GGS 664 Spatial Data Structure

Instructors: Ms. Manzhu Yu & Dr. Chaowei (Phil) Yang
Teaching Assistants: Fei Hu, Yongyao Jiang, Han Qin
Tuesdays: 4:30 pm - 7:10 pm, Place: Exploratory Hall 2103

Course Description
This course explores spatial/spatiotemporal data models and data structures used to effectively represent, store and index geospatial data. Emphasis is on core data models, structures and tools. Specific topics include database theory, spatiotemporal indexing, and geospatial data examples including shapefiles, social media, climate, land use, and log files.

Prerequisite

GEOG 650 or a working knowledge of any programming language. This is a high level graduate course introducing research examples, therefore, first-year graduate students are not encouraged to take this course.

References

We don't have a text for this course, please fully review the slides, papers, and other course materials. Cloud computing will be used to experience the course materials in class, homework, and projects.

Grading:
The components of the final grade are as follows:

Class Participation:	10%
4 Homework:	60% (15% each)
Individual Project:	30%

Class Participation
All students are expected to keep up with assigned readings, complete in-class exercises and participate in class discussion. You may be asked to demonstrate data models, structures and algorithms during class.

Homework Assignments
Four homework assignments will entail creation or handling of specific spatiotemporal data structures or related algorithms. Cloud computing assisted working environment will be provided and assisted by TAs. Pseudocode may be used for the assignments.

Project
Each student must complete an original research project that involves a spatiotemporal data structure or modeling technique. Past projects have addressed issues such as topology, climate, spatial indexing and spatial search, social media, uncertainty and interoperability.

All assignments should be submitted before class on the due date.

Computer Hardware and Software

Please be sure to transfer all of your work to a portable medium such as a USB Flash Drive at the end of each class.

To complete assignments and projects outside of class, you may work in the *GIS Lab*. You may also work on your own computer to access the cloud environment, which will be discussed about how to access the cloud environment.

Grading Policy

1. Documentation
   You should document your solution to each assignment as if you were providing a product to software development company. This means providing:
   a) A description of the general purpose of the programming class structure that is developed
   b) A description of how to use the programming class structure
   c) Detailed documentation within your code or pseudo-code
   d) Evaluation of efficiency, robustness, or other characteristics as presented in the assignment instructions

2. Assignment Grading
   Each assignment will be graded on:
   a) Logical correctness of the code
   b) Robustness in handling special cases
   c) Clarity of documentation
   d) Accurate evaluation of efficiency, robustness, or other characteristics as presented in the assignment instructions

3. Late Assignments
   Late assignment credit will be reduced on a basis of 10% (1st day), 30% (2nd day), 50 % (3rd day), and no credit will be given with more than three days late.

4. Working with Other Students
   You are encouraged to discuss assignments with other students, but *all work must be your own*. Violation of this rule will result in both students receiving zero credit.

5. Programming Languages
   You may use any programming language you wish for your modeling assignment and final project. No programming assistant will be given.

6. Working with Existing Data Structures
   You are encouraged to explore existing software libraries and their component object models for your final project. All use of such libraries must be properly documented.

Schedule

Class	Topic	Readings

Class	Topic	
Jan 24	Introduction and conceptual models	
Jan 31	Databases, example: Mysql	
Feb 7	Spatial data model, structure & shape files I	
Feb 14	Spatial data model, structure & shape files II	
Feb 21	Social media: text files; PostgreSQL/QGIS; mining; visualize using google earth/CartoDB	
Feb 28	Log file: text files, database, semantic search, knowledge mining I	
Mar 7	Log file: text files, database, semantic search, knowledge mining II	
Mar 14	**Spring Break**	
Mar 21	Dust storm: File structure, RAM structure, Visualization structure, I	
Mar 28	Dust storm: File structure, RAM structure, Visualization structure, II	
Apr 4	Climate: NetCDF+HDF, tool: Taylor Diagram I	
Apr 11	Climate: NetCDF+HDF, tool: Taylor Diagram II	
Apr 18	Big Data I: HDFS, Spark/Hadoop, example: satellite imagery	
Apr 25	Big Data II: HDFS, Spark/Hadoop, example: climate + model	
May 2	Project presentation	

Contact Information

Instructor	Manzhu Yu
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Instructor	Chaowei (Phil) Yang
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Teaching Assistants

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