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ESM 244, Assignment 1

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**Task 3: Team Shiny Mushu**

**Title: Exploring Harmful Algal Blooms Along the California Coast (2008-2018)**

***App Summary***

The purpose of this app will be to visually explore spatial and temporal distributions of harmful algal blooms (HABs) at various research stations located in California coastal waters between the years of 2008 and 2018.

***Data***

The data used for the app was sourced from an open access database courtesy of the Southern California Coastal Ocean Observing System (SCCOOS), found here: <http://www.sccoos.org/query/>. The objective of SCCOOS is to collect data at five stations to better understand the environmental factors surrounding HABs, as well as their impacts on marine ecosystems, ecosystem services, and human livelihood. Samples for this project are collected weekly at each station via water grabs and net tows. Parameters collected include latitude, longitude, algal toxins, temperature, salinity, and nutrients.

These data are not in tidy format and will have to be tidied prior to use in the application. There are data from eight different stations along the California coastline from Bodega Bay to San Diego. Every station has the same parameters, which will make wrangling simple. There are some “NA” values which will have to be considered when deciding which data to filter.

Our app will look at how the California Coast is affected by different elements that are known to contribute to HABS. The general idea is to look at the data graphically and spatially over time. We want to understand the role different environmental factors have in algal bloom occurrence over the past decade.

***Widgets***

1. Slider Widget to assess time and different amounts of different variables. Abundance of HABs over time in the form of bar charts.
2. Check Box Group of different variables. Correlation Plot of the Different Variables. Can select the different parameters for plot.
3. Three Select Boxes to Display onto a Map: the user will be able to choose the different attributes of the map by displaying “Year”, “Different Variable Type”, or “Location”. The different tabs will include drop down menus of the contents of the data. The “Different Variable Type” tab will include variables: Temperature, the various Chemicals (Ammonia, Nitrate, Phosphate, Domoic Acid), Biological Cell Counts (Chlorophyll, Dinophysis spp., Other Diatoms). The Location box will include the different sites where the user can select one, multiple, or all the sites.

***Outputs***

1. Abundance of HABs over time in the form of bar plots.
2. Correlation Plot of the different variables. Can select the different parameters for plot.

1. Interactive Map: Density plot, the user will be able to choose the different attributes of the map by displaying “Year”, “Different Variable Type”, or “Location”. The different tabs will include the contents of the data. The “Different Variable Type” tab will include variables: Temperature, the various Chemicals (Ammonia, Nitrate, Phosphate, Domoic Acid), Biological Cell Counts (Chlorophyll, Dinophysis spp., Other Diatoms). Depending on what they choose, the different densities will appear on the map. The user can also choose where on the map they would like to focus on with the Location box. I.E. when there is an increase in nutrients there will be an increase in Domoic Acid visible on the map.

***User Interface Sketch***

*User interface: front page (Tab 1)*

**Title: HABs Along the California Coast (2008-2018)**

In this tab (Tab 1): A summary of the app, what it does, how to use it, and a description of the data (including citations as necessary)

**HERE:** A photo of a red tide

**Tab 1: Summary**

Tab 4: Interactive Map

Tab 3: Correlation plot

Tab 2: HAB abundance chart

**Widget 1: Select location**

Type: Select box

Input: Select pier

**Widget 2: Select time**

Type: Date slider range

Input: Select timespan of data set to include in analysis

**Tab 2: HAB abundance chart**

**Bar chart of HAB abundance here**

Tab 1: Summary

*User interface: bar chart (Tab 2)*

**Title: HABs Along the California Coast (2008-2018)**

**Output visualization: HAB abundance**

A bar chart showing HAB abundance at a selected pier over a selected time period.

**Sidebar Panel**

Tab 4: Interactive Map

Tab 3: Correlation plot

**Interactive map here**

**Widget 7: Select variable**

Type: Select box

Input: Select variable

**Widget 6: Select location**

Type: Select box

Input: Select pier

**Widget 5: Select year**

Type: Select box

Input: Select year

**Correlation table outputs here**

**Correlation plot of variables here**

**Widget 4: Select y values**

Type: Checkbox group

Input: Variables

**Widget 3: Select x values**

Type: Checkbox group

Input: Variables

**Tab 4: Interactive Map**

**Tab 3: Correlation plot**

*User interface: interactive map (Tab 4)*

**Title: HABs Along the California Coast (2008-2018)**

**Output visualization: Interactive Map**

An interactive map showing where HABs occur depending on year, location, and variables. When there’s a HAB, the user would see a larger density of biological cell counts on that area of the map.

**Sidebar Panel:**

Tab 1: Summary

Tab 3: Correlation plot

Tab 2: HAB abundance chart

*User interface: correlation plot (Tab 3)*

**Title: HABs Along the California Coast (2008-2018)**

**Output visualization: Correlation plot of variables**

A correlation plot that explores relationships between chosen variables (e.g., temperature, salinity).

**Sidebar Panel:**

Tab 1: Summary

Tab 4: Interactive Map

Tab 2: HAB abundance chart