**Assignment_3**

Hurricane Landfall

Group Assignment

Brooke Anderson's Hurricane Exposure R package describes how tropical storms move in time and space over land with respect to the hazards they generate. Using Atlantic-basin tropical storms between 1988 and 2018, the Hurricane Exposure package accesses storm-specific time, location, wind, rain, floods and tornado data for counties in the eastern half of the United States.

Landfall is a critical event for hurricanes which are often at peak strength as they come ashore. NOAA Data Buoys offer a source of detailed data that can be used to explore hurricane landfall in detail.

Your task is to use data from NOAA Data Buoys to analyze and describe the landfall of a particular hurricane that you select from the Hurricane Exposure package. To give you some context for this assignment, assume that you are reporting the storm conditions at the time of landfall to the community located closest to the point of landfall.

**Task ONE**

Select a hurricane for this project using the Hurricane Exposure package to locate your hurricane's point of landfall. As you choose your hurricane, pay attention to the data buoy coverage available at the point of landfall. Although your focus is going to be on the hurricane's landfall, provide some detail about your hurricane, including at least one map of the storm tract from the Hurricane Exposure package. For each map you include, explain what the map shows and how you decided what to show and what not to show. Be careful with labels, legends, captions, and titles.

**Task TWO**

Use the more detailed data available from NOAA buoys to describe your hurricane's landfall. As in Task ONE, mapping will be an important part of your description, but may not be all that you include. Consider plots, and additional maps. Make sure that your description tracks the storm from landfall to the inland boundary of the community. Limit your detailed data to what is available from the NOAA Data Buoy website.

**Deliverable**

Complete Tasks ONE and TWO. Use the results to produce an electronic deliverable -- a document, a presentation, or a webpage. Explain your choice. Submit your assignment as a link to a github for your group. Make sure that the group members are shown on your submission. The work you submit must be reproducible. If you submit a webpage made with Shiny, you may want to publish on shinyapps.io or on https://bu-rstudio-connect.bu.edu/connect/.

*Things to keep in mind:*

A. Anderson is using land-based data to create her maps and to tell the story about the hazards of hurricanes tracking over land. For Task TWO you will be using buoy data and addressing the hazards as hurricanes make landfall. How is this different?

B. The variables available from the Hurricane Exposure data package are different from some of the variables reported in the buoy data. Are the two sets of data (about the same storm) related? How? How do you know?

C. You have data from multiple buoys. Does this improve your description of the hurricane's landfall as compared with the description available in the Hurricane Exposure data? How does it improve the description? Be specific.

D. Calculate the empirical variogram for this storm. Explain how you would use it. Discuss whether or not the variogram is useful here.

E. Consider your workflow.
   a. Is there value in beginning with a small set of NOAA buoys? Explain.

   b. What additional information is generated by using a larger set of NOAA buoys.

   c. Given the context for this assignment, described above, what additional material would you consider including in your presentation. Why?

   d. The NOAA buoy data is reported minute-by-minute. Consider the level of aggregation that you will use in your report. Would it be useful, for example, to take the mean over a period of time and report the mean and standard deviation ( e.g., knowing that the wind speed was 12 knots at 13:25:30 may not be as informative as knowing that between 13:00 and 13:30 the mean wind speed was 10 knots and the standard deviation was 5 knots)?