GEOG 4/5/7 9073: Environmental Analysis in R

Week 04.02: Term project and "Wildcard Thursday"

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Today's schedule

- Open discussion
- Lab 1 check-in
- Building blocks of reproducible code

Anything to discuss? Questions?

How is lab 1 going?

Preferences for "wild card Friday"?

Term project/paper

- a geoprocessing or spatial analysis task of your choosing
- **must** use R, and it **must** address a "spatial problem"
- emphasize the problem you wish to solve, rather than the number of lines of code
- strongly encouraged that your project *slightly exceed* your programming skill level

Four components/deliverable:

1. Project proposal
2. In-class update (VERY INFORMAL)
3. In-class final presentation
4. Report

Document is in the GitHub repo in the final_project directory

Deliverable 1: project proposal (50 points)

You must submit a proposal for your project detailing the following items:

1. What is the topic area and problem of interest
2. Why are you interested in this problem/area
3. How your proposed project will make the task more efficient, more accurate, more consistent, or easier.
4. Why the problem/task cannot be solved using standard "out-of-the-box" tools from ESRI or other GIS software packages/modules.

A bit more

5. What you expect the outcome of the project will be.
   Note, you will always provide your code, so think about how you would define "success" for your objective
   (e.g., a measurement of efficiency, a completed task, completed analysis)
6. Preliminary or sample data
7. Any preliminary work (strongly encouraged)

Other proposal details:

- 1-2 pages, inclusive of figures
- Microsoft Word document or PDF
- 1-inch margins
- Font: Times New Roman, size 12, 1.5 spacing or less
- Cite all sources using a standard referencing format (e.g., Chicago, APA, your favorite journal). However, you may NOT use an endnote style.

Deliverable 2: in-class project update (25 points)

You will give an informal 3-5 minute presentation to the class that will cover:

1. Your objectives, topic area, and/or problem of interest
2. What tools you are using to accomplish the task
3. Your current progress in accomplishing the task
4. Evidence of work
5. Any issues or challenges you have encountered

Deliverable 3: in-class final presentation (75 points)

You will also give a final presentation during the final week of class detailing the full extent of your project work and accomplishments. Graduate students will give a 10-15 minute presentation.

In this presentation, you will at a minimum discuss:

1. Your objectives/problem/task
2. How you accomplished the task - or if you did not, why not
3. Obstacles, challenges, etc. you faced during the work
4. Your results - including a discussion about how you measured success (look back to your proposal)
5. The implications of your work (e.g., for your research, job)
6. Future goals and objectives

Deliverable 4: final report (250 points)

Your final report will follow the format of a short technical report where you should provide:

1. A short introduction to the topic and research question
2. A methods section detailing the data you used and the work you completed
3. A results section that explains, in detail, what you accomplished. Be sure to connect to how you defined success in the project proposal (e.g., what should be understood from them)
4. A discussion section that covers the implications of your results, including a critical self-reflection of the project (e.g., what limitations, assumptions, or uncertainties are present). Also, what have you learned and what would you do differently next time (and why)?

Other details:

- 2 pages exclusive of figures (graduate students, 3-4 pages)
- At least three figures, two of which must be maps (these do NOT count towards the page requirements)
- Microsoft Word document or PDF
- 1-inch margins
- Font: Times New Roman, size 12, 1.5 spacing or less
- Cite all sources using a standard referencing format (e.g., Chicago, APA, your favorite journal). However, you may NOT use an end note style.
- It is strongly suggested that you format your text using an RMarkdown notebook or Quarto document

Caveats:

- Everyone is at a different stage of their career/studies - that's ok
- Everyone has different skill levels wrt GIS, spatial analysis, and R programming - that's ok
- The point(s) is to challenge yourself, learn something new, and help move your studies, career, hobbies, etc. forward
- this is a term project, not a Master's thesis or a Dissertation chapter. Limit your scope and you'll be happier for it :)

Questions?

Today's task

- Find a buddy (a different one)
- Tell them about your research interests (or your career aspirations, or something else relevant that has a "spatial problem" or a "data problem" component)
- Listen ATTENTIVELY to your buddy
- Ask at least 2 critical questions
- Brainstorm together possible directions for your (and their) project

Wildcard Thursday!!!

The setup:

- Today's exercise builds on an example from earlier in the semester
- in the course GitHub repo, there are new files in: `./data/wildcard_thursday`
- These include:
    - an 7-day composite of satellite images of a cyanobacteria bloom in Lake Champlain
    - various shapefiles, including a bounding box and in-lake monitoring stations
    - some other stuff (you'll need to look around)

Your task(s):

1. Make a team (or 2, or 3)
2. Explore the data, understand what it is, its structure
3. STEP AWAY FROM RSTUDIO (but not necessarily your computer)
4. Make a plan to address the following question(s):

How large is the harmful algal bloom (HAB) in Missisquoi Bay?

Which monitoring station(s) could have detected the HAB?

How much area (in the entire lake) has a CICyano value greater than 0.10?

... only once you have a plan should you start writing code

Rules and caveats

- I know I haven't given you everything you'll need and that you don't know all of the steps. Deal with it :D
- Work AS A TEAM. If I see someone "going rogue", I'll call you out. In front of everyone.
- I MEAN IT, EVERYONE PARTICIPATES AND YOU DON'T LEAVE ANYONE OUT
- Do NOT START with code. It's ok for the exploratory data analysis, but not for the planning stage. Again, DON'T GO ROGUE

Hints:

1. consider spatial operations before you figure out how to implement them in code
2. how good is your google-fu?
3. ugly, functional code > pretty, non-working code

```
library(tidyverse)
library(terra)
library(sf)

myras <- terra::rast("./data/path_to_raster/myraster.tif") # read a raster

mypoints <- myraster %>% as.points() # could be useful, maybe not

?terra #is your friend
```