R Shiny

CVEEN 7460 HYDROINFORMATICS

zACH HERBERT

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**Memo**

**To: Dr. Burian, PhD, PE**

**From: Zach Herbert & McKinley Olson**

**Date: November 20, 2018**

**Subject: Creating R Shiny Apps**

The purpose of this memo is to present the development of the R Shiny web app for comparative water quality analysis. Quality Controlled time series of water temperature and dissolved oxygen (DO) were obtained at two different aquatic monitoring stations within Salt Lake City, Utah. The two sites chosen for the analysis are 1300 East Aquatic along Red Butte Creek and 900 West 1300 South Basic Aquatic along the Provo River. The data for these two sites is obtained from the iUTAH GAMUT network using the package WaterML in RStudio. The web app, ‘WaterQualitySiteComparison’, has been uploaded to a repository on GitHub under the username ‘zherbz’ and is available for download or cloning. Also, the app is published via shinyapps.io and can be accessed through the following url: <https://zherbz.shinyapps.io/WaterQaulitySiteComparison/>

The web app offers visual comparison of water quality data between the two sites through regression smooth line plots, multi variable scatter plots, as well as box and whiskey plots. For the multi variable scatter plots, the user may select combinations of DO, temperature and time for a single site. An R squared value is provided below the scatter plot to offer a measure of the fit of the regression to the data. However, it must be noted that an R squared value is not available when time is selected as the dependent variable. Furthermore, statistical parameters such as standard deviation, mean, median, the 5% and 95% quartile are calculated between the two sites and provided to the user as output. In addition to this, an interactive map is displayed on the web page. The map illustrates where the selected site is located within Salt Lake City. The addition of the interactive map now allows for comparison of water quality between the two sites both spatially and temporally.

Input widgets that were included in the web app consist of selection panels for the two available sites, the independent and dependent variable of interest for the multivariable scatter plot, and the variable of interest for the comparative series line plot. Due to the extensive amount of data that is recorded on a 15-minute basis at these monitoring sites, the available date range has been limited to a single water year. The date range selection is between April 1st and October 31st during 2017. Furthermore, the number of variables available for analysis is limited to two in order to reduce the run time of loading the web app. There are many other variables measured at the monitoring sites such as turbidity, pH and specific conductance; however, the addition of more variables will result in too much time spent towards data retrieval while running the app. As a result of this the app fails to open in a browser window and cannot be viewed, even though the web app has been successfully published.

In conclusion, the web app ‘WaterQualitySiteComparison’ allows for water quality data of DO and temperature to be analyzed for a single site with a multivariable plot. The app also allows for the data to be compared with another site both spatially and temporally through the use of an interactive leaflet map, a smooth line time series plot, and a boxplot. Input widgets within the app consist of the beginning and end dates, site name, independent and dependent variable, and variable for comparison between sites. The number of sites and variables that are retrieved using the package WaterML are limited due to the issue of a timeout error when attempting to publish the app.

Sincerely,

Zach Herbert

McKinley Olson

References

<https://shiny.rstudio.com/gallery/>

<http://his.cuahsi.org/wofws.html>