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EDITORS' MESSAGE

Welcome to the September edition of *Inroads*. As still new Editors-in-Chief, when we first read about the annual study of non-doctoral-granting departments in computing, we wondered why such a paper would be interesting. Since then, we have learned that many USA-based heads of Departments need to know this data and use it to support their cases for starting new programs, or closing down others, or changing emphasis for future directions. Hence, we are very happy to be able to provide the latest data and interesting insights developed by Yan Timanovsky and others at the ACM headquarters. However, we did ask them to identify the relevance to the international community; you may like to extend further questions. We also welcome in this issue articles on interdisciplinary computing education, diversity and retention, and data visualisation, which emphasises to us the range and variety of topics in computing education.

We are always interested in your questions and welcome submissions for columns and articles. Even something controversial can be interesting, and we could consider setting up panel discussions around topics where people have very different opinions and interests. To enhance possibilities for interaction, we would also like each edition in future to have a specific theme. Our current thinking around this is below; please feel free to let us know your comments on them and ideas for other themes. Also, please consider submitting an article on one of these themes and urge others to do so too:

Issue	Theme
December 2019	The Classroom of the Future
March 2020	The Role of Industry in Computing Degrees
June 2020	Trends in Computing Education Research
September 2020	Data and Learning Analytics

The Classroom of the Future

Classrooms have always been adapted to incorporate technological developments, such as blackboards, whiteboards, overhead projectors, PowerPoint slides, video, presentations or live

streams. Recent trends in classroom organization have tended to swing away from the traditional mode of information delivery towards active learning techniques, but there appears to be little consensus, even within the computing disciplines, about what constitutes best practice. This is particularly acute in the more conceptual areas of computing, in which the appropriate framing and guidance from a content expert can be vital. Suggested topics include active learning, flipped classrooms, the role of video content and podcasts, problem-based learning, learning in groups, learning spaces, innovative technologies, feedback and assessment, and related topics.

The Role of Industry in Computing Degrees

Computing degrees often include a capstone project, i.e., one that is done in the final semester which serves as an introduction to the workday life in the computing industry. This usually involves a client from a relevant company, with the students working as end-to-end developers, eliciting the requirements and designing, implementing, testing and deploying the relevant software. Industry representatives may also be present on advisory or accreditation boards, or have other involvement in curriculum design or delivery of content. They may also provide advice on current practice, assessment, review, project supervision while delivering desired interaction with students explaining why particular skills would be relevant for jobs and discussing what the role of industry could be in computing degrees. Industry may also include technology providers, as their technologies and resources such as textbooks, e-books in education, training programs or other technical content provide a role in computing degrees.

Trends in Computing Education Research

There are now numerous journals and conferences based on research into computing education, i.e., the application of education research outcomes to computing and related disciplines. The recent publication of the Cambridge Handbook of Computing Education Research underlines the emergence of this field. While much of the early research in this area was focused on introductory programming, there are various other aspects of computing education that are much less developed (such as topics involving

the learning of a second programming language, formal methods and related concepts, statistics, mathematics, and artificial intelligence) and others which are becoming increasingly important (such as the development of computational thinking, and examining reasons for the lack of diversity of a specific student cohort). It could also include research undertaken by students as part of their studies for master's or PhD degrees, particularly in the area of computing education.

Data and Learning Analytics

In an increasingly online world, volumes of data are being generated daily. This includes data related to computing education, and often it is a matter of sifting through what is available in order to find the most useful or most relevant data. This may involve identifying patterns and profiles for successful students (and other types), or developing explanatory models or generating predictive models building on correlations between student interaction with learning management systems or practice tools and their grades, or being informed about the use and effectiveness of particular tools (such as online quizzes). While there are general lessons and trends to be observed, we are particularly interested in viewing these from the perspective of computing education. This may include analytics around the use of tools such as GitHub, cloud services, IDEs and debugging tools as well as more general settings such as data from learning management systems and related tools in computing education. In particular, we encourage submissions that can identify trends in technological use and extrapolate from these in order to inform future developments in computing education.

Overall, our aim is to encourage the sharing of excellent practice, research outcomes, and opportunities within our computing education community which extends world-wide. One further outcome would be to extend the discussion of these relevant topics to involve future collaborations and encourage divergence of opinions. ♦

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