An Online Introductory CyberGIS Course for Masters Degree Professionals

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The broad range of studies and projects that can benefit from geographic information systems (GIS) technology attract students of varied backgrounds and skills. A challenge in cyberGIS education and curriculum is that students have different forms of fundamental skills or the computer science background that is required for service-based technology. Often, student experience is limited to individual workstations used privately or in academic laboratories. The challenge for the JHU cyberGIS course, called Big Data Analytics: Tools and Techniques, is to provide professional training to students of diverse backgrounds in a focused way that enables or facilitates any number or type of cyberGIS activities.

Students participating in the Big Data Analytics course are typically already GIS professionals with limited interest in advancing to research doctoral programs. Thus, the central objective is to provide professional preparation for students to initiate and develop cyberGIS solutions for projects within and outside of the graduate program environment. To do so, the curriculum being developed integrates skills required for relevant approaches, analysis of best practices, and planning for time and work constraints. Non-expert users are expected to demonstrate a level of technical proficiency in one fourteen-week semester. Non-programmers are required to understand aspects of coding so programs can be edited, but no programming is required for the course.

The course design rests on a logical narrative of problems and approaches in sequential lecture and reading assignments that are reinforced through exercises and tests. Topics include: forms of distributed architecture; distributed databases, processing, and services; open source software environments such as Hadoop and derivative commercial products such as MapReduce; and case studies of projects described in various relevant literature, including online sources. Emphasis is placed on software algorithms, data models, and translators in current practice. Access to infrastructure is contracted with Amazon Web Services, though exercises and projects are based on a range of available tools.

Secondary presentations and tutorials offering reviews of fundamental skills involved in more complex projects are designed by the instructor to complement the central focus of the lectures and exercises. These include NoSQL, web services, Linux, Python, and other tools. Other sources of background information or that explain basic skills are identified and made available over the Internet with provided links. Students are free to use them or not; these materials are not required for tests. The focus remains on cyberGIS concepts. Foundational concepts will be evaluated not as stand-alone topics, but as they interrelate with a focused geographic information (GI) process. Sometimes the most enlightening material is the vast wealth of GI science literature that has been published in the last thirty or forty years that build the logical application of a geospatial perspective.

Curriculum materials are designed with online education principles in mind. For example, research findings recommend smaller, frequent lessons provide greater effectiveness of instruction. A variety of online resources are made available, but without causing confusion for students, and peer communication and information sharing is supported. Optional approaches are demonstrated and
instructions for completion of the work are clearly explained. Such an environment requires testing for comprehension of concepts, not memorization of materials.

An important aspect of the course is to integrate with other classes the students take in their masters degree GIS program. The Big Data Analytics course may touch upon semantic graphs and reasoning, commercial GIS products, volunteered geographic information, alternative media such as sound, and other areas that are ubiquitous in the information environment.

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