

Find My 14er

Introduction: Hiking 14ers is a common hobby for residents (or travelers) of Colorado. A 14er is defined as a mountain peak that exceeds 14,000ft in elevation, and Colorado boasts 58 of them. In 2017, it was estimated by the Colorado Fourteeners Initiative that over 334,000 individuals had hiked 14ers during the busy season, which typically runs from June or July through September of each year. Hiking 14ers takes careful planning- you must carefully plan and study your route, prepare for the changing/inclement weather, choose a peak with an appropriate difficulty for your ability level, and ensure you are prepared with the right equipment and supplies. This visualization tool “Find My 14er” will help hiking enthusiasts select and prepare for treks to the peaks of Colorado 14ers.

A visualization approach is appropriate to solve this problem of choosing a 14er to climb, as the visualization tool can aid in the exploration of Colorado 14ers through filtering mountain peaks based on attributes such as distance of hike, difficulty (class), elevation gain, popularity, weather, location, or specific mountain ranges. A user can visually compare the different mountain peaks using generated bar graphs and other visualizations, and filter different attributes until an appropriate 14er is found for the specific user based on their individual desires or ability levels. Allowing the comparisons across the various attributes visually can provide the user the ability to select an appropriate 14er to climb in an efficient and timely manner.

Dataset: The core dataset for this project was obtained from <https://www.kaggle.com/mikeshout/14erpeaks/version/4>. The dataset was downloaded as a CSV file containing 58 rows and 16 columns. This dataset includes data for each peak such as elevation, mountain range, latitude, longitude, standard route, distance, elevation gain, difficulty, traffic low, traffic high, and a URL link to a photo of each mountain peak. This dataset was enriched to also include a URL link to 14ers.com external webpage for each specific mountain peak, in addition to a URL link to a photo of the main standard route to climb each peak. The photo for each standard route was obtained from 14ers.com by taking a screenshot and hosting it externally on an image hosting site to obtain a direct URL to be added to the dataset. To obtain weather data, an external link to 14ers.com was added to the dashboard to check the weather at each mountain peak in real time. This was a feature that was already built into the 14ers.com website. Below are the first two rows from the main dataset in Figure 1 (on three separate lines stacked due to limited space), followed by the data abstraction for the dataset using Munzner Ch. 2 framework (Figure 2).

#	Abc 14erFinal.csv ID	Abc 14erFinal.csv Mountain Peak	Abc 14erFinal.csv Mountain Range	#	Abc 14erFinal.csv Elevation ft	Abc 14erFinal.csv Fourteener	#	Abc 14erFinal.csv Prominence ft	#	Abc 14erFinal.csv Isolation mi	⊕ 14erFinal.csv Lat	⊕ 14erFinal.csv Long
1	Mount Elbert	Sawatch Range		14,440	Y		9,093	670.000	39.11780	-106.44540		
2	Mount Massive	Sawatch Range		14,428	Y		1,961	5.060	39.18750	-106.47570		
<hr/>												
14erFinal.csv.Standard Route	#	14erFinal.csv Distance mi	#	14erFinal.csv Elevation Gain ft	#	14erFinal.csv Difficulty	#	14erFinal.csv Traffic Low	#	14erFinal.csv Traffic High	Abc 14erFinal.csv Photo	
Northeast Ridge		9.5000		4,700		1	20,000	25,000	https://www.14ers.c...			
East Slopes		14.5000		4,500		2	7,000	10,000	https://www.14ers.c...			
Link 14Er		Route Map										
https://www.14ers.c...		https://i.imgur.com/s...										
https://www.14ers.c...		https://i.imgur.com/r...										

Figure 1: First Two rows of the utilized dataset, separated and stacked upon one another for limited space purposes.

Column Name	Semantics	Data Type	Attribute Type	Availability
Mountain_Peak	The name of the peak	String	Categorical - nominal	static
Mountain_Range	The name of the primary mountain range the peak is apart of	String	Categorical - nominal	static
Elevation_ft	The peak elevation in feet	Numeric	Quantitative - sequential	static
Fourteener	Indicator if the peak is considered a 14er, Y or N value	Boolean	Ordinal	static
Prominence_ft	How much higher peak is in feet from the next highest point	Numeric	Quantitative - sequential	static
Isolation_mi	Distance in miles from the nearest point with same or higher elevation	Numeric	Quantitative - sequential	static
Lat	Latitudinal coordinates in decimal form	Numeric	Positional	static
Long	Longitudinal coordinates in decimal form	Numeric	Positional	static
Standard_Route	Name of most commonly used hiking route to peak	String	Categorical - nominal	static
Distance_mi	Distance of standard route in miles	Numeric	Quantitative - sequential	static
Elevation_gain_ft	Elevation gain of standard route in feet	Numeric	Quantitative - sequential	static

Difficulty	Yosemite Decimal System, a value ranging from Class 1 (easiest) to Class 5 (most difficult)	String	Ordinal	static
Traffic_Low	Low range of estimated visits in 2017	Numeric	Quantitative - sequential	static
Traffic_High	High range of estimated visits in 2017	Numeric	Quantitative - sequential	static
Photo	Photo of the mountain peak	String	Categorical	static
Link_14er	Link to 14ers.com webpage for each peak	String	Categorical	static
Route Map	Photo of the standard route to top of each peak	String	Categorical	static

Figure 2: Data Abstraction for Find My 14er

Tasks: The following is a task abstraction (Figure 3) using the framework described in Munzner Chapter 3. The table includes the task abstraction, actions, targets, and finally describes the domain specific task.

Task Abstraction	Actions	Targets	Domain Specific Task
Compare values between different targets	Query → Compare	Attributes → Many Attributes → Similarity	The user will have the ability to compare characteristics of different targets (peaks) such as elevation gain, current weather, foot traffic, difficulty, or distance.
Locate values using known targets	Search → Locate	Attributes → Many Attributes	The user will have the ability to locate peaks using certain desired characteristics (targets) such as specific mountain range, difficulty, distance, popularity, or elevation gain.
Lookup known target and Identify values for that target	Search → Lookup Query → Identify	Attributes → One Attribute	The user will have the ability to first lookup a known target (peak) then identify the current weather for that known target and view standard route for the target.
Summarize all targets	Query → Summarize	All Data	The user will have the ability to obtain an overview of 14ers in Colorado, color coded by mountain range, as a graphical display map.

Figure 3: Task Abstraction for Find My 14er.

Visual Designs: Below you will find the final interactive dashboard used to contain each individual visualization representation (Figure 4). Each individual idiom will be further explained, in addition to the interactions between the visualizations and actions each visual representation can perform.

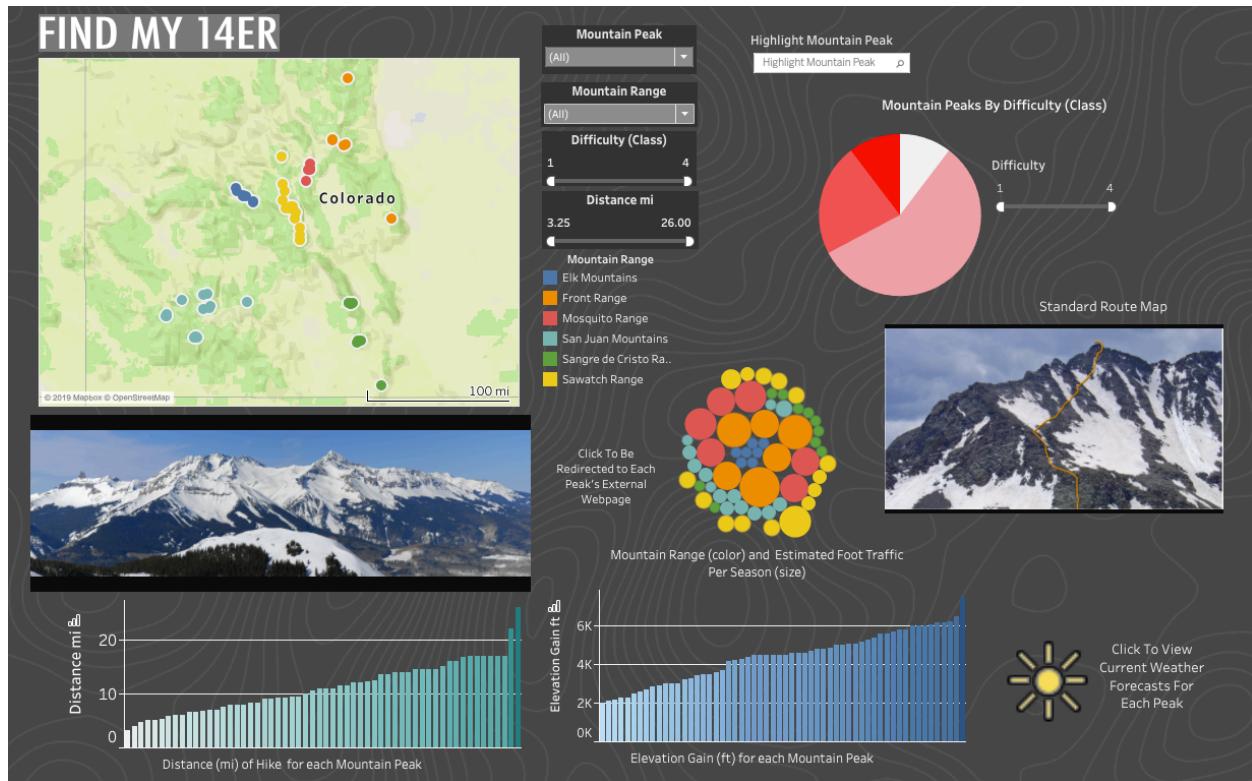


Figure 4: Find My 14er Interactive Tableau Dashboard

Geographic Map Idiom: The geographic map visualization representation can be found in the upper left corner of the main interactive Tableau dashboard for Find My 14er. This idiom can be utilized to perform a variety of filtering tasks, which can be accomplished by either using the selection tool within the map (Figure 5) or by filtering using specific desired characteristics which can be found to the right of the map visualization. These options include filtering based on specific mountain range, distance of hike, difficulty of hike, or for specific mountain peaks. Once the filters are applied, the user will still need to use the selection tool to select the filtered mountain peaks to allow the other visualization idioms to update accordingly to reflect this filtering. The dashboard in Figure 5 demonstrates the selection of mountain peaks using the freeform selection tool and the resulting changes throughout the other idioms within the dashboard. The geographic map idiom also incorporates a hover feature, where a photo of the mountain

peak will be displayed and update in real time below the map idiom when hovering over a specific mountain peak on the geographic map.

This idiom was chosen as the main interactive visualization idiom as it efficiently can filter on many different attributes, and visually displays each peak in its actual location within a map of Colorado. The main dataset focused on geographic locations, and then individual attributes for each location as secondary considerations, so a geographic map idiom is an appropriate choice for this set of tasks. The geographic map uses color marks to differentiate between each mountain range, which is a consistent color scheme throughout other idioms as well (packed bubbles idiom).

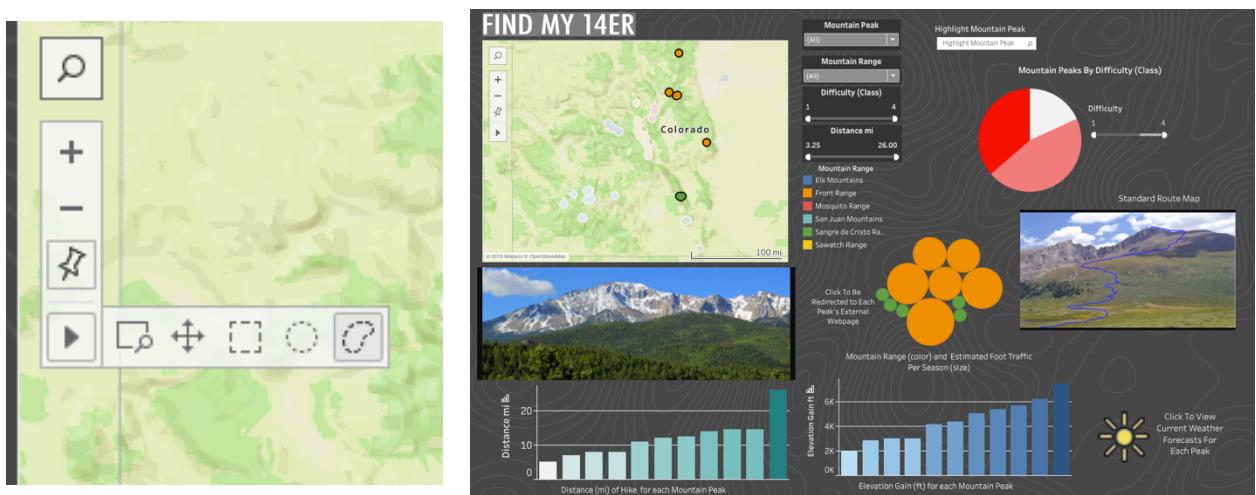


Figure 5: Performing selection within geographic map idiom and changes reflected throughout interactive dashboard

Bar Graph Idioms: Bar graphs can be found within the main interactive Tableau dashboard for Find My 14er in the lower left and lower center of the dashboard. These bar graphs are used to compare the quantitative data values of distance and elevation gain for the selected mountain peaks. The marks utilize a diverging color scheme, ranging from lighter shades of green for shorter distance to darker shades for greater distance of hikes. Similarly, the elevation gain bar chart utilizes a diverging blue color scheme ranging from light blue for lesser elevation gain to darker blue depicting a greater elevation gain. These bar graphs are updated in accordance to the selection made on the geographic map idiom. This allows the user to perform comparison for the desired mountain peaks which are selected within the other idiom. The bar graphs have a hover feature incorporated, which is where the data information is displayed for the peak being hovered over. This design choice allowed space to be saved and less visual clutter of labeling each mountain peak with their corresponding values. This hover feature can be displayed in Figure 6.

The bar chart idiom was appropriate for the task of lookup and comparing values, as bar charts are well suited for both tasks. The number of data values was also small enough to successfully visualize all of the mountain peaks at one time if desired, which was another reason to utilize the bar chart idioms to visualize comparisons between different mountain peaks. The bar charts can be sorted in descending or ascending order, by clicking on the bar graph image on the Y axis near the axis label.

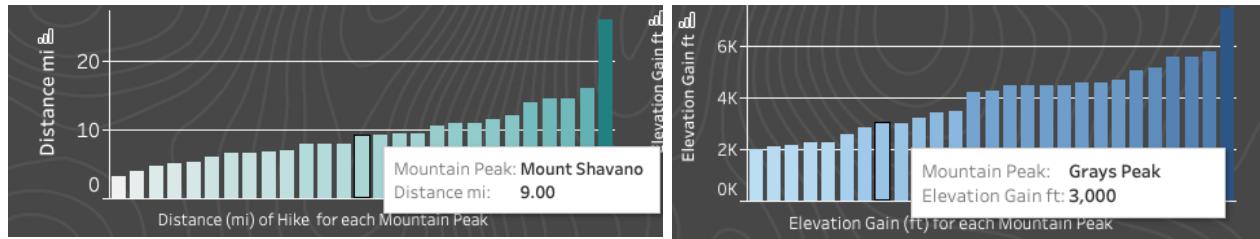


Figure 5: Bar chart idioms with hover feature displayed when hovering over each mountain peak

Pie Chart Idiom: The pie chart idiom can be found in the upper right corner of the main Find My 14er dashboard. The pie chart is utilized with one categorical attribute (mountain peak) and one quantitative attribute (difficulty/class). The standard route is also included in the display hover (Figure 6). The pie chart can be filtered by desired difficulty using a sliding scale, and updates accordingly. The pie chart idiom incorporates a diverging red color scheme for marks, ranging from class 1 mountain peaks as lightest red to class 4 mountain peaks as the darkest hue of red. The pie chart also is updated in accordance to the selection made on the geographic map idiom, only including the selected mountain peaks. The pie chart idiom also incorporates a unique hover feature, which displays a photo of a generalized mapping of the standard route to the top of each mountain peak. This photo is updated when hovering over each portion of the pie graph and displayed as a photo underneath the pie graph. This also

assists the user in making an appropriate decision because they are able to see the top of the peak and the potential terrain they will be encountering.

A pie chart idiom is an appropriate choice for comparison of the difficulty attribute because it displays a small part of the whole data set. It allows the user to visualize how many mountain peaks are categorized by each difficulty/class and improves the chances of the user making an appropriate selection for their individual ability level or experience.

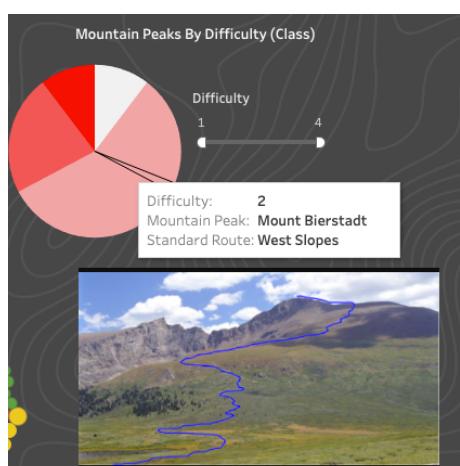


Figure 6: Pie chart idiom displaying peak information and a generalized photo of the standard route to the top of the peak

Packed Bubbles Idiom: The packed bubbles idiom can be found centrally within the main Find My 14er dashboard. This idiom is used to display the popularity of each selected peak. The size channel is used to indicate the amount of estimated foot traffic per season, with larger bubbles indicating greater popularity and higher foot traffic, and smaller bubbles indicating lesser popularity and lower foot traffic. Similar to the other idioms, the packed bubbles idiom updates based on any selection within the geographic map idiom. The marks utilize the color channel and are differentiated by mountain range the color scheme is an extension of the main geographic map idiom. The mountain range legend can be seen directly above the packed bubbles idiom, which assists in deciphering between different mountain ranges. Upon hovering over a specific bubble, you will see information displayed about that peak including the mountain range where it can be found, the name of the peak, and the estimated foot traffic for the season. The packed bubbles idiom also includes a unique selection feature, where upon clicking on a bubble a user will be redirected to an external web browser page for that specific mountain peak on 14ers.com where further information about the peak can be found. This information can be found in Figure 7. This idiom was appropriate for this task as it allows the user to visually see the difference in foot traffic using the size channel, and also uses the consistent color channel which is also utilized in the main geographic map idiom.

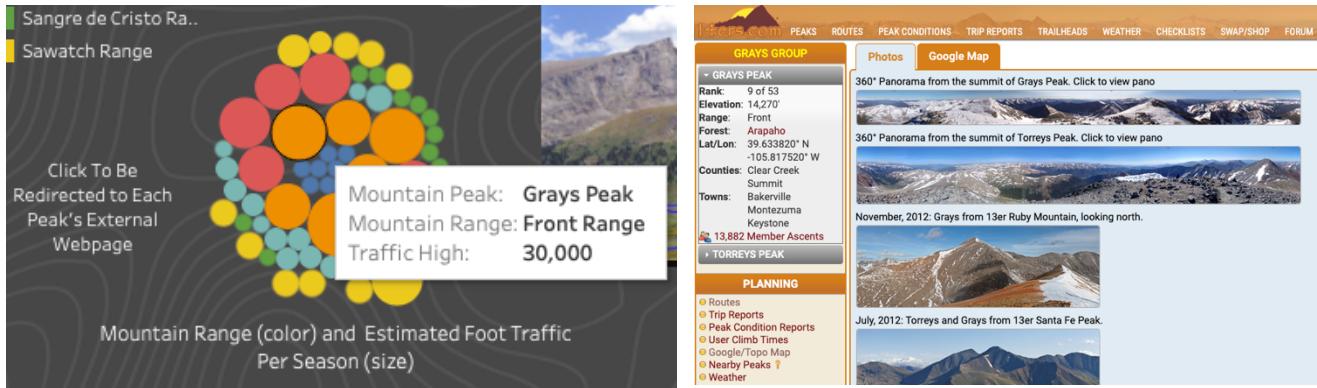


Figure 7: Packed bubbles idiom with displayed peak information and an example of the peak's main webpage on 14ers.com

Weather Idiom: Incorporated into the Tableau dashboard for Find My 14er is an external button to check the weather forecast for each desired peak. This idiom utilizes a simple URL link which redirects to 14ers.com weather feature page (Figure 8). The weather page shows an extended forecast for each peak, including an additional extended forecast as well. This feature can be useful to users once they have selected a desired 14er, as they will be able to utilize this feature to appropriately plan for the weather at the top of the peak, which often differs greatly from the weather at the trailhead at the bottom of the mountain peak.

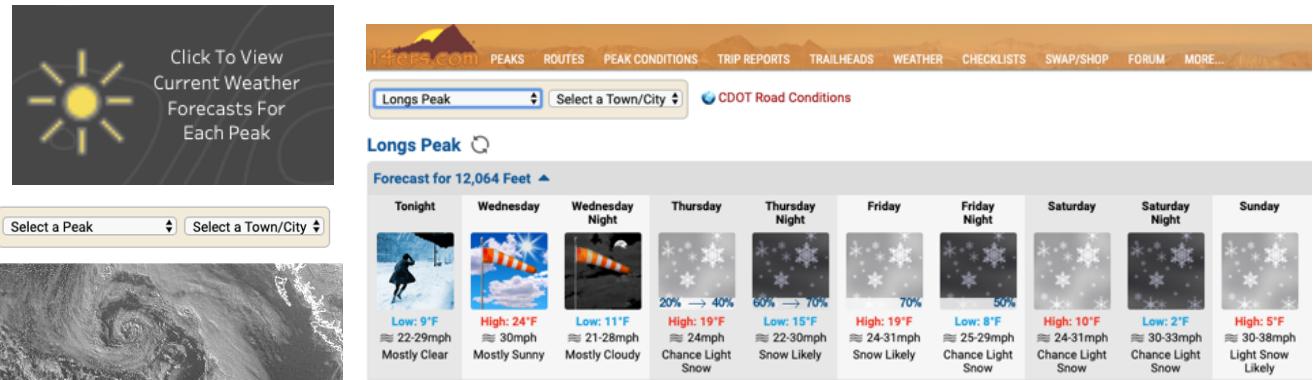


Figure 8: Weather feature which utilizes the weather forecast for each mountain peak from 14ers.com

Other interactions: The main dashboard also incorporates a highlight feature. This is used to visually see each mountain peak in accordance to their position in each idiom. As an example (Figure 9), Mount Bierstadt is highlighted and can be easily distinguished in each specific idiom. The other mountain peaks are dimmed and the desired highlighted selection is easily seen within each idiom.

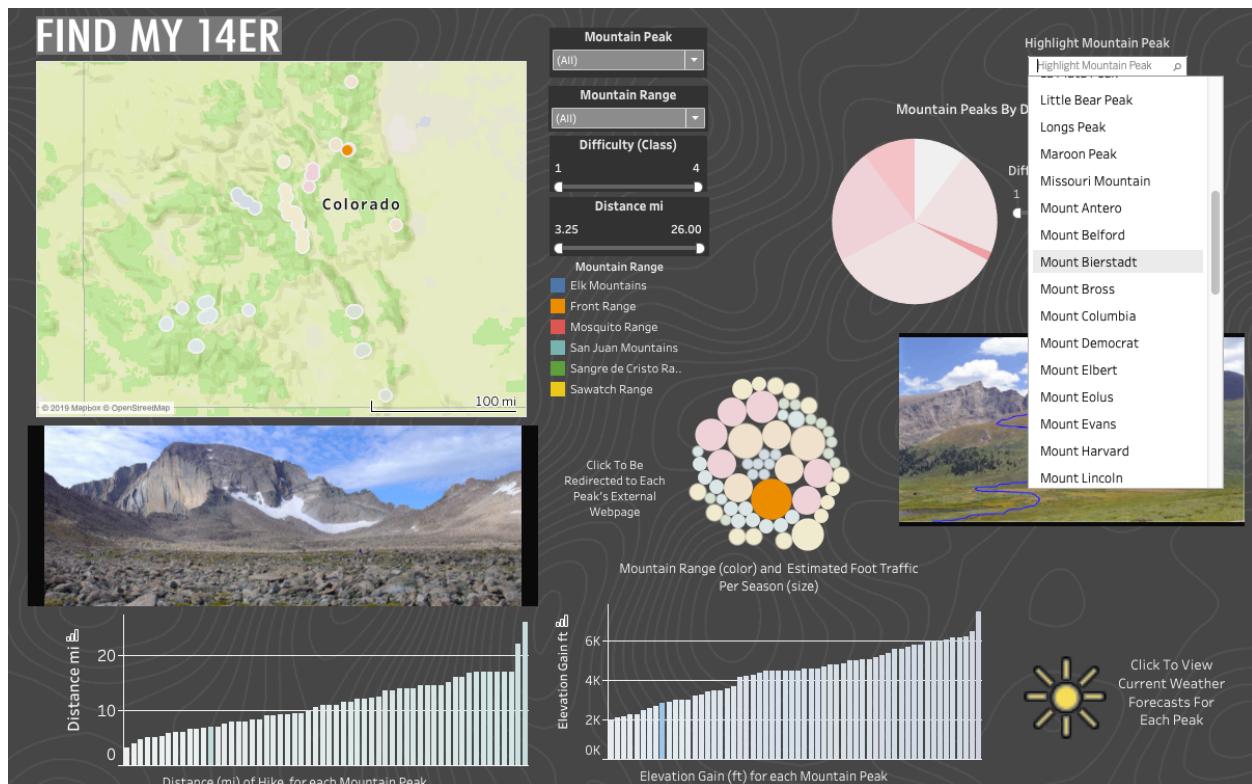
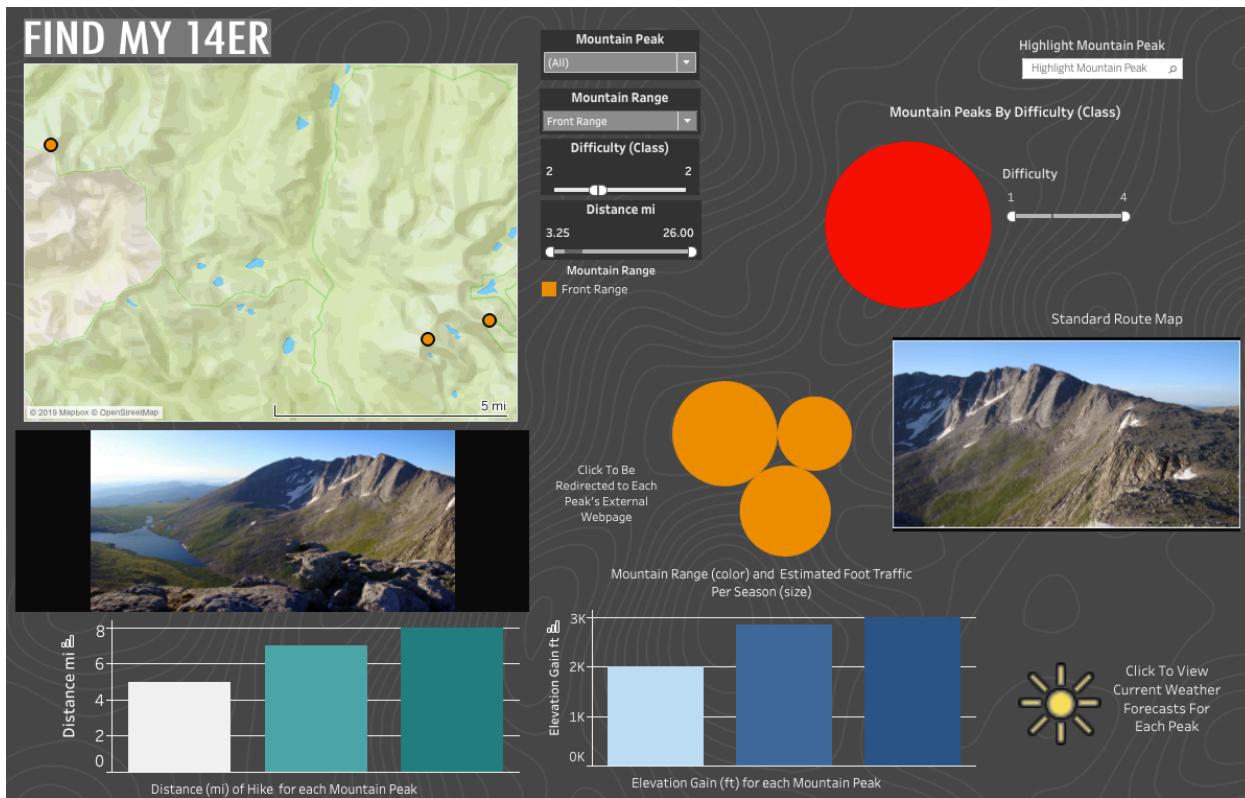


Figure 9: Find My 14er Tableau Dashboard with highlighting feature for Mount Bierstadt

Results: The Find My 14er interactive visualization was designed using Tableau. The database utilized was initially thought to be thorough without any additional data needed to be incorporated into the visualization. Upon doing work on the project, the vision evolved, and a few new entries were needed to incorporate new features into the visualization dashboard. I updated the initial database within Microsoft Excel, adding columns for a link to each external main page on 14ers.com, as well as a direct link to a photo of the standard route for each peak. To obtain the direct link to each photo, I went to each peak's webpage on 14ers.com and took screenshots of the generalized mapping of each standard route. I then uploaded each image to an image hosting website and used the direct link from each image to add to the dataset for each mountain peak.

To decide which visualizations were appropriate to accomplish the desired tasks, I considered the specific domain tasks that were looking to be accomplished. I tried many different layouts and different visualization idioms before deciding on the final layout of the dashboard, considering each idiom and how the idiom would assist the user in accomplishing the domain tasks from the task abstraction. I utilized Tableau Desktop for the majority of the project, and also utilizing 14ers.com for datafiles as well as photos for each mountain peak.

For the main user story, a user wants to find a class 2 mountain peak under 15 miles in distance with an elevation gain less than 3000ft within the front range. The user would first use the drop-down menu to the right of the geographic map and uncheck 'all' and then check 'front range'. This would then update the map to only show mountain peaks within the front range. The user would then update the sliding bar for distance to only include class 2 peaks. The selection tool would then be used to select the peaks on the map, which will update all other idioms within the dashboard (Figure 10). It can then be noted that only 3 peaks are left to choose from, Mount Bierstadt, Mount Evans, and Torrey's Peak. Torrey's peak has an elevation gain of 3000ft, which leaves only Mount Bierstadt and Mount Evans to choose from. Mount Evans has the shortest distance hike of 5 miles, with an elevation gain of only 2000ft, and is also less popular than Mount Bierstadt with an estimated popularity of 20,000 hikers per season. The user then makes the decision to climb Mount Evans. The standard route is displayed under the distance pie chart, in addition to a photo of the mountain under the geographic map idiom. The user can then click on the bubble for Mount Evans in the packed bubble idiom to learn more about the peak, and also click on the weather link to view the current weather at the top of the peak. The user will be prepared to hike Mount Evans by using Find My 14er interactive visualization.



[Home](#)

[Weather](#)

CDOT Road Conditions

Evans, Mt.

Forecast for 13,150 Feet ▾

Tonight	Wednesday	Wednesday Night	Thursday	Thursday Night	Friday	Friday Night	Saturday	Saturday Night	Sunday
Low: 7°F ≈ 22-29mph Partly Cloudy	High: 23°F ≈ 24-29mph Mostly Sunny	Low: 7°F ≈ 18-26mph Mostly Cloudy	High: 19°F ≈ 18-23mph Partly Sunny then Slight Chance Light Snow	50% → 70% ≈ 23-31mph Partly Sunny then Slight Chance Light Snow	Low: 14°F ≈ 24-31mph Light Snow Likely	High: 17°F ≈ 24-31mph Light Snow Likely	Low: 7°F ≈ 24-32mph Chance Light Snow	High: 9°F ≈ 22-31mph Chance Light Snow	Low: 0°F ≈ 30-35mph Light Snow Likely
									High: 3°F ≈ 31-39mph Light Snow Likely



[PEAKS](#) [ROUTES](#) [PEAK CONDITIONS](#) [TRIP REPORTS](#) [TRAILHEADS](#) [WEATHER](#) [CHECKLISTS](#) [SWAP/SHOP](#) [FORUM](#) [MORE...](#)

[Home](#)

[14ers](#)

[Evans and Bierstadt \(Main Page\)](#)

EVANS GROUP

▼ MT. EVANS
Rank: 14 of 53
Elevation: 14,264'
Range: Front
Forests: Arapaho
Pike
Lat/Lon: 39.588360° N
-105.643333° W
Counties: Clear Creek
Towns: Denver
Idaho Springs
Georgetown
Evergreen
 10,340 Member Ascents

MT. BIERSTADT

PLANNING

- Routes
- Trip Reports
- Peak Condition Reports
- User Climb Times

[Photos](#) [Google Map](#)

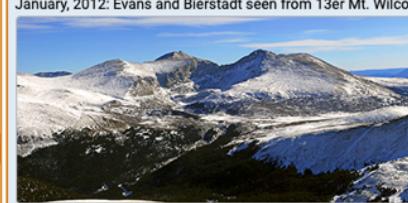
360° Panorama from the summit of Mt. Evans. Click to view pano



360° Panorama from the summit of Mt. Bierstadt. Click to view pano



January, 2012: Evans and Bierstadt seen from 13er Mt. Wilcox.



July, 2009: Mt. Evans and Summit Lake seen from 13er Mt. Spalding.

Figure 10: Generated user story for Find My 14er- a class 2 mountain within the front range with an elevation gain less than 3000ft and a distance less than 15miles. The user can also check the current weather, and obtain other information about Mt Evans from the main peak webpage within 14ers.com