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HW 0: Background Survey

(1) Teamwork experience is vital to your success in any career in the future. To encourage this, all homeworks, projects and literature surveys will be completed in groups of two. Each person should provide your group partner's name and e-mail address that you will be working with this semester. Please submit all your homeworks by hardcopy in the lecture. Please be sure that both of you are aware of each other's information. Make sure that you or your partner can arrange common times in which to work.

- Group Partner Name: **M. Taylor Long**
- Group Partner E-mail Address:**longx598@umn.edu**
- Group Partner CSE lab account (if has): **n/a**
- Web URL to group webpage: spatialcomputing.github.io

(2) Have you had any previous courses where homeworks (not projects) were completed in teams? If yes, which courses? Describe your experience.

N/A

(3) Many groups go through stages of forming, storming and norming before performing. Describe a personal experience illustrating these stages.

I have worked in groups in several classes - usually for a larger project or activity. My experience that I will outline comes from GIS 5572 when we had to work in groups to create a map. First, our groups were formed by the professor. The first step once the group was formed was to introduce ourselves and get to know each other. Each student explained their background and interests. The second stage of storming, is when we began to outline a plan of action or how to approach the project or problem. Different students had different opinions and workflows. Eventually we decided on a single plan. This is norming. Once we had a set plan, we got to work on our separate task and once each individual was finished with their load of work, we merged all our work together for the final project.

(4) Each team will present one or two article from either the Encyclopedia of GIS or recent spatial news using 5 slides. Identify four articles from Encyclopedia of GIS, your group is interested in. Another option instead of articles in Encyclopedia of GIS is news relative to spatial data.

- ArcGIS: General Purpose GIS Software System, D. Maguire, page 25-31
- Generalization and Symbolization, W. Mackaness, O. Chaudhary, page 330-339.
- Quantum GIS, M. Hugentobler, page 935-939.
- User Interfaces and Adaptive Maps, Sarjakoski(s), page 1205-1212.
- Relative News: License Plate Scanners and Location Privacy Issues
    - (https://www.aclu.org/alpr)
    - (https://www.aclu.org/maps/does-your-state-protect-your-privacy-digital-age)
- Relative News: Regulation of personal drones

(5) Do you have a CSE lab account (yes/no)?

- NO

(6) Have you had any previous courses with relative grading (i.e., based on median and standard deviation)?

If yes, which courses?

- N/A

(7) Are you an Undergraduate, MS or PhD? What is your major?

- MGIS in Geographic Information Science (Geography Department)

(8) How many computer are there currently in your home, and how many items in your home have rfid tags? If you have a mobile phone, is it an Android phone, is it GPS-enabled? Do you have other GPS devices in the home? Which database management systems and GIS software have you worked with? Provide a table summarizing this information for each member in your group. Limit your answer to 100 words.

QUESTIONS	**M. Taylor Long**	**Agata Miszczyk**
How many computers in home?	3	1
How many items have rfid tags?	0	1
Mobile Phone: Android?	No	No
Mobile Phone: GPS Enabled?	Yes	Yes
Other GPS devices in the home	Garmin GPS (for driving)	Garmin GPS (for driving)
Which database mngmnt systems/GIS software have you worked with?	ArcMap, ArcServer, and Postgresql/PostGIS, QGIS, ArcGIS Online, CartoDB, LeafletJS	ArcMap, ArcServer, and Postgresql/PostGIS, QGIS, ArcGIS Online, CartoDB, LeafletJS

(9) Which of the material are you familiar with (choose all that apply)

A. Relational Databases and/or Principles of Database Systems (CSci 5707)
B. Geographic Information Systems ✓
C. Data Mining
D. Algorithms and Data structures

(10) Which topics other than those in the Schedule are you interested in learning?

- I am particularly interested in open source, online technology - Leaflet CartoDB and how that can be leveraged for computing projects and crowdsourcing.

(11) Please write a single paragraph on your objectives for this course.

- I would like to learn more the technical terminology and methods of GIS. Spatial computing and location services are universal operations that are being performed and used many times a times by all people. I would like to get a better understanding of how these processes work and how I can begin to incorporate some of the crowdsourcing and VGI techniques into my own research.

(12) Which spatial computing systems and services have you used previously (choose all that apply)?

A. Global Positional System ✓
B. Location-based Services ✓
C. Virtual Globe (e.g. Google Maps) ✓
D. Spatial Statistics (e.g. SatScan, CrimeStat)
E. SQL/OGIS (e.g. postgreSQL, postGIS, Oracle) ✓
F. GIS (e.g. ESRI, Arc) ✓
G. None

(13) Which spatial concept are you familiar with (choose all that apply)?

A. Coordinate system (e.g. latitude, longitude) ✓
B. Map projection ✓
C. Shortest Path ✓
D. Spatial auto-correlation ✓
E. None

(14) Compare and contrast the following concepts (as much as you can):

A. Relational Database vs. Spatial Database
    - A relational database just means that the schema and structure of the database conforms to the relational model. A relational database does not necessarily have spatial data stored in it. A spatial database is a database that has been optimized to query and store spatial data (usually through some sort of library add-on). A spatial database can also be a relational database.
B. Raster data model vs. Vector data model
    - Vector is a discrete data model consisting of points, lines, and polygons. Each feature needs its geometry (coordinates of each vertex) and can also have attributes associated with it. Raster on the other hand, is a continuous data model. Raster data is a grid of pixels. Each cell is the same size and has a value. The value represents an attribute and corresponds to the particular area on the ground (resolution). Vector - think water bodies - Raster - think elevation.
C. OGIS topological operations vs. Metric operations (e.g., distance)
    - Open GIS Consortium (OGIS) operations differ from metric operations in many ways. When we say within or contains, we usually mean one geography is inside of another. Using OGIS terminology, within means that the interior of a given geometry does not intersect with the exterior of a second geometry. Distance in OGIS is the shortest distance between two points. When we speak colloquially using kilometers or miles we might not be talking about the shortest distance.
D. Geodesic distance vs. Euclidean distance
    - Euclidian distance is the straight-line distance between two points. Geodesic distance follows the curve of the sphere to get the distance. Euclidian distance could cut through the center of the sphere.
E. B-tree vs. R-tree
    - A B-Tree is a balanced search tree data structure used for sorting and searching. An R-Tree is also a balanced search tree, but it is used for spatial data access methods. An R-Tree is a way to deal with the complexities of spatial data.
F. Spatial hotspots vs. Spatial outliers
    - A hotspot is an area of statistical significance where there is a high occurrence of values. A

hot spot shows a cluster or features, either based on their physical location or weighted by field. An outlier is the opposite. An outlier is an anomaly that sticks out - either on the low or high end of the spectrum.

G. Cartography vs. Geo-visualization
    - Cartography is the practice of creating maps. Geovisualization is a sub-field of cartography that involves making interactive, dynamic maps.

H. Graph vs. Spatial networks
    - graphs can plot any variable and can have anything on the axises. A spatial network, or geometric graph, is a graph that plots spatial elements. Real world features or vertices are located in a space with a certain metric. Urban areas and roads are often represented via spatial networks.

I. Classical statistics vs. spatial Statistics
    - Statistics is a field that uses numerical data to display and analyze patterns and trends. S Statistics can help a researcher formulate answers and predict future trends. Statistics is a branch of mathematics. Spatial statistics is a sub-field of statistics. Instead of just looking at numbers and values, you are also looking at geographic location. Spatial dependency - the location proximity of features - plays a huge role in spatial statistics, whereas it is not so important in classical statistics.

J. Local function vs. Focal function in map algebra
    - Local functions compute on a cell-by-cell basis, regardless of what other cells are around. Focal functions are also known as neighborhood functions and compute a cell based on it and surround neighbors. There are several different ways to compute focal functions based on the neighborhood size.

K. Volunteered Geographic Information vs. Authoritative Geographic Information
    - VGI can be thought of as user-generated content. Any person using a GPS device or phone knowingly or unknowingly produces geographic data that is collected and can be analyzed. The data is not governed by any ruling body and does not have a standard. Authoritative data is collected by some agency with set standards and rules.

L. Global Positioning System vs. Global Navigation Satellite System
    - Global Navigation Satellite System is a system of satellites that provide global geo-spatial positioning data. Many satellites are needed in a system in order to achieve global coverage. Some Global Navigation Satellite System use geostationary satellites, meaning its orbit matches that of the rotation of the earth so the satellite appears to be stationary above the same point at every point in time. A Global Positioning System is also a satellite based system that provides location information - however, the GPS system is managed by the US Government.