M. Taylor Long
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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: **Agata Miszczyk**
- Group Partner E-mail Address: **miszc001@umn.edu**
- Group Partner CSE lab account (if has): **n/a**
- 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.

- Yes, I took a course on modeling for human-environment interactions, and we completed many of the homework assignments in small groups. I actually worked with Agata on most of the homework assignments in this class as well, so we established a good working relationship. We typically worked independently on problems, then shared and discussed our answers.

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

- In a Web GIS course I took last year, we were to split into groups for a final project. In the **forming** stage, I gravitated to a group that contained another student who I knew was interested in some web technologies that also interested me. However, in this forming stage, I soon realized that the content of their project ideas didn't align well with my goals. I realized I wanted to develop a site dealing with water resource issues, so I went around the class finding others with similar interests and expertise, poaching some people away from other groups. With a team of four people who shared similar interests and agreed upon a common goal, we began the **storming** stage in which many proposals were pitched. We all set out working on various aspects of our project to see who could make real progress in a short amount of time. As the deadline approached, we reached the **norming** stage in which decisions were made to cut certain goals and prioritize others. We really didn't reach a **performing** stage until the last few days when we actually had to finish the work. Perhaps if we had reached this stage earlier, we could have accomplished more.

(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
- *Relative News:* Regulation of personal drones (quad-copter, etc)

(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?

- Sort of: FR 5262 (Remote Sensing) always showed us our test scores based on median and standard deviation, but I don't think he actually used these principles to adjust the grades.

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

- MS 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 management 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'm fairly interested in Accuracy as it pertains to mobile GPS, but I assume this might be covered during our week on Location. What interests me specifically is how poor accuracy is reconciled on mobile devices. When do you let someone know how inaccurate their GPS location is? When do you make it look like it's accurate, and how?

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

- My objectives for this course are to gain a deeper understanding for the processes underlying the GIS software I've learned to use in the MGIS program. While I'm comfortable using many GIS tools and familiar with the concepts behind the tools, I have little understanding of the algorithm logic behind many geoprocessing tasks. As an MGIS student with only basic programming experience, I know that some of the content in this course will challenge me more than computer science students, but I'm willing to learn as much as I can, and remain calm when the subject matter completely surpasses my understanding. I'm here to improve my understanding with little regard to how my understanding compares to that of other students.

(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):

- Relational Database vs. Spatial Database
    - A relational database organizes related tables of data in a structure that offers the ability to run complex queries and analyses by sorting records. A spatial database incorporates data structures specific to spatial data that allow queries to ask questions about how data are related relative to each other on a spatial plane. Rather than connecting data by similar attributes, you can connect data by shared location (contains, within, intersects, etc).
- Raster data model vs. Vector data model
    - The raster data model creates a surface of cells, like pixels, each containing one value. Overlaying different datasets and comparing cell values using raster data can result in fairly simple, intuitive geoprocessing, but raster file sizes can grow quite large and don't scale up and down very well. The vector data model relies on points, connected by lines segments, that can form closed shapes (polygons) and other more complicated objects. This model scales up and down fairly easily and is much more efficient for storage than raster data, but comparing different datasets becomes more complicated with boundaries do not match.
- OGIS topological operations vs. Metric operations (e.g., distance)
    - I believe that OGIS topological operations refer to different relationships that two spatial objects can have with each other based on shared features (points, lines, etc). I'm not how this differs from metric operations, but I suppose that metric operations deal less with

shared pieces of a shape and more with calculating the distance relationship between certain shapes. I'm quite unsure about this answer.

- Geodesic distance vs. Euclidean distance
    - Geodesign distance represents a more "real-world" distance between two points that accounts for the curvature of the earth. Euclidean distance represents the mathematically simpler calculation of the distance between two points on an XY grid.
- B-tree vs. R-tree
    - B-tree indexing is appropriate for typical relational databases, while R-tree indexing is used in spatial databases. I am unfamiliar with the logic behind either method.
- Spatial hotspots vs. Spatial outliers
    - Spatial hotspots represent areas where a certain density of observations is high (useful for calling attention to concentrations of a certain phenomenon. Spatial outliers represent data that share some quality with other data but do not follow the same pattern of clustering.
- Cartography vs. Geo-visualization
    - Cartography refers to the practical and artistic design of a map or interface that shares spatial information. Geo-visualization is a newer term that tends to be used when describing visualizations of spatial data that are more dynamic and real-time. Personally, I have difficulty distinguishing between these two concepts, and fail to see the reason for doing so.
- Graph vs. Spatial networks
    - A graph is simply a gridded plane of two or more axes that offer a system for referencing the location of a particular point on the plane. A spatial network is made of of points and lines (on a graph) that connect with each other and store information about the nature of those connections. A spatial network can be traversed and analysed for the best path from point A to point B.
- Classical statistics vs. spatial Statistics
    - Classical statistics assume that all the data being analyses were collected independently of each other. Spatial statistics acknowledges the fact that data collected close to each other are more likely to be similar than data collected far away from each other.
- Local function vs. Focal function in map algebra
    - I can't remember the difference between these two terms. Perhaps local functions operate on just one cell in a raster and focal functions operate on one cell, but also affect the surrounding cells within a given area of influence.
- Volunteered Geographic Information vs. Authoritative Geographic Information
    - VGI comes is derived from members of the general public submitting information about where something is, or is occurring, often without any formal validation. AGI is geographic information that comes from some sort of organized institution, with some set of imposed standards for accuracy and consistency.
- Global Positioning System vs. Global Navigation Satellite System
    - I consider a Global Positioning System to be a network of satellites circling the earth that can communicate with devices to precisely determine where the device is through triangulation. Perhaps GPS can refer to other more land-based systems for determining position, and Global Navigation Satellite Systems specifically refer to what I described above. I'm just not sure.