

GEOG 491/891: Special Topics - Spatial Analysis in R

Week 01.01: Introduction

Dr. Bitterman

Today's schedule

- Open discussion
- Course welcome
- Introductions
- R basics and practice

Anything to discuss? Questions?

My approach to this course

- Geography matters
- Concepts and independent thinking are important, trivia is not (or at least not always)
- It's important to solve problems or complete tasks, but understanding HOW you do so is more important

Class introductions

Pair up (with appropriate distance) – and don't leave anyone behind

Share:

- Name
- Where you're from
- Major/program, year
- Why are you taking this course? Why are you in your major? Why UNL?
- Previous GIS experience
- Previous programming experience, R experience?
- Imagine it's December 2021 – what would make you feel like you were successful in this course?

My introduction

- Dr. Patrick Bitterman
- Independence, IA -> Ulowa -> UVM -> UNL
- Assistant Professor in Geography Program, SGIS, 3rd year
- Goals: teach a successful course, build my research program, get my sense of smell/taste back
- GIS experience? Programming experience? Extensive, but I don't use ArcGIS much...
- Success in this course:
 - students reach *their* learning objectives
 - students are able to use R to make their work faster and more consistent
 - students improve methods related to their other research or career interests
 - students develop and appreciation (and dareisay, love?) for programmatic spatial analysis

Time to share

- Present your partner to the class
- Who wants to go first?

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Course basics

Instructor (me)

- Dr. Patrick Bitterman
- Geography Program, in School of Global Integrative Studies
- Office: 932 Oldfather Hall
- Office hours: M 12:30 – 2pm, or by appointment (also Zoom)
- Email: patrick.bitterman@unl.edu

Materials

- Brundson, C., Comber, L. 2019. An Introduction to R for Spatial Analysis and Mapping (Spatial Analytics and GIS). SAGE. <https://us.sagepub.com/en-us/nam/an-introduction-to-r-for-spatial-analysis-and-mapping/book258267>
- Optional: Wickham, H. 2017. R for Data Science: Import, Tidy, Transform, Visualize, and Model Data. O'Reilly Media. (if you are unfamiliar with R or other programming language) (<https://r4ds.had.co.nz/index.html>)

Learning objectives

By the end of the term, students will be able to successfully:

- Demonstrate a familiarity with the R programming language in the context of geospatial analysis
- Write self-contained functions to automate geospatial tasks
- Analyze model workflows and describe computer code and algorithms in plain language
- Create small-scale programs that interface with web-based tools
- Practice good programming practices
- Plan, develop, and execute a programmatic analysis of a dataset

Course policies

Assignment submission:

- All assignments due on their due date
- All assignments will be posted on Canvas, but turned in via GitHub (we'll talk more)
- Late items will be accepted, but will be penalized 20% of the potential points for each day they are late
- All changes to the syllabus will be communicated via Canvas announcement
- Students are expected to attend all class meetings, but attendance is not graded

Collaboration

- Feel free to discuss labs, etc. with your classmates
- However...
 - All lab reports, papers, and other work should be your own, individual thoughts
 - Students who do not follow these policies will be reported to the College for academic dishonesty

Other tips

- Read relevant materials before class
- Attend class – understanding theory and concepts will help you with practical applications
- If there are topics, news stories, blog posts, tweets, etc. that you find interesting or want to know more about, let me know
- Before you start coding, think through the process and sketch out the workflow. This is called *pseudocode*
- Labs build on each other, so don't get behind
- Take advantage of office hours
- Do not leave assignments until the last minute
- Have fun!

Assessment

- Lab assignments
- 5 labs, 2-3 weeks to complete each one
- Final project
 - Proposal
 - Update presentation (in-class)
 - Final presentation (in-class)
 - Final paper
- Participation

Gradaute students

For those students enrolled in GEOG 891, the requirements of the final project will be expanded to include:

1. an additional 3-4 pages in your report
2. code documentation
3. an additional 5 minutes in your final presentation to the class.
4. required to produce a cover page for your GitHub page/portfolio

Course format

- Project-based
- Student-led
 - I am not going to recap the readings (much)
 - You are expected to be ready to participate in discussion
 - We will spend most of our time doing, not lecturing
- Mondays and Wednesdays: discussion, examples, and activities
- Fridays: wildcard day (coding challenges, group work, seminar)

Course inspiration and source material

- My own experience
- Your textbook
- Lovelace, R. *Geocomputation with R* <https://geocompr.robinlovelace.net/index.html>

University policies

- Learning accommodations
 - Contact Services for Students with Disabilities
 - Let me know
- Academic integrity
 - Don't cheat
 - Don't plagiarize
- Health and safety
 - Counseling and Psychological & Services (CAPS)
 - Big Red Resilience & Well-being

COVID Policies

- Pass the screening at the door (get tested, show your status)
- Take care of yourself
- If you don't feel well, don't come to class
- Take care of others
- Be respectful

It's time to talk about masks...

Let's talk coding

Your homework for today

(setup your computing environment, review chapters 1-4 in *R for Data Science*, come to class with 2 questions about R, geospatial programming in general, or this course)

Find a *different* buddy

- Share:
 - How you found the setup process to go (e.g., did you run into any issues?)
 - What you thought of Chapters 1-4
 - Your questions

Report out (to the whiteboard!!!)

Bringing everyone along together

- One of our challenges in this kind of course
- Spatial analysis is not programming...
- ...and programming is not spatial analysis

SA and Programming in R

- Experience? In what setting?
- Experience with a version control system (e.g., git)?
- What about experience with spatial analysis, GIS?

If we have time...

1. Open RStudio
2. Create a new project in a temporary working directory (it can be anywhere)
3. Let's talk about packages... (install **tidyverse**)
4. Assignment: "<-" vs. "="
5. ...and familiarize ourselves with the interface

Review and next class

- Any questions on course policies?
- On anything else?
- This week's readings/tasks:
 - Chapter 1 in textbook
 - Review Hadley's book/site
 - Practice on your own
- Next session: basics of R and GIScience