BIOS 6660, Spring 2019
Homework 2: Version control and basic R
Due: Tuesday, February 5th at 10:30am

In this assignment, you will begin working directly with Git, GitHub, R, and RStudio.

Instructions for turning in assignment:

All of your work on this assignment will be added to the GitHub repository you created in Homework 1 (or will create in ungraded Problem 0 below). When you have completed the assignment, you will submit a URL pointing to the specific version of the repository you wish to submit.

To get a URL for a specific version of a GitHub repository: from the repository web page, click on the "commits" tab (it will say "*n* commits" where *n* is a number). Choose the latest commit where you added material for this assignment, and click on the "<>" button next to the commit, whose mouseover text is "Browse the repository at this point in the history." This will direct to a page containing the correct snapshot of your repository, whose URL represents the snapshot.

Make sure all of your work for the assignment is visible in this snapshot. We are looking for five files under a `Homework_2` directory: `rstudio.png`, `script_run.png`, `my_script.R`, `scoping.txt`, and `yampa.txt`. Submit the URL through Canvas.

Problem 0 *ungraded*: Completing setup from Homework 1

If you haven't already, complete the setup of the GitHub repository that was affected by the firewall issue on Yampa. The instructions are reproduced here:

On Yampa, make your `BIOS6660` directory into a Git repository and then add it to GitHub as a **private** repository named "BIOS6660". Do a commit and push to add the contents of the repository to GitHub. If you are logged into GitHub, your new repository should be visible at https://github.com/*your_username*/BIOS6660, and you should see your `Homework_1` directory there.

Since your repository is private, you need to add the instructors as collaborators so we can see your work. On the web page for your repository, in Settings -> Collaborators & teams, add each username (pamelarussell, vanderll, weiming80045) as collaborators. We will receive invitations to collaborate on your repository.

Your repository is now hosted on GitHub (and there is a copy on Yampa), but you need to be able to work with it from your own computer. To do this, you will create a "clone" of the repository on your machine. Choose a directory on your local computer where you will keep your work for this class, and follow the procedure from Lecture 2 to clone the repository to your computer. Now there should be a directory called `BIOS6660` on your local computer containing the same contents as the repository on Yampa.

Problem 1: Setting up RStudio

Install the latest version of Rstudio onto your computer from [here](#). Open RStudio and take a screenshot of the RStudio interface. Save the screenshot in a file named `rstudio.png` (or whatever image file extension you get).

Create a directory under your local copy of the `BIOS6660` repository named `Homework_2`. (For now, this new directory only exists locally and has not been pushed to GitHub, and also does not exist in the copy of the repository on Yampa.) Put the screenshot file inside the `BIOS6660/Homework_2/` directory.

Problem 2: **Creating an R script**

In RStudio, create an R script named `my_script.R` and save it inside the `BIOS6660/Homework_2/` directory.

In `my_script.R`, write lines of code to do the following:
- Create a variable named `my_list` which is a list containing the following elements: an element named **"a"** whose value is **1**, element **"b"** with value **3**, element **"c"** with value **5**, and element **"d"** with value **7**.
- Create a variable called `elt_b` and set it equal to the value of element **"b"** of `my_list` using the element access methods from Lecture 3.
- Create a variable called `elts_1_to_3` and set it equal to a new list consisting of elements 1, 2 and 3 of `my_list`.
- Create a function called `double_each` that takes in a list of integers and returns a vector consisting of each integer in the list times two. (Hint: use `sapply` inside the body of your function.) Create a variable called `elts_1_to_3_doubled` and set it equal to the result of calling `double_each` on `elts_1_to_3`.

Run the script within RStudio. The variables `my_list`, `elt_b`, and `elts_1_to_3`, and `elts_1_to_3_doubled` and the function `double_each` should appear in the "Environment" view in Rstudio. Take a screenshot of Rstudio with the script open and the variables and function visible in "Environment". Save the screenshot as a file called `script_run.png` inside the `BIOS6660/Homework_2/` directory.

Now there should be three files in the **Homework_2** directory: two screenshots and your R script.

Problem 3: Pushing your changes to GitHub

Using the procedure from Lecture 2, create a commit adding the **Homework_2** directory and all three files to the repository. Push the changes to GitHub. Check the repository on github.com to make sure the new files have appeared there.

Problem 4: Editing a file on GitHub; R Scoping

It is possible to edit files directly on GitHub and commit the changes to the master copy of your repo from the browser. (This is only advisable for text or documentation files, not code.) In this problem you will create, edit and commit a file directly from the browser.

In your BIOS6660 web page on GitHub, click on your **Homework_2** directory, then click the "Create new file" button. Create a new file called **scoping.txt**. Enter text into the file directly in the "Edit new file" window in the browser. Your text should be a few sentences answering the following question:

> When the R interpreter executes the body of a function and encounters a variable reference, how does it determine the value of the variable?

You can preview the text file in the "Preview" tab if you wish. Then, commit the file directly to the master branch with the button at the bottom of the page.

Problem 5: Updating your repository on Yampa

Log into Yampa and navigate to your **BIOS6660** directory; update this copy of the repository with the command **git pull**. This pulls down the latest changes from GitHub; you should now see copies of your newly created directory and files. Navigate into the **BIOS6660/Homework_2/** directory on Yampa and issue the following commands:

- **hostname > yampa.txt**
- **pwd >> yampa.txt**

This should create a text file in your **Homework_2** directory on Yampa that contains the name of the server and your current working directory. Create a commit to add this file to the repository, then push the commit to GitHub.

Note: now the repository on your local computer is behind the master version on GitHub; it is missing the file you just pushed from Yampa. Issue a **"git pull"** on your local computer to get the latest changes in that local copy. If you forget to do this, Git will complain when you try to push changes from a clone that is out of sync. (As long as the changes from the different clones don't directly conflict with each other, this situation is easily rectified, however.)