the map and the recommendations list is made smaller because these are static; the visualization should put a larger emphasis on the dynamic visualizations
- Experienced difficulties with using the Alcohol by Volume slider

## REDESIGN

Based on our usability testing results, we reflected on our initial implementation and went through a large redesign of the visualization to align the visualization with our target users' goals. The users wanted to use our visualization to find beer recommendations and explore the complex beer landscape. In our first implementation, the overview and detail views were not effective in allowing users to accomplish their goals because they were confused by the encoding methods we used to represent the data (for example, we represented beer flavors in colors that are very similar to each other, which was difficult for users to differentiate.)

We responded to user feedback by making the following redesign to our visualization:

- Changed bar graph into a scatter plot to support user understanding of data encoding
- Increased the size of the scatter plot to support effective visualization browsing
- Increase the filter size to allow for easier manipulation
- Moved elements on the map to reflect relative importance of each view to the users (ie: moved map to the bottom because most users were interested in the beer landscape)

- Renamed the graphs to support user understanding of each view
- The map was made smaller and part of Alaska was cut off to support the effectiveness of the visualization
- We decided to exclude sub-flavor of beers into our visualization because users were confused by it
- We increased connectivity in our visualization: now clicking on a beer on the recommendation list, individual dots on the beer landscape view is also highlighted. This change supports the effectiveness of the visualization.
- When one beer is selected -> the average ratings bar is no longer a solid color -> we changed it to display a gradient which displays a continuum
- For the visualization that we tested, users noted that when they selected one particular beer, the average ratings bar turned a solid red (rather than show the default gradient). We fixed this error so that when one beer is selected, the default gradient on the average ratings bar remains.
- We provided a one line description above the beer image to describe it in order to support user understanding of the image element
- We changed the color of the map to blue in order to distinguish it from the beer color, as many of the participants in our usability study were confused by its relation to beer flavor.
- We found data for beer style, as requested by a peer during our final presentations. Because it's in a different dataset from the one we are mainly using for now, we didn't manage to include the style in the earlier version. As one of the classmates mentioned after our presentation in class, many beer drinkers care about the style of the beer, we decided to match the style data with our current dataset, and added style as one of the filters in our final design.
- We eliminated the region filter because it represents similar information as the geospatial map. We also added style information into the recommendation list as well as the pop out bubbles.
- We added several additional columns to the recommendation chart, and clearly labeled each field. This addition supports the effectiveness of the visualization and increases understandability of users.

Our redesign reconsidered the visualization from the perspective of Shneiderman's infovis tasks [3]:

1. **Overview:** we present an overview of the beer landscape to users. At first glance, users can gain some understanding of beer dimensions in relation to ratings and flavors.
2. **Filter:** users can filter beers based on flavor, rating, alcohol content, and style
3. **Select:** users can select individual beers or groups of beers by clicking on individual dots on the beer landscape or by clicking and dragging across several dots to select multiple points.
4. **Coordinate:** users can look at beers from different perspectives within our dashboard. These views are linked so that users can immerse in a multi-dimensional exploration of the visualization
5. **Organize:** the visualization is arranged into multiple windows and workspaces, which increases the effectiveness and efficiency of user tasks
6. **Zoom:** users can zoom into a specified location on the map of the US to compare and contrast rating data between states
7. **Details-On-Demand:** users can hover over individual points (representing individual beers) to gather more information about food pairings, and taste information, and details about styles.



## Find Your Beer!

**Search for a Specific Beer**

Choose the Beer Style!

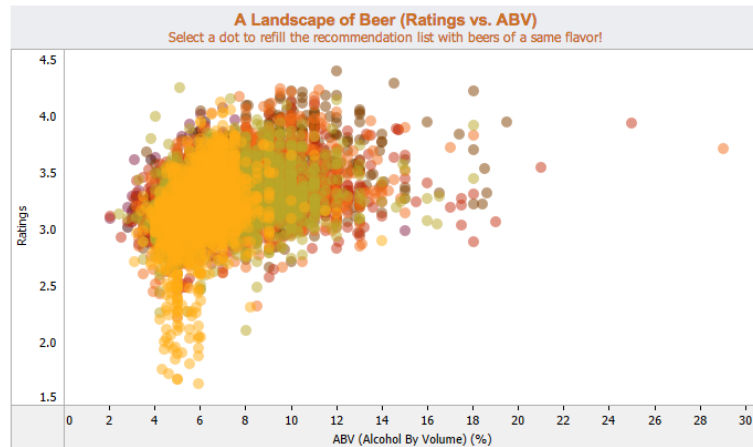
Filter by Ratings (1 to 5)

Filter by ABV (Alcohol By Volume) (%)

Filter by Flavor

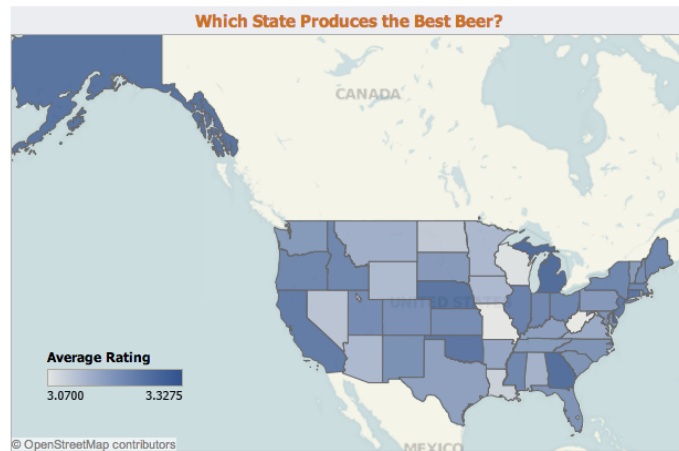
- ☒ (All)
- ☒ CRISP
- ☒ FRUIT & SPICE
- ☒ HOP
- ☒ MALT
- ☒ ROAST
- ☒ SMOKE
- ☒ TART & FUNKY

Hover a dot in the chart to see what your beer looks like!



**Recommendation List**

Beer Name	Style	Flavor	Ratings
AleSmith Speedway Stout	Imperial Stout	ROAST	4.408
Goose Island Bourbon County Stout	Imperial Stout	ROAST	4.301
New Glarus Belgian Red	Fruit Beer	FRUIT & SPICE	4.256
Three Floyds Dreadnaught Imperial I.	Imperial IPA	HOP	4.250
Stone Double Bastard Ale	American Barleywi..	HOP	4.240
Founders Kentucky Breakfast Bourbo..	Imperial Stout	ROAST	4.227
Dogfish Head World Wide Stout	Imperial Stout	ROAST	4.226
Stone Imperial Russian Stout	Imperial Stout	ROAST	4.222
Bells Hopslam	Imperial IPA	HOP	4.220
AleSmith YuleSmith - Summer	Imperial IPA	HOP	4.209
AleSmith Barrel Aged Speedway Stout	Imperial Stout	ROAST	4.191
Bells Expedition Stout	Imperial Stout	ROAST	4.191
Stone Ruination IPA	Imperial IPA	HOP	4.181
Russian River Pliny the Younger	Imperial IPA	HOP	4.180
Great Divide Oak Aged Yeti Imperial ..	Imperial Stout	ROAST	4.175
Bells Black Note Stout	Imperial Stout	ROAST	4.167
Russian River Temptation	Belgian Strong Ale	FRUIT & SPICE	4.161
Founders Breakfast Stout	Coffee Stout	ROAST	4.158

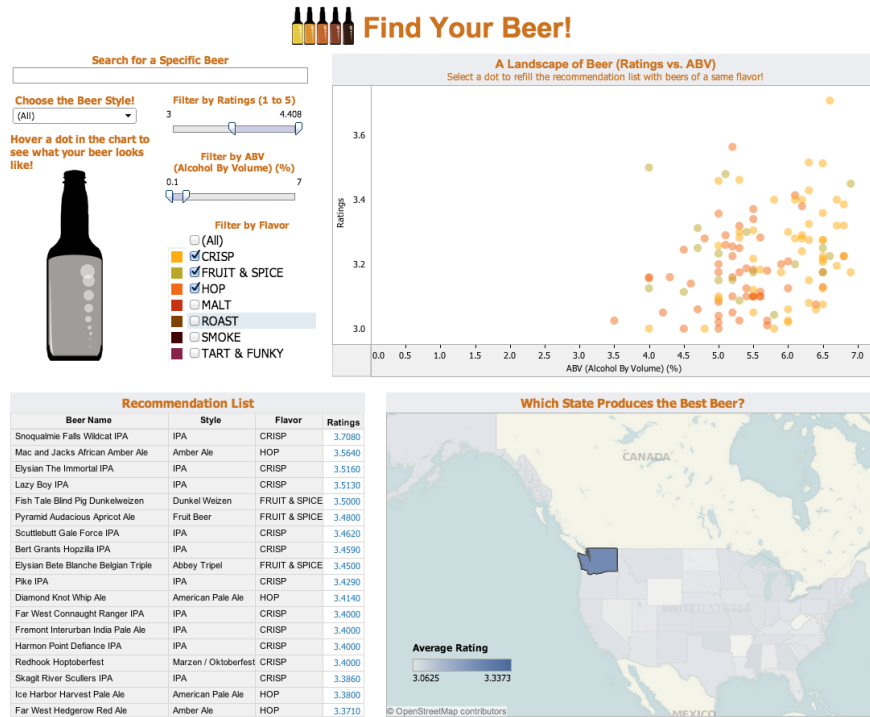


### Redesign 1: Final Design

There are four sections in our new design, the control panel, the scatterplot (A landscape of beer), the geospatial map (Which state produces the best beer), and the recommendation list.

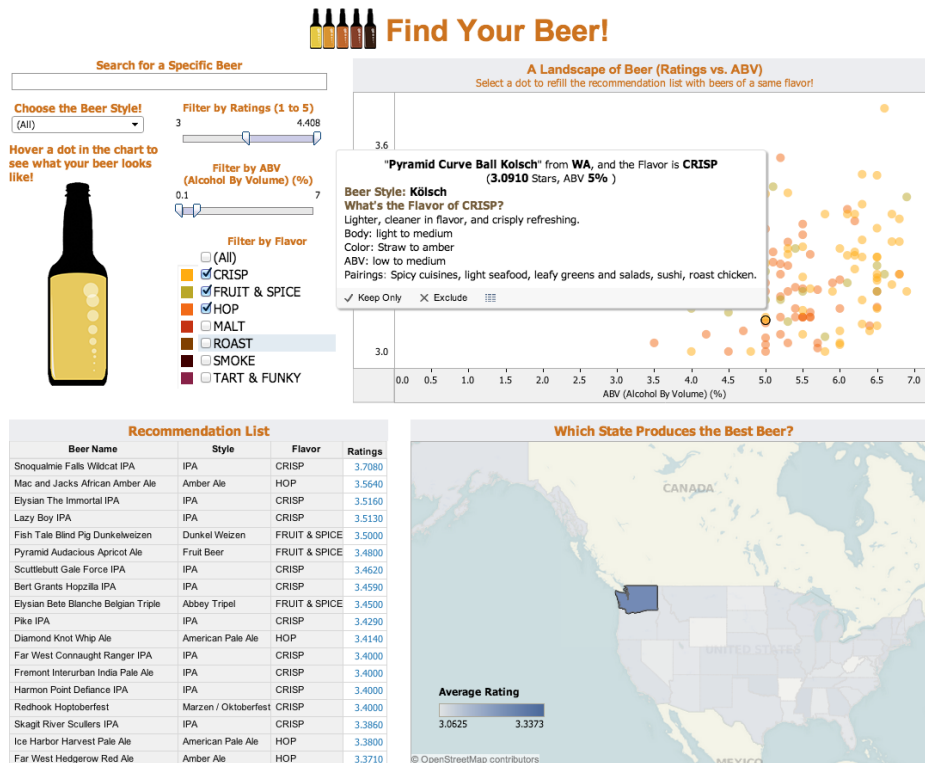
Filter: We allow users to filter the data from four different aspects:

- Filter by ABV (alcohol by volume): the ABV of beers range from 0.1% to 85%. Users could narrow down the range of ABV by dragging and drop the handling bars or by typing the exact number.
- Filter by ratings: narrow down the dataset to beers only within a specific range of ratings.
- Filter by flavor: users could use checkboxes to select their preferred flavors
- Filter by region: “high-end” drinkers may want to look for beers from specific regions. We allow users to do this through a geospatial map.



## Redesign 2 : Filters

As users make changes in the filters (and the geospatial map), we can see the corresponding changes in both the scatterplot and the recommendation list.



## Redesign 3 : Details on demand (pop out bubble on hovering a dot)



The scatterplot and recommendation list are for users to look up details. They could look through either the recommendation list or the dots in scatterplot to check the details of each beer. We also support interaction between these two sheets. As users select a beer they find interesting in the recommendation list, the corresponding dot will also be highlighted in the scatterplot, which allow users to see the beer within the context and compare it with other of beers.

## **FUTURE WORK**

Since we were constrained by time, we chose to use Tableau to create our visualization. As a result, we had to work around several limitations; for example, the visualization was quite slow when it was uploaded onto Tableau Public and there was no way to create a reset button to refresh the visualization. Also, Tableau doesn't enable us to include evocative animations and certain affordances such as the ability to drag and drop items to filter out the beers. In the future, we would like to use D3 for its efficiency and for including additional features in order to create a more immersive and interactive visualization.

Another road block that we ran into was finding and using specific data in our visualization. We couldn't find data for the following: prices, locations for which each beer is sold at, glass styles for each beer, information on what the beer ratings are based on, written reviews, and beers produced outside of the United States. With the variable glass style, we came up with the idea of creating a dynamic panel where the images of the glass style change based on which beer name was highlighted. In addition, we want to include the data that we found but didn't include into our visualization such as bitterness (International Bitterness Unit), carbs, and glass size. We also managed to find a dataset on the beer brand images but could not figure out how to extract the data.

If we are able to attain all these variables, we would then generate more graphs to illustrate the relationships among the variables for the purpose of further educating our target users. As we found from our usability test, one of the participants thought it would be useful to see if there is a relationship between ratings and beer color. And if we are able to integrate the bitterness data into the visualization, it would be useful to include a graph that looks at the relationship between bitterness level and the color of the beer; during our process of exploring the data using Tableau, we found that the more bitter the beer is, the darker the beer color. And of course, more usability testing would be needed and we would reiterate on the design. In our future usability tests, we want to cover a wider range of participants which includes recruiting more participants with a broader age range.

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## **APPENDIX**

Links to the data sets:

Beerpal: <http://www.beerpal.com/>

Brewery DB: <http://www.brewerydb.com/>

Craft Beer Analytics: <http://www.craftbeeranalytics.com/beer-data.html>

The Splendid Table:

<http://www.splendidtable.org/story/the-7-flavor-categories-of-beer-what-they-are-how-to-pair-them>