

CS 6630 - Class project

Project Proposal:

# Avalanche Forecast Explorer

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# Project Information

## Team

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## Project repository:

<https://github.com/UofU-Cryosphere/dataviscourse-pr-avalanche-explorer>

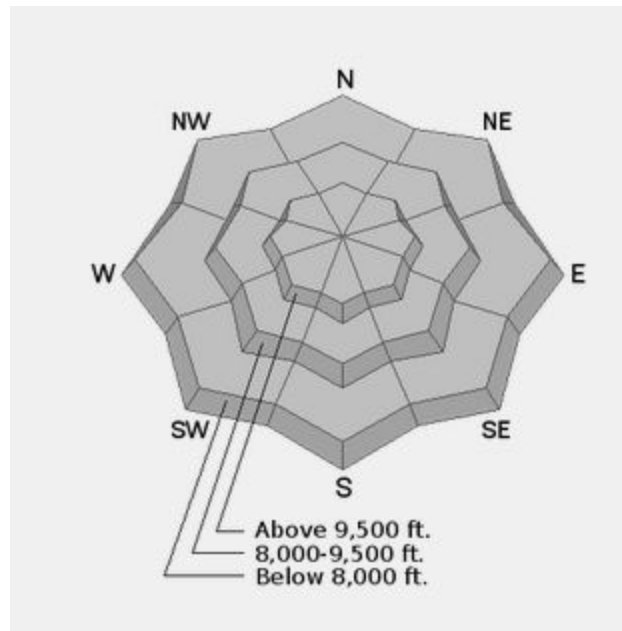
## Project Objectives

We would like to improve our skills on coordinating multiple views with each other and also learn more ways to filter broad information and drill down to specifics. The chosen dataset of the avalanche danger forecast seems ideal for that, as the user first arrives at the page gaining an overall understanding on global information before being able to get more details on a specific sub-sections. Being able to easily get to specifics by filtering and reduction along with tying that to real world knowledge to associate the displayed data will improve the comprehension of the information as a whole.

## Motivation

The Utah Avalanche Center (UAC, <https://utahavalanchecenter.org>) is one of the primary sources for backcountry skiers to get the latest reports and forecasts for avalanche conditions in the winter. Avalanche advisories are reported on a daily basis and updated on their website under the forecast section: <https://utahavalanchecenter.org/forecast/>.

The visualization in the report uses an avalanche rose (Figure 1), which gets colored for each aspect and elevation band with the corresponding avalanche danger level. Currently this is a static visualization and could benefit from adding user interaction options to better inform and guide the visitor to information. For instance, after a skier has the information for a specific aspect and elevation band on hand, he or she needs a third party information source to associate that to locations on a map. This, however, could be displayed along with the rose and eliminate this need. In addition to the current forecast, it is equally important to look at historic information to an aspect and elevation band to better judge the current risk. This present design requires the user to navigate away from one forecast to view another and prohibits a side-by-side comparison.



Central idea for this class project is to combine the avalanche rose with a map that highlights corresponding areas right away after a selection from a user. In addition to aspect and elevation, the selected areas would also have the information of the slope angle to an individual location. The latter is an additional factor to determine the avalanche safety level that is currently not visualized with the rose. In a separate view, the past forecasts will be displayed with links to additional information. Transforming the static page into an interactive visualization will benefit the decision making process for a backcountry skier by having more relevant area information accessible in one central source.

Challenge for this project is that the required data is not readily on hand for download and will need manual collection. With this limitation on hand, we decided to prototype the visualization for the month of January 2020. For a physical location, we selected Little Cottonwood Canyon as the reference area for this implementation since there are a number of popular backcountry destinations in that region.

# Data

## Avalanche Rose Data

One of the challenges to enable the transition to an interactive form is that the current data is currently not centrally accessible via download. As a compromise between time and completeness of the data, we decided to pick the month of January of 2020 and manually create a data file that will be used in the project. For that we will go through the forecast archive:

<https://utahavalanchecenter.org/archives/forecasts/salt-lake>  
and gather the information. The avalanche rose is currently served as a static image and does not have a consistent naming pattern, which makes automated processing more time intensive. A benefit to the manual gathering of the data is that it will be in the final required format and no further manipulation will be required.

## Geoinformation data

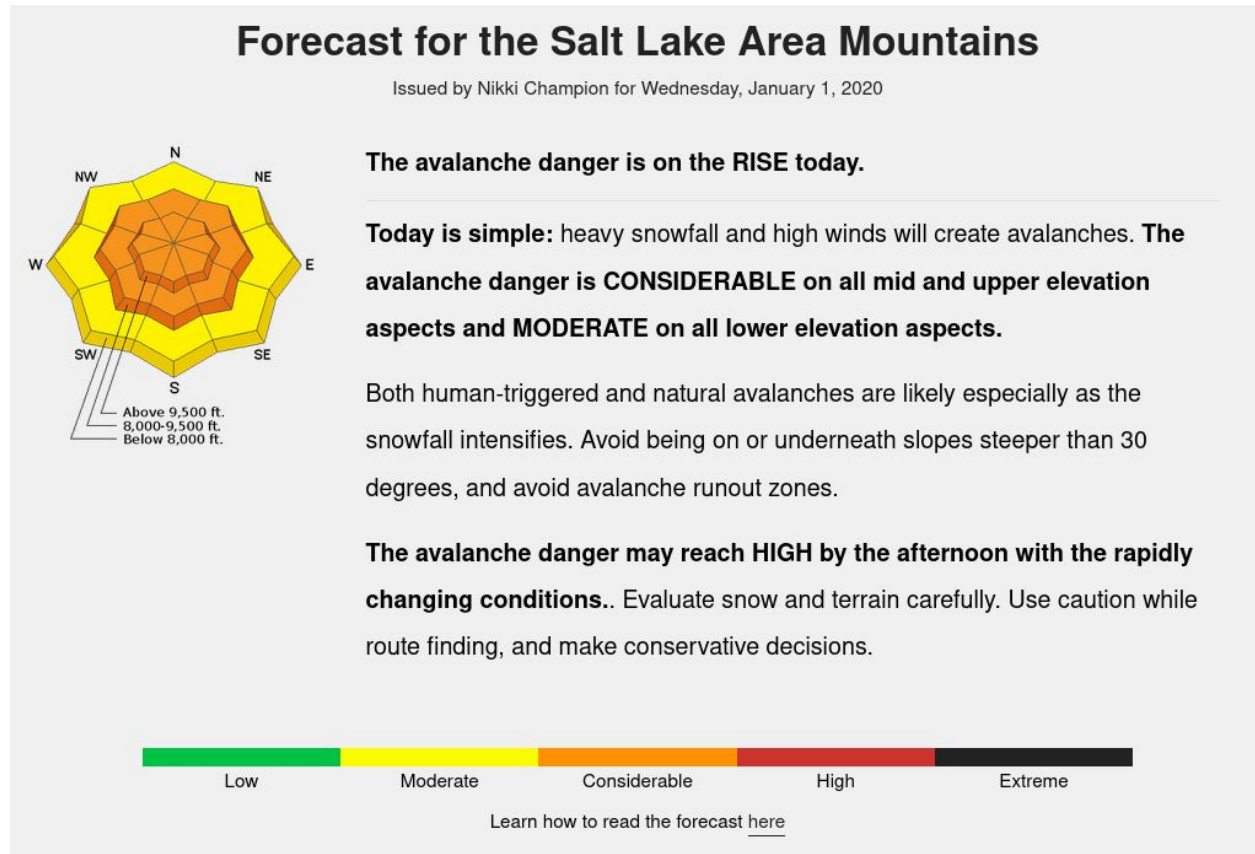
The elevation, aspect, and slope angle information can all be derived by downloading a high-resolution spatial dataset from:

<https://gis.utah.gov/data/elevation-and-terrain/>

After download, all described spatial information will be created using the Geospatial Data Abstraction Library (GDAL, <https://gdal.org>). GDAL can also transform the data into GeoJSON, which will be the targeted format for loading the information.

# Design

## Current page



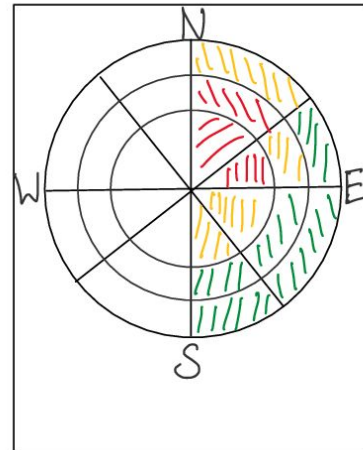
Above is the current design for reference. The avalanche rose is on the left hand side, colored by current forecasted danger level by aspect and elevation. To the right is a quick summary, highlighting the most important information.

## Re-Design

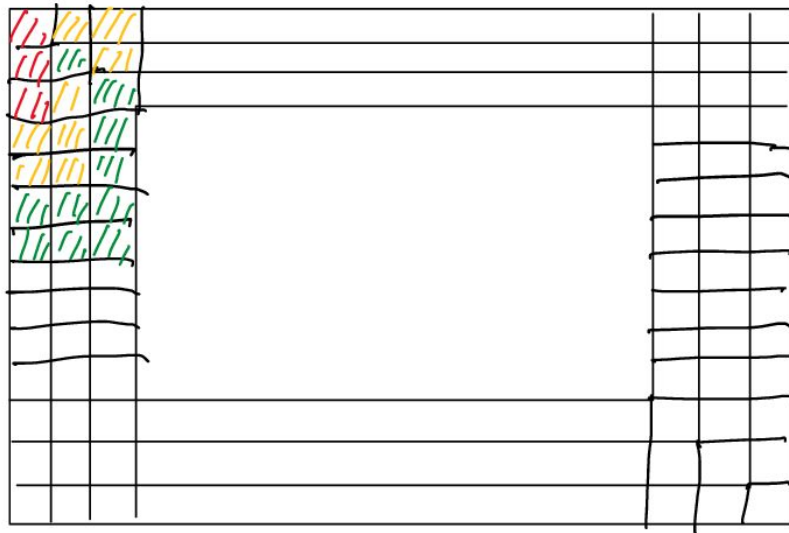
Here we list the elements we see as components for the interactive version.

### Avalanche Rose

The rose will be changed from a 3-D representation to 2-D. We don't see any benefit from the current 3-dimensional display and also think it will be easier to navigate the different aspects and elevation bands this way.



### Area Map



Map information will be displayed in rectangular grids, overlaying the avalanche danger with a corresponding color. We envision that an aerial map like Google Maps will be a base layer to help orient the user within the canyon.

Tooltip

Once a user hovers over one rectangle above, more detail will be displayed. At the moment we have the following:

- Aspect
- Slope angle
- Avalanche danger

Tool tip

Aspect: NE  
Slope angle: 30  
Elevation: 9000 ft

Forecast History

New element compared to the current design is a historic view, showing previous forecasted avalanche danger levels to the selected square. The historic view will also enable the user to filter the current map view by clicking on a certain day, filter by aspect, and/or elevation.

Jan 2020

MTWTFSS

1

2

3

4

5

4	4	4	3	3	3	3
1	1	4	4	4		

Aspect

Elevation

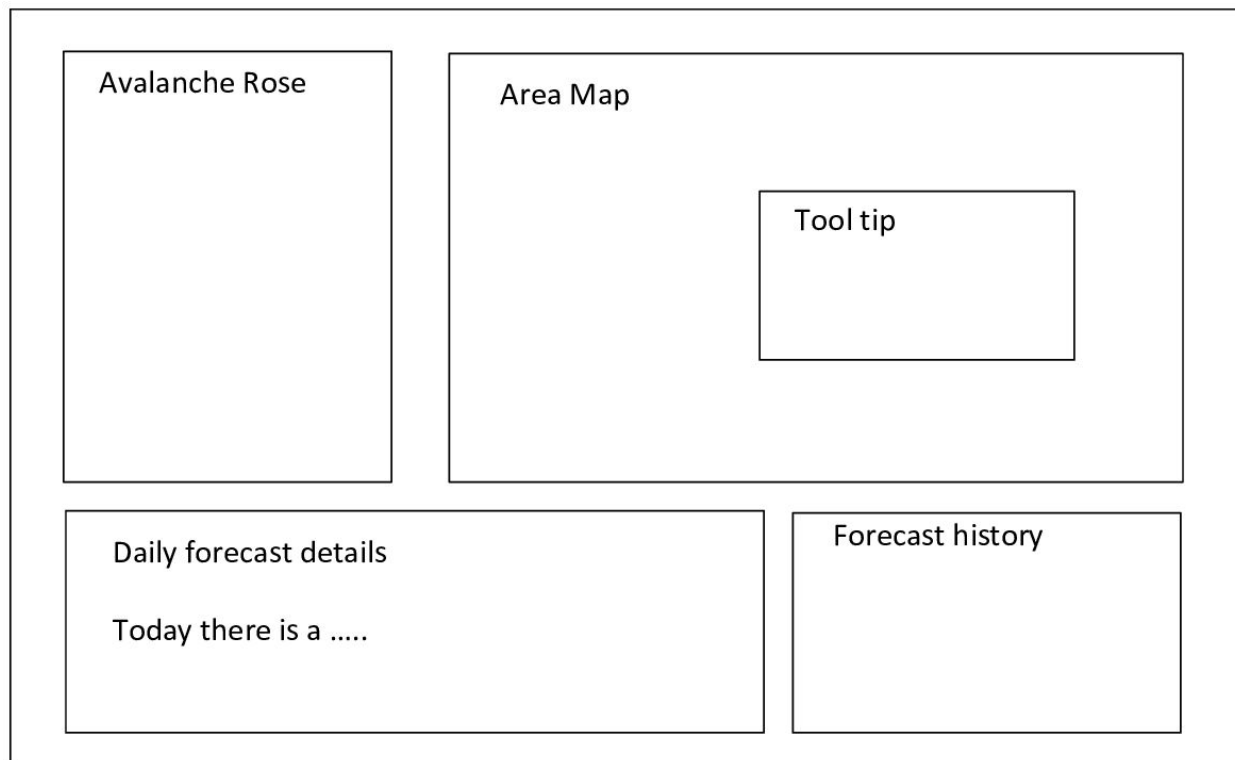
Info Panel

Forecast	Weather

The info panel will display all of the text that is on the current design. This includes a summary, details to specific forecasted avalanche problems, other announcements, and weather. One possible option is to break this further apart into tabs, which is shown in the design above. We will experiment with both options.



## Overview



Above the first envisioned draft of the redesign and where we see each component to be located on the page. When a user first lands on the page, we want to show the same information as on the current page with the rose on the left, short summary in the info pane, and the map showing the areas with the highest danger for the day. The forecast history would have no preselected information and won't be visible when opening the page.

# Features

Our goal is to have the following interactions for the user in place.

- Avalanche Rose:
  - Select by aspect
  - Select by elevation band
  - Select by aspect and elevation band

All of these actions will result in a filter of the map. The forecast history will only be filtered if both criterias are selected.

- Select a single tile
  - Filter rose by current conditions
  - Show history for current tile
- Forecast history
  - Click on each day and show past condition
  - Update Info panel and show report once a day is selected

## Stretch Goals

Time permitting, we have the following optional features in mind:

- Ability to filter the map by slope angle. This would be a new filter within the map that allows to filter the entire day or a selected aspect and elevation by a value.
- Add Observation tab

The UAC site has the ability to read reported observations by a specific date. This information could be added as a new tab to the information panel and updated once a user selects a date in the historic forecast.

## Timeline

Proposal due date:	10/30
Data processing complete:	11/04
Prototyping for components:	11/04
Peer feedback:	11/05
Rose and map sync complete	11/15
Project milestone:	11/15
Heatmap view	11/23
Info Panel view	11/30
Project due date:	12/02

## Links

Current forecast page:

<https://utahavalanchecenter.org/forecast/salt-lake>

Avalanche Observations:

<https://utahavalanchecenter.org/observations>

Example Avalanche avalanche report:

<https://utahavalanchecenter.org/avalanche/54622>

Geospatial data:

<https://gis.utah.gov/data/elevation-and-terrain/>