Organization, Information, and Learning Sciences (OILS) 515 Goals, Objectives and Reading Assignments

An understanding of core spatial data concepts and principles is increasingly important in the current world of collaborative, spatially enabled research and applications. We are no longer working in a vacuum as individual researchers that only need to understand and use the data that we create and use in our separate research projects. Successful research depends upon being able to integrate data generated by others with our own and by extension being able to share our data with others, both during our research projects and also for posterity (and to meet the requirements of funding agencies). This class will focus on the following aspects of spatial data management that relate to this need for effective integration, use, collaboration and sharing:

- The *Research* and *Data Lifecycles*
- Types of spatial data
- Spatial database design and management
- Working with and managing gridded data
- Spatial data documentation standards and practices
- Ethical, legal and privacy issues as they relate to spatial data
- Data management planning
- Emerging topics

Upon completion of the course students will have improved their knowledge and skills in the following areas:

- Locating and evaluating spatial data based upon knowledge of formats, content models and documentation standards
- Structuring data (both in terms of format selection and content) from a variety of sources to enable integrated research
- Evaluate data products to determine which elements of a dataset might raise ethical, legal or privacy issues if released or shared with others
- Documenting data as an ongoing process throughout the research cycle
- Producing machine- and human-readable documentation for data to support discovery, understanding, and use of data that they produce

Week 1 - Introductions, Course Overview and Introduction to the Research and Data Lifecycles

This week's required "collaboratory" session (Tuesday afternoon, 5:00-6:30 - method TBA) will allow us to share some background about each other, review the class structure and objectives and have a brief overview of the research and data lifecycles and the linkages beween them. While this week's lecture will be done "live" during our collaboratory session, future lectures will be pre-recorded and accessible at the beginning of each class week.

Reading

Piwowar, Heather A., Roger S. Day, and Douglas B. Fridsma. 2007 "Sharing Detailed Research Data Is Associated with Increased Citation Rate." Plos One 2, no. 3: Science Citation Index, EBSCOhost (accessed January 20, 2014). link

Tenopir, Carol, Suzie Allard, Kimberly Douglass, Arsev Umur Aydinoglu, Lei Wu, Eleanor Read, Maribeth Manoff, and Mike Frame. 2011. "Data Sharing by Scientists: Practices and Perceptions." *Plos ON*E 6, no. 6: 1-21. Academic Search Complete, EBSCOhost (accessed January 19, 2014). link

Week 2 - Introduction to Vector Data

Background

This week we begin our consideration of the different classes of geospatial data that you are likely to encounter - both as you search for data to use in your research and as you produce data with a spatial component that you need to integrate into a spatial data management system or workflow. Our focus is on *vector* datasets this week, with a particular emphasis on the general types of vector data *features* you need to be aware of, and the key linkage between vector *geometries* and the *attributes* that are linked to those features. While the introductory lecture focuses on these aspects of vector datasets, the concepts of *map projections* or *coordinate reference systems* as introduced in the reading are also core concepts that you will need to understand in the context of all spatial data that you work with. Next week's lecture will include a more detailed overview of map projections (and focus on raster data), but for now see what you can also pick up from the reading as it blends both vector and raster data and map projections into a single chapter.

Expected Outcomes

By the end of this week's reading and work you should have an understanding of:

- The types of geometries that are likely to be encountered when working with vector data
- The concept of attributes and attribute types as they are linked to features
- The beginning of an understanding of how you can transform tabular data that may have implicit spatial content into explicitly spatial data
- The importance of map projections in clearly understanding the spatial context for coordinates and geometries based upon those coordinates.

Key Concepts

- Vector Feature Types: *point*, *line*, *polygon*
- Attributes and associated attribute data types
- Map projections

Readings

Westra, E. (2010). Python Geospatial Development : Build a Complete and Sophisticated Mapping Application From Scratch Using Python Tools for GIS Development. Olton, Birmingham: Packt Publishing. (link for access page for downloadable eBook - expires) (link for access page for online eBook). *Chapter 2* and skim *Chapter 1*.

Nikos Mamoulis (2012), Spatial Data Management. Synthesis Lectures on Data Management #21. Morgan & Claypool Publishers. DOI10.2200/S00394ED1V01Y201111DTM021. http://libproxy.unm.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=cat00503a&AN=unm.b7199537&site=eds-live&scope=site. Review the *Introduction*, keeping in mind that some of the database related issues will come up in a few weeks - so, don't be worried if some of the database terminology is confusing during this initial read through.

Galati, S. R. (2006). Geographic Information Systems Demystified. Boston: Artech House. Link for access to the online and downloadable eBook. Skim *Chapters 1 & 3*

Assignment

Link to this week's assignment

Class Project

Link to this week's task related to the class project

Week 3 - Introduction to Raster Data and Other Related Geospatial Data Concepts

Background

This week we will conclude our overview of geospatial data types and cover some additional core geospatial data concepts that you need to be familiar with as you work with geospatial data in your own research. Beginning with a discussion of *raster* data types, an introduction to the *geodatabase* concept (to be much expanded upon in the coming weeks) our overview of different classes of geospatial data is now complete. This week's lecture also includes a discussion of the key role of *coordinate reference systems* (AKA map projections) in understanding the map coordinates represented in geospatial data, the importance of the consideration of *accuracy and precision* in geospatial (and other) data, and the relationship between accuracy and precision and the concept of map scale.

Expected Outcomes

After reviewing this week's lecture and completing the reading, you should understand the following concepts:

- Raster, vector and tabular data and their respective characteristics in spatial data management
- The importance of coordinate reference systems, and the specific purposes for which they are defined, in characterizing locations encoded in spatial data
- The concepts of accuracy and precision in location data and some of the factors that can contribute to decreased accuracy (bias) in location data.

Key Concepts

- Spatial data types
- Map projects and the tradeoffs in defining them
- Accuracy and precision in location data

Reading

Review the readings from last week as they relate to the raster data and other data concepts that will be covered in this week's lecture and demonstration.

NationalAtlas.gov. *Map Projections: From Spherical Earth to Flat Map.* Online resource: http://nationalatlas.gov/articles/mapping/a_projections.html. Accessed on 2/2/2014.

Quantum GIS (QGIS) Documentation:

- A gentle introduction to GIS
- User's Guide (skim for reference and familiarity with content and organization)

Assignment

Continue your work on the literature review that you began last week.

Class Project

Continue your work on defining your data management focus for the term