Beyond Widgetology:
CyberGIS as a First Class Citizen in Departments of Geography

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The ability to write computer code, i.e., the ability to program, is moving closer and closer to the required section of job advertisements in the GIS field. What were previously nice-to-haves, or “desired” skills – “2-plus years programming experience”, “fluency with Python”, “ability to create web maps with JavaScript” – are now becoming required skills necessary to perform the stated duties of many entry-, mid- and senior-level GIS Analyst, GIS Technician, and other positions across a number of fields including but not limited to Oil & Gas, Local & Regional Government & Planning, Retail, Real Estate, Construction, and Environmental Services. The required knowledge, skills, and abilities of a GIS student with an undergraduate degree seeking a job in 2016 are markedly different than those of a decade ago. The subject material included and emphasized in the degrees we offer our students in two and four year colleges and universities needs to change to keep pace with what employers are expecting of our graduates.

An initial analysis of a year-long survey of GIS hiring performed by the authors which captured the full text of 22,000+ GIS job postings in the US has revealed some astounding facts about the state of GIS hiring in the US. Most astonishingly, a full one third of all job posting for entry level positions – GIS Technician (I), or GIS Analyst (I) – posted during this timeframe (Feb 2015 – Feb 2016) explicitly either require or desire CyberGIS knowledge, skills, and abilities spanning the full spectrum of the CyberGIS knowledgebase. These include but are not limited to: knowledge and extensive experience in one or more programming languages like Python or JavaScript; knowledge and extensive experience in web-based GIS and server platforms like Windows Server or ArcServer; and knowledge and extensive experience in managing spatial data in one or more databases management systems like PostgreSQL, MySQL, or SQL Server.

These are not the topics covered in many Departments of Geography in the US, currently. To many in Departments of Geography nationwide, these topics are seen as something that should be “outsourced” and “should be covered in the [XYZ] Department”, where X, Y, and Z are often Computer Science, Management Information Systems, or Information Technology. These (not intentionally disparaging) sentiments by colleagues across the country may have their roots in the same confusion that many have traditionally found between GIS as “Geographic Information Systems” or “GIScience.” Students seeking degrees in GIS in many Departments have in many cases been seen in the light of the former, as “Buttonologists” – technicians (i.e., worker bees) trained in how to click buttons to solve a problem that someone else hands to them. With the growth of Geographers undertaking CyberGIS research careers and the responsibilities it entails – engineering systems; developing code; managing servers, creating interactive apps and web-based visualization – the Buttonologist is giving way to the equally irreverent term “Widgetologist”, referring to those Geographers whose research outputs consist primarily of software code and engineered systems which solve novel problems, at larger scales, faster, on innovative platforms, with new sensors or previously undiscovered interfaces or functionality.
Our ongoing survey of the needs of GIS workforce, from the perspective of those hiring in the field as demonstrated by the job ads for people they seek to hire, has revealed clearly for us that the time has come to raise the profile of CyberGIS education in Departments of Geography in the US. A recent survey completed by the authors of the degree requirements for Geography and GIS undergraduate degrees (210 different degree options) in the top 55 Departments of Geography in the US (as ranked by National Research Council Rankings and Academic Analytics) revealed that only 22 degree tracks (10% out of 220 degree tracks investigated) require any form of programming course for degree completion. We contend that when one third of all jobs in our discipline require a skill of our graduates, and only 10% of the degrees offered in the US require this skill as a foundation for graduation, nationwide, we are failing in our job as educators.

We acknowledge fully that CyberGIS and the trend toward the GIScientist-as-programmer is an emerging phenomenon that has been unfolding before our eyes in just the recent few years thanks to the high profile efforts of a number in the GIScience community. However, Android devices and platforms which offer turnkey samples for creating mobileGIS applications, web services and relevant API’s for building interactive JavaScript application, and software development kits (SDK’s) for extending desktop GIS (e.g., Esri) have been in existence for, in many cases, decades. The technological basis for CyberGIS education has been around for quite some time, and we have no excuse for not teaching it other than inertia. Designing a new course takes effort; getting a special topics course approved by Departmental, College, and University curricular committees takes time; purchasing hardware, servers, and licenses to enable student development takes money; inserting a new course into an already packed undergraduate degree plan takes approval from colleagues and often means that something else must go by the wayside.

Many of these challenges cannot be overcome by a single faculty (research group, or cluster) alone. Such changes take full departmental buyin for a vision for the future of Geography and GIScience where a Computational foundation is just as fundamental as a Human, Cultural, or Physical Geography foundation is in many Departments now. The leaders in our field, our Departments, our Colleges, and our Universities must be convinced that just as Big Data is permeating through all aspects of the Academy, Cyber is permeating through GIS and Geography as a whole. Our society needs Geographers highly trained and skilled in developing and utilizing CyberGIS to solve hard, large, impactful problems with broad-reaching consequences. Without the fully-developed educational frameworks of curricular materials, shared and accessible learning environments, and realistic problem sets and collaborative spaces that a coordinated CyberGIS education agenda at the national scale can afford, students in the US will continue to graduate from our departments unprepared to join the US STEM workforce or lead the world in the innovation that CyberGIS can be used to foster.

However, all is not doom and gloom. Initiatives such as the CyberGIS Fellows Program and strong investments by the National Science Foundation are seeding the core for a burgeoning future of CyberGIS educators and researchers at US institutions. The AAG CyberInfrastructure Specialty Group will likely sponsor 70+ sessions at this year’s AAG. Our job, as members of the CyberGIS community, is to continue to demonstrate that software development, systems engineering & design, and all of the other aspects that encompass CyberGIS remain as the drivers of science which solve important problems. And, most importantly, we translate these accomplishments into exciting learning materials that can be used and shared in the classroom to inspire more and more of our students to demand more and more CyberGIS-related courses be included in their degree plans.

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