CSc 10802 Web-based Geographical Information System (Web-GIS)
3 Credits, Tuesdays 04:50-07:20 PM NAC-7/313 (Registration code 2487)

Instructor: Dr. Jianting Zhang
Dept. of Computer Science, City College

Descriptions: Online mapping services, such as Google Map and Microsoft Bing Map, have had significant impacts on our daily lives over the past decade. It has been estimated that more than 80% of the information has a geographical component. Web-based Geographical Information Systems (Web-GIS) integrate Spatial Databases, GIS and Web technologies to manage and process geographical information in a Web environment. The course includes the following units:

- Spatial concepts and representation of spatial objects
- Spatial query languages and query processing
- Spatial access methods (spatial indexing)
- Geospatial Web services: Standards and Practices
- Web-GIS architectures and realizations
- Introduction to parallel processing of large-scale geospatial data

Learning Goals: This course will introduce students to a new field of managing and processing geographical data in a Web environment, which is not only technically challenging but also practically useful. Through working on individual assignments and a large term project of considerable technical depth, students are expected to expose themselves to the forefront of research and development in the field. Furthermore, students have a chance to apply their software engineering knowledge in a large project full of technical challenges. By the end of the course, students will: (1) Understand the concepts, principles, technologies and best practices in geospatial data management and Web-GIS through lecturing. (2) Receive valuable hands-on experiences in research and applications through a large group-based term project. (3) Gain deeper insights into the design and implementation of real world software engineering. (4) Be better prepared for the career opportunities in GIS and Web-based programming.

Special Announcement: motivated and qualified students will be invited to join a recently funded National Science Foundation (NSF) project entitled “Spatial Data and Trajectory Data Management on GPUs” with full Graduate Research Assistant (GRA) support, including stipend and tuition reimbursement. For a non-technical summary of the project please see http://www.nsf.gov/awardsearch/showAward?AWD_ID=1302423.

Grading Policies:
- Attendance and participation: 10%
- Homework assignments (2-3): 30%
- Midterm: 20%
- Term (group) project: 40%

Logistics:
- Office Hours: Tu/Th 11am-12pm
- Instructor email: jiazhang@ccny.cuny.edu
- Instructor Phone#: 212-650-6175
- Course Website: CUNY Blackboard
Textbook & References
- No textbooks are required. Slides and links to course material will be provided on Blackboard before or shortly after classes.

Prerequisites: 1) Graduate standing at the CUNY AND one of the following: A) CSc21200 Data Structures or equivalent; OR B) Introduction to GIS with strong programming skills and permission from the instructor.

Desirable (but not required) Courses and Programming Skills:
1. High-level programming languages: C++ (with STL) and Java
2. CSc 322 Software Engineering
3. CSc 336/ I1000/I1100 Databases
4. CSC 471/ I0807/I1896 Image/Vision
5. CSc 472 / I0500 Computer Graphics
6. CSC473 Web Site Design (TCP/IP, HTTP, HTML, XML, Javascript, etc.)
7. CSC 318/I4330 Internet Programming
8. I1400: Parallel Algorithms

Sample group project topics
- (Traditional Web-GIS, for “beginners”) Building a Web-GIS to visualize and analyze georeferenced social-economic and environment datasets, such as Census 2010, urban infrastructure (subway, bus, taxi etc.) utilization, in-situ observed and remotely sensed global biodiversity data and regional environmental data.
- (Mobile Web-GIS, for “explorers”) Developing efficient iPhone/Android apps to deliver geographical information on mobile devices.
- (High-Performance Web-GIS, for “pioneers”): Integrating Web-GIS with parallel programming for efficient querying and visualization of large-scale geospatial data
  - Multicore CPUs: OpenMP/MPI/MapReduce
  - General Purpose Graphics Processing Unit (GPGPU): CUDA/OpenCL

Selected Term projects from the previous years:
1. Mapping Where in the World do CCNY Students Come From
2. NYC Restaurant Sanitation Guide (http://134.74.146.40/~king/rsg/)
4. Fast Routing (http://134.74.146.40/~Li11/term/)
5. 3AM Project Commuter (http://134.74.146.40/~Kodia11/commuter/)

Related Master Projects from the previous years
1. MTA Data mining for Turnstile Usage and its relation with the weather event
2. Analyze Delays On the Airline On-Time Performance
3. NYC Taxi Trips Outlier Analysis
4. NYC Subway Fare Visualization(http://134.74.146.40/~king/project/)