The Snowfall Application tool is a resource for people interested in snowfall around different ski and snowboard resorts. The application reports depth and snowfall from multiple weather stations within a specified radius of these resorts.

**The Data:**

This data comes from the National Oceanic and Atmospheric Association (NOAA). Obtaining the data is slightly intensive, and requires a few installations. The largest program is called Geospatial Data Abstraction Library (GDAL), which will translate geospatial data for into vectors. Next, the R package “rnoaa” must be installed. You can find links to GDAL and highly detailed instructions on connection to NOAA at this website: <https://docs.ropensci.org/rnoaa/>. Similarly to many government organizations, NOAA requires a key to connect to their website which can be obtained here: <https://www.ncdc.noaa.gov/cdo-web/token>. The “rnoaa” package has as extensive documentation on the functions that are contained within it located here: <https://cran.r-project.org/web/packages/rnoaa/rnoaa.pdf>. Within this package this data pull only uses a few functions, that are quite simple to use, but extremely powerful.

**The rnoaa Functions:**

The functions within this package are designed to easily pull specific stations and data from specific desired locations. Each station has an ID that corresponds to a geo location where that particular station is located. The way to pull all the stations and their corresponding geo spatial coordinates is through a function “ghcnd\_stations()”. This function takes a very long time because this data is kept at a world level, so this function essentially pulls every weather station in the world’s ID and geospatial coordinates. Since this function takes a very long time to run, it is important to save the output of this file somewhere on your local hard-drive. Many other functions within “rnoaa” are used to interact with this station file. The first function that interacts with this file that will be used is meteo\_nearby\_stations(). This function is extremely powerful, when used properly. This function is capable of allowing the user to pass geo spatial coordinates into the function, specify a radius in kms, as well as limit the amount of stations within this radius subject to proximity distance. It will return a list of data frames containing weather station IDs within the specified radius of each geo spatial location that was passed into the function. Since there is a large amount of data frames, you can collapse these list objects together into a single data frame using bind\_rows() function. The last function that will be used from “rnoaa”, is called meteo\_pull\_monitors(), this function allows you to pass the column of the collapsed list of data frames from meteo\_nearby\_stations(). This will allow the user to download all of the data from the specified weather stations. Lastly, the NOAA weather data needs to be merged with the mountain resort locations so you can use them as identifiers.

**The Application:**

The application is built using a flexdashboard Rmarkdown file in R. Once the data has been cleaned and manipulated into a form that is easy to display (through the functions above), a final data frame should be generated. This data frame will be fed into this application, and will be loaded in once the application is knit. All of the graphs will use this data frame to pull information and display the information for the user to see.

*The Logic*

The app is designed to allow the user to specify up to 4 data feeds on the time series graph. The reasoning behind this, is because weather station data can be highly variable. Stations may close, or move, so in order to obtain a complete feed of weather data it is important to be able to graph multiple feeds of the same mountain. The first drop down menu, allow the user to toggle between snowfall and snow depth. The reasoning behind this is because some weather stations only track one or the other, and bank data feeds are extraneous to the user. The weather station selection dropdowns update, in accordance with the selection of depth or snowfall, and only make selection options available that have at least 1 observation greater than 0.

The next backend logic has to do with the bar chart located underneath the snowfall time series line chart. This bar graph observes dates where there was snowfall or snow depth data on the same dates between 2 weather stations and aggregates this data up. The idea is to give the user another good way to compare overall snowfall. The bar graph will only graph the first two selections of weather stations. There are scenarios where graphing more than 2 mountains could lead to highly misleading figures. Consider if 1 mountain has dates from 2000-2010, the second mountain has dates from 1990-1999, and a third selection has dates from 1990-2010. Since the chart compares dates only where data was collected for all mountains aggregation of this data and comparison would give a misleading picture, because the date ranges would be inconsistent.