

Setting the Stage for Computing Curricula 2013: Computer Science – Report from the ACM/IEEE-CS Joint Task Force

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1. SUMMARY

Following a roughly 10 year cycle, the Computing Curricula volumes have helped to set international curricular guidelines for undergraduate programs in computing. In the summer of 2010, planning for the next volume in the series, Computer Science 2013, began. This panel seeks to update and engage the SIGCSE community on the Computer Science 2013 effort.

The development of curricular guidelines in Computer Science is particularly challenging given the rapid evolution and expansion of the field. Moreover, the growing diversity of topics in Computer Science and the integration of computing with other disciplines create additional challenges and opportunities in defining computing curricula. As a result, it is particularly important to engage the broader computer science education community in a dialog to better understand new opportunities, local needs, and novel successful models of computing curriculum.

The last complete Computer Science curricular volume was released in 2001 [3] and followed by a review effort that concluded in 2008 [2]. While the review helped to update some of the knowledge units in the 2001 volume, it was not aimed at producing an entirely new curricular volume and deferred some of the more significant questions that arose at the time. The Computer Science 2013 effort seeks to provide a new volume reflecting the current state of the field and highlighting promising future directions through revisiting

and redefining the knowledge units in CS, rethinking the essentials necessary for a CS curriculum, and identifying working exemplars of courses and curricula along these lines.

Early discussions in the CS 2013 effort provide several topics that the panel will address:

- *The “Big Tent” view of CS* – As CS expands to include more multi-disciplinary work and new programs of the form “Computational X” are developed, it is important to embrace an outward looking view in computing that sees CS as a discipline actively seeking to work with and integrate into other disciplines. Such a view impacts the definition of CS curriculum as a means for promoting multi-disciplinary work while maintaining a clear identity of the field.
- *Managing the size of the curriculum* – Although the field of Computer Science continues to grow unabated, it is simply not possible to proportionately expand the size of the curriculum. Indeed CS 2001 was successful in reducing the total number of required instruction hours in comparison to Computing Curricula ’91 [1]. Similarly, CS 2013 seeks to further reduce the number of required instruction hours in order to promote more flexible models for curricula, without losing the essence of a rigorous CS education.
- *Computational Thinking* – While there has been a great deal of discussion in regard to computational thinking [7], its direct impact on curriculum is still unclear. While we believe there is no “right answer” here, CS 2013 seeks to gain more clarity regarding models by which CS curricula can promote computational thinking for broader audiences.
- *Actual course exemplars as opposed to stylized course guidance* – CS 2001 took on the significant challenge of providing descriptions of stylized courses incorporating the knowledge units defined in that report. While this was a valiant effort, it was felt in retrospect that such course guidance did not have much impact on actual course design. As a result, CS 2013 plans to take a different approach: identifying existing successful courses and curricula as fielded exemplars of how the relevant knowledge units can be addressed in actual programs. This bears some similarity to the recent report by

CRA-E [4], although that report focused specifically on preparing students for research careers.

- *Institutional needs* – Understanding that curricula exists in the context of specific institutional needs, goals, and resource constraints, CS 2013 aims to provide curricular models suitable in a broad range of contexts. This requires not only a curriculum that affords flexibility, but one that is also cognizant of and aligned with upstream (K-12, two year college) and downstream (graduate school, industry) needs and constraints.

Additionally, specific developments in the field in the past decade (such as the pervasiveness of parallel computing and the need for better understanding computer security) as well as issues identified by 2008 Interim Review (such as differing models for knowledge units on Programming Languages) provide additional topics for discussion during this panel.

Importantly, the goal of this panel is not simply to provide an update on the current thinking and state of CS 2013, but to actively engage the community in the discussions and work that will eventually manifest into the published volume. We encourage the community to review and comment on forthcoming drafts of CS 2013 by contacting the committee chairs Mehran Sahami and Steve Roach.

2. MEHRAN SAHAMI

Mehran Sahami is chair of the ACM delegation for the Computing Curricula 2013: Computer Science volume. He is an Associate Professor and Associate Chair for Education in the Computer Science Department at Stanford University, where he recently led a complete revamping of the undergraduate Computer Science curriculum [6].

3. MARK GUZDIAL

Mark Guzdial is a member of the ACM Education Board and the SIGCSE Board of Directors. He is a Professor in the College of Computing at Georgia Institute of Technology and the former Director of Undergraduate Programs in Computer Science and Computational Media. He served on the Computer Science Curriculum 2008 Review Taskforce and also was a principal in the development of Georgia Tech's innovative Threads Computer Science curriculum [5].

4. ANDREW MCGETTRICK

Andrew McGettrick is chair of the ACM Education Board. He is a Professor in the Department of Computer and Information Sciences

at the University of Strathclyde. He has been involved in several Computing Curricula efforts, including Computer Science 2001, Software Engineering 2004, Computer Engineering 2004, Overview volume 2006, and was co-chair of the Computer Science Curriculum 2008 Review Taskforce.

5. STEVE ROACH

Steve Roach is chair of the IEEE-CS delegation for the Computing Curricula 2013: Computer Science volume. He is an Associate Professor and Associate Chair of the Department of Computer Science at the University of Texas at El Paso. He was involved in Computing Curriculum Software Engineering 2004 and the Graduate Software Engineering 2009 efforts.

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