Majok Ring

VanWagenen

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Computer Science: Delivering Undergraduate Experience

With the increasing expansion of computer science into different fields/ research opportunities which involve increasing interdisciplinary cooperation, there arises a need to develop students with the necessary skills to analyze this data and to be able to quickly adjust to new and changing resources. With the UC system facing ever increasing budget cuts, they must decide which departments to cut funding from. The Computer Science and Engineering department is in danger of losing a large majority of its funding and must be preserved. The continuation of the CSE curriculum with adjusted allocation of resources can both serve to benefit the students by giving them learning experiences through cooperation. Within the university structure and even future work environments, team members must learn to communicate/ relay their findings and explain its impact or necessity. With CSE programs which focus on the interdisciplinary aspect such as Engineering Service Learning, we are teaching students how to prioritize certain tasks as well as giving the department more room to communicate as computer science is well branched out in terms of application. As technology continues to advance at a rapid pace, there will always be a need for more highly skilled individuals with a greater understanding of the concepts in order to figure out new breakthroughs, create programs which compile faster, and develop new machines to solve the everyday issues of society. These individuals cannot be found randomly or produced hastily, rather, they must spend years learning a curriculum which is dedicated to learning the actual science behind computers, programming, and engineering. In order for these individuals to be able to do their jobs, we need to give them the tools they need to do that job; a more in depth curriculum and more efficient peer to peer learning systems. Colleges must take this into consideration as computer science is a rapidly growing field which is serving as a bridge/mode of communication to other fields and can increase a university’s standing in terms of cooperative research.

Interdisciplinary research is a core aspect within the college experience. Groups of students of all backgrounds each learning to apply their skills successfully, utilizing the knowledge of others and applying it to their research can grow into well rounded individuals with the necessary skills to work in any environment. Computer Science and Engineering, being so widely applied to many skillsets and jobs which rely on communicative elements, fosters an environment which encourages this interdisciplinary cooperation. This is exemplified through the Q Project, a committee founded by graduate student Theo Crouch II of UC Merced. This project employs the skills of several Biology majors and utilizes Computer Science majors to utilize a form of data collection and analysis known as Big Data. Take for example useful data such as genetic sequences which contain an astonishing 3-billion base pairs (Genome.gov). This data cannot be analyzed by any resources other than computer databases. This branches into computational genomics in which computer scientists work with biologists to create algorithms and programs to locate and organize analyze genetic sequences. In terms of the Q Project, we employ the same work methods as each section must communicate with the other and will only be efficient if they work in unison and have their objectives prioritized. My involvement within this committee has taught me several valuable skills such as prioritizing tasks/objectives between members, efficiently organizing information for easy access, and working with others to both teach and learn new skills. The biology majors, with their knowledge on brca genes and p53 proteins would teach me both the terminology and function of these genes/proteins while I, with my experience in Java programming would teach them the core concepts of programming and its application to this project. Within this committee, my role is to utilize computer science to analyze and organize large amounts of data for the Biology majors to research and reach conclusions based upon this data.

The UC Budget committee bases its action on the budget presented by the Legislative Budget Conference Committee. This committee serves to highlight the future expenditures in 3 year increments and needs to divide and displace funds to key areas as there is not enough for every program to remain fully funded. According to the University of California Budget office, the UC system now receives $460 million less than it did in 2007-2008, even though they are continually enrolling more students each year. The UC must allocate funding to many departments and research areas such as Library Academic Support, Breast Cancer Research Account, and Health Care benefits, as well as the cost to maintain many other programs. Although the UC is spreading its resources thin among myriad programs/divisions, this allocation is necessary to keep programs/departments such as Computer Science and Engineering competitive and facultative to a developing engineers learning style. The UC recognizes the necessity of increased funding towards UC Merced’s academics as in a letter to the Conference Committee, they addressed Item 6440-301-0668 (Ebugdget.CA) which is a proposal for the allocation of $45.1 million for the UC Merced Classroom and Academic Building, in which the funding has already been approved. Since this funding has already been approved, the UC has more legitimacy when proposing funds as Merced is in a growing area and needs the Computer Science Department to attract more students from all of California into Merced as it is a growing major with increasing potential.

Computer Science can be the program which spurs UC Merced into a new age of development. New students from all around the state enrolling in UC Merced will increase profits for the University of California system and will then increase funding for Computer Science and Engineering departments as a whole. This semester UC Merced has increased enrollment to over 6,000 students. This is a new precedent for this university as it primarily focuses its efforts on research. With a large landscape and growing capacity, these funds should be allocated to form new and grand engineering buildings which will be a highly attractive element in terms of both learning capability and also profitability for the UC. According to the UC President Janet Napolitano, “Today in America, we are trying to prepare students for a high tech world of constant change, but we are doing so by putting them through a school system designed in the early 20th Century that has not seen substantial change in 30 years.” (Mayflower Hotel, Washington, DC, 2004). Here, Napolitano explains how in order for the UC’s to become a frontier for education and research, It must present the tools and resources for students to be able to engage in interdisciplinary activities, research opportunities, internships, and highly intuitive programs. Napolitano projects great emphasis on the inconsistency between our goals for our students and the resources they are being given. The push for greater advancements and research projects within the CSE field must be accompanied by supporting funds and would give professors/ instructors the means to incorporate more interactive learning programs, hands on experience, and develop new and more expansive curriculums. Funding for the CSE department remains the crutch for future developments as these programs constitute a great majority of the potential progress in which the UC could make.

Studies have shown that with the proper funding, most proposals follow a Cultural-Cognitive pillar. (Boden, Borrego & Newswander, 2014, pg. 865)This pillar follows the template in which the main focus is on future broad future goals such as establishing a culture of interdisciplinary communication and collaboration in graduate education. “Thus, in order for students to thrive in interdisciplinary graduate education, institutions of higher education cannot simply add new degree programs and research centers without considering existing organizational culture and structure” (Boden, Borrego & Newswander, pg. 862). This shows that by continuing to enhance and develop the Computer Science department/ curriculum, UC Merced will be actively preparing itself for upcoming changes in curriculum as CSE already has interdisciplinary cooperation as a large part of its ideals/workings. Through the study conducted by Boden, Borrego & Newswander, we now understand the impact that interdisciplinary education has on a college’s curriculum as out of the 114 proposals examined, (57/114) 50% of the proposals were Cultural-Cognitive which revolved around creating the cross-discipline supporting environment. This cooperation is present within careers such as Synthetic Biology, Bioengineering, Medical imaging systems, and Information systems analyst. Scientific research has always suffered from the compartmentalization of different disciplines. In research done by James Moore, he describes how human genetics has a history of using a variety of disciplines to gather research and form analyses on the body structure/function with respect to genetic code and thus need to utilize Computer Science to analyze the data. There are many computational challenges when dealing with genetics as there is too much data to organize and collect efficiently and we need to determine which sequences out of thousands are important( Moore, Jason. Biological Data Mining). With computer science, you can narrow down these genetic sequences and find the function of a certain gene/code. “This historic phenomenon is beginning to erode in specific broader disciplines such as medicine where new interdisciplinary areas such as bioinformatics have worked to bring together biologists with computer scientists and mathematicians” (Moore, 2013). In Moore’s publication, *The Central Role of Biological Data Mining in Connecting Diverse Disciplines,* he describes the limitations of new research and advancements as many aspects of research has been compartmentalized and engaged in confidential research initiatives and needs to change starting with young students. Division and lack of cooperation leads to less research being published and even less individuals partaking in this research as only a few have the skillsets to complete certain tasks/experiments without seeking out experts in other fields. If universities can foster an environment which supports this diversification of research amongst different departments, we can use Computer Science to fill in that gap by establishing research/curriculums which create foundations for this learning style. Take for example the Engineering Service learning course at UC Merced. This course employs interdisciplinary qualities as teams are composed of students within differing majors such as Biology, Computer Sciences, Mathematics, and English and so on. These groups utilize each other’s skill sets to accomplish a unique goal and learn from each other’s experiences. Unfortunately, these course have limited funding and cannot provide enough resources to buy more circuitry to create circuit boards to further expand on their UAV program or even link differing teams, ex. UAV team buys more circuit boards and IR sensors, CSE students then develop program to utilize infrared sensors to look over areas in the central valley and then relay the information back to the agricultural team.

Computer Science and Engineering remains a core element within research and development as its applications are broad based and can be used to communicate with different sectors. By developing applications and hardware/architecture for more advanced computing, Computer Science can change the way we function in our daily work environments. It remains an attractive program for colleges as it can boast being member of one of top 3 growth industries at 38.3%, according to the Bureau of Labor. Since college curriculums are adapting and following the trend of moving towards an interdisciplinary supporting environment, computer science will continue to grow as there are many opportunities for cooperation with other majors to occur. As Merced is a new and growing area, there needs to be a strong Computer Science program to draw in more students from all of California to this new UC. This, through new and innovative solutions to the current budget problem, will effectively increase the UC’s reputation and make up for any losses by gaining funds through new programs and opportunities in which the students have and will expand upon. The University of California has tried to appropriate funds to necessary departments but has failed due to the Budget Committee’s lack of allocated funds to the school system. Through proposals, the UC should allocate even more funding for Computer Science in UC Merced as it is a relatively new research university and will benefit greatly on its enhanced focus on the CSE department as this department will compete and or cooperate with neighboring UC’s to advance new technologies and publish research.

References

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Majok,

Let me first say that I’m impressed with the focus of your research essay. I love the approach you take – to analyze how Computer Science contributes to interdisciplinary research, which is fulfilling a need in higher education today. You also have some excellent sources, such as the quote from the UC President and the information you dug up about the UCM Budget.

The main revision to make will be to add to your analysis in your paragraphs. I’d like to have a clearer picture of what Computer Science is and can do to contribute to interdisciplinary research. For example, on the top of page 4 I’ve asked a few questions about the role CSE could play in creating the kind of educational environment that Napolitano is describing.

One other note is to make sure to cite page numbers and authors in all the areas you draw from their research. Even if you explain the source in a different place in your paper, the first time and every time you discuss others’ research you’ll need to follow it with a parenthetical citation. Let me know if you have questions about how to do this.

Overall I’m pleased with the direction you are headed with this essay. Continue to work on adding to the analysis and fixing the citation issue. Your argument will really shine with these two revisions in place. Great job!

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