Introduction to GIS, Geospatial Data and Spatial Analysis

Essex Summer School
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Course Description

This course will provide the student with an in-depth knowledge of spatial data, and how it can be used in a variety of social science applications. They will learn how spatial data is structured, how and where it can be used and how and where it cannot be used. By the end of the course they will be able to apply the skills they have learnt in their own area of study, and there will be time during the course provided to start this will the instructor available to help.

Course Objectives

After the course, students will be:

- confident understanding and using spatial data in a wide range of social science settings
- be able to process a variety of GIS data sources and critically assess whether they are appropriate to use
- be confident using QGIS and R to manage and work with spatial data
- understand a range of spatial statistics and be able to research more advanced spatial statistics

Course Prerequisites

Students will be working with a range of software, and no previous knowledge of spatial data is required. Good computer skills are required, as is a willingness to learn.

Course Structure

Over the five sessions, students will become familiar with the theory required to use spatial data and analysis effectively, as well as a range of practical tools with which to perform their analysis.

1. What is spatial data and creating choropleth maps in QGIS
    - What is GIS and spatial data?
    - Projections and coordinate systems
    - Creating choropleth maps
    - *Bearman (2021) Chapter 2: Using GIS in Social Sciences*

2. Working with data (and geospatial data) in R
    - What is R?
    - Writing code for R
    - How does R handle geospatial data
    - *Brunsdon and Comber (2018) Chapter 3: Handling Spatial Data in R*

3. Creating multiple maps in R and working with mapping packages
    - Plotting maps in R
    - Using the sf and tmap packages in R
    - Using loops to create multiple maps
    - *Brunsdon and Comber (2018) Chapter 4: Programming in R*

4. Spatial Statistics and how they can be used in social science
    - Spatial autocorrelation
    - LISA / clustering analysis
    - Using GeoDa to calculate these statistics
    - *Bearman (2021) Chapter 7: Spatial Data Analysis*

5. Performing spatial analysis in R, including writing your own functions
    - Performing spatial analysis in R
    - Writing your own functions
    - Developing your own spatial analysis

Course Readings

Bearman, N. (2021) GIS: Research Methods, 9781350129559, 1st (only) edition, Bloomsbury

Brunsdon, C. and Comber, L. (2018) An Introduction to R for Spatial Analysis and Mapping (Spatial Analytics and GIS), Sage