KDI SCHOOL OF PUBLIC POLICY AND MANAGEMENT

GEOSPATIAL DATA ANALYSIS IN R

Semester: Fall 2024
Time: TBD

Lecture Room: TBD
Professor: Josh Merfeld
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Office Hours: TBD

COURSE DESCRIPTION

This class will offer an introduction to geospatial data in R. We will cover different geospatial data types -- rasters, shapefiles, etc. -- and the tools available to analyze the data.

Keywords

geospatial, data science, R

Text Book

https://rspatial.github.io/terra/

R for Data Science (Wickham and Grolemund). This is available for free here. Please note that this guide does not introduce most of the topics we will discuss in class. However, it is incredibly helpful for getting started in R.
R Markdown: The definitive guide (Xie, Allaire, and Grolemund). This is available for free here. This guide will help you learn about using R Markdown, which is a very handy way to write using R.

Readings

From time to time, I may ask you to read things before class. I will make this clear each week and will post the readings on the class website.

Course Requirements (Pre-requisites)

Experience with R.

Evaluation

1. Homework – coding tasks (30%): Throughout the semester, I will assign two to three coding tasks related to the material we cover in tasks. You will be required to do these tasks in R, turning in a write-up using R Markdown.

2. In-class labs – coding tasks (20%): We will have two in-class labs, in which you will work together in groups to complete a coding task. You will be required to do these tasks in R, turning in a write-up using R Markdown by the end of class.

3. Final exam (40%): The exam will be a take-home exam, due during finals week. It will include questions on content as well as some coding tasks.

4. Participation (10%): I expect you all to come prepared to class. This includes having read the assigned material. Participation will be graded based on your participation in each class. *You will be required to bring a laptop to class*.

This course includes Korean development experience **(*please check Yes or No)**

□ YES

X NO

This course utilizes resources from KSP (Knowledge Sharing Program), K-Developedia, or Modularization report **(*please check Yes or No)**

□ YES

X NO

COURSE OUTLINE

Week 1

Introduction

- Introduction to the course and material
    - Expectations
- Introduction to geospatial data: what is it used for?
    - Poverty mapping
- Introduction to R, R Markdown

Notes

- **Please come with R and RStudio already installed on your computer.** You are also welcome to use a different code editor, like VS Code. You can find instructions on getting started with R here and here.

Week 2

Coordinate reference systems and vector data I

- Introduction to shapefiles
- Types
    - Points
    - Polygons
    - Lines
- Introduction to coordinate reference systems
- The *R* package *sf*
- Mapping shapefiles

Readings

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Week 3

Coordinate reference systems and vector data II

- The *terra* package
    - The *tidyterra* package
- Creating shapefiles from points
- Areas, lengths

Readings

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Week 4

Data extraction I

- Combining shapefiles
- Buffers, unions, intersections
- Overlap analysis
- Distance analysis

Readings

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Week 5

In-class lab

Week 6

Rasters

- Introduction to rasters
- File types
    - .tif
    - .netcdf
- The *R* package *terra*
- Mapping rasters in R

Readings

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Weeks 7

Data extraction II

- Combining shapefiles and rasters; spatial joins
- The *R* package *exactextractr*

Readings

Week 8

Accessing geospatial data

- Where does the data come from?
- APIs
- Direct downloads
- Google Earth Engine (less focus due to use of Javascript)

Readings

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Week 9

Spatial interpolation

- Inverse distance weighting (IDW)
- Kriging

Readings

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Week 10

In-class lab

Week 11

Reading week

Week 12

Take-home final exam due