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ICER 2016, and Star Trek at 50

Mark Guzdial reports on promising papers, and Daniel Reed recalls a television show that continues to inspire innovation.

Mark Guzdial
14 Years of a Learner-Centered Python IDE
http://bit.ly/2aNXAnC
August 10, 2016

Early September saw the 2016 International Computing Education Research (ICER) conference in Melbourne, Australia. The conference was terrific, as is usual for ICER.

Two of its papers were meta-papers studying the ICER community itself. They found the community has healthy levels of newcomers and collaboration, and features methodological rigor and strong theoretical foundations.

I will report on three papers: two award recipients, and one of my favorite papers at the conference. ICER has two paper awards: a "people's choice" (voted on by attendees) *John Henry* award for innovation and new directions, and a "Chairs" award selected by the conference chairs based on the paper reviews.

The people's choice award was won by Elizabeth Patitsas (with Jesse Berlin, Michelle Craig, and Steve Easterbrook) from the University of Toronto for "Evidence that Computer Science Grades are not Bimodal" (http://bit.ly/2dsBo3L). Elizabeth's paper had two studies in it and a provocative discussion section.

Many CS teachers believe grades in CS classes are bimodal: some students have innate ability and just "get it"; others don't. There are research papers presenting explanations for the bimodality effect, but is the effect really there?

In her first study, Patitsas did an analysis of 18 years' worth of grade data from a large university CS department, and found less than 5% of the courses had signs of non-normality. Her second study was a "deception study" (debriefed at http://bit.ly/2dKM48u). She asked 60 CS teachers (mostly from the SIGCSE members list) to judge if a number of grade distributions were bimodal; the reality was that none of them were. She also asked teachers if they agreed with the statements "Some students are innately predisposed to do better at CS than others" and "Nearly everyone is capable of succeeding in computer science if they work at it." Both of these statements strongly correlated with "seeing bimodality" in the distributions, the first positively and the second negatively. If teachers believed in a "Geek Gene" (that some students are innately gifted at programming), they saw bimodality, even if it was not there.

The provocative explanation is that CS teachers see bimodality because they do not teach well. Patitsas used a social defense theory to explain "seeing-bimodality." Patitsas suggests our overconfidence in CS teaching leads to seeing bimodality when there is none.

The Chairs award was particularly exciting because it was won by a team led from a School of Education. Computing education research has been dominated by CS researchers, and it's terrific to see the Education side playing a more prominent role. The paper was "Learning to Program: Gender Differences and Interactive Effects of Students' Motivation, Goals, and Self-Efficacy on Performance" (http://bit.ly/2d3UKJA) by Alex Lishinski, Aman Yadav, Jon Good, and Richard Enbody from Michigan State University. Self-efficacy is one's own rating of their ability to succeed or perform in a particular discipline. We knew from prior work women tend to have low self-efficacy ratings at the start of CS classes, while men have high ratings. What hasn't been studied previously was how these changed with feedback. As students get grades back on homework and exams, what changes? Lishinski showed women more quickly adapt self-efficacy ratings compared to men; the scores rise dramatically. It takes a long time (more feedback) to get men to downgrade their overestimated skills to match their performance.

One of my favorite papers at ICER 2016 was "Some Trouble with Transparency: An Analysis of Student Errors

with Object-oriented Python" (http://bit.ly/2dKNqji) by Craig S. Miller and Amber Settle. Anyone who writes object-oriented programs in Python knows methods in Python classes must explicitly state a parameter self. Miller and Settle call that "transparency." References to the receiving object are available in Java (for example) methods, too, but not as an explicit parameter. Is that a problem? Settle presented evidence that it really is. In a study of object-oriented programming in Python (where students were asked to code a particular method for a given class), some errors (like returning too early from a method, or forgetting to loop through all items in a list) occurred relatively frequently—19% and 31% of all errors, respectively. The self-related errors were far more common; 53% of all errors were due to missing the self parameter in the method declaration, 39% were due to missing self in an object reference, and 39% used self incorrectly. That's a cost of using Python for novice students not previously measured.

There were lots of other great papers I'm not going to discuss here. I recommend Andy Ko's excellent ICER 2016 trip report (http://bit.ly/2dSpWhd) for another take on the conference.

Daniel A. Reed "Star Trek"@50: Inspiring Discovery and Innovation

http://bit.ly/2cFzx9X
September 8, 2016

On September 8, 1966, 50 years ago, "Star Trek" (http://bit.ly/2dKQRY5) premiered in the U.S. on the NBC television network. By the standards of the day, it was not a great success. The ratings were mediocre, the reviews were mixed, and it was canceled after three seasons despite a fan-driven letter-writing campaign. Defying this inauspicious beginning, "Star Trek" has become an international cultural phenomenon, with multiple series, movies, and casts since its television premiere.

Much has been written about why "Star Trek" has lived long and prospered. I suspect much of its enduring appeal lies in the personal relations of the three original starring characters (Kirk, Spock, and McCoy), along with technological optimism and the ethical questions and conundrums posed.

"Star Trek" has also entered the cultural lexicon in deep ways, "Beam me up, Scotty!" and "Set phasers to stun" being just two of many examples. The town of Riverside, IA, even has a commemorative monument to the "future birthplace" of James T. Kirk. More importantly, "Star Trek" has inspired generations to pursue science and technology careers, not a few of whom have transformed part of that television science fiction into technological and commercial fact.

Through a B&W Broadcast, Darkly

Alas, I missed the premiere and the original run of "Star Trek" broadcasts because my family did not own a television. Today that seems incredible, given television's nearly universal market penetration, the plethora of cable channels, and ubiquitous streaming media services. At the time, there were only three broadcast television networks in the U.S., and cable service was not available in many rural areas. In the 1960s, channel surfing often involved climbing on the roof to rotate the antenna while responding to guidance through an open window. Instead, it was best to pick one of the broadcast networks and stick with it, particularly in winter.

When "Star Trek" entered syndication a few years later, I was able to watch it in B&W; when I saw it later in color, I was amazed by the bright, garish colors. Whether in gray scale or color, the series immediately engaged both my teenage angst and my scientific aspirations. Mr. Spock's stoicism and logic comforted many who felt the pain and loneliness of cultural isolation, including this geek. The series also gave hope that a better world was possible, one where we could celebrate our differences as strengths while embracing the common core of our shared humanity. During the height of the Vietnam War and our ongoing struggle for civil rights, this was a powerful message of hope.

From Fiction to Reality and Back

Though one might also rightly argue convergent evolution (http://bit.ly/2dfrqgM), cellphones (communicators) and tablet computers both owe some elements of their form and function to "Star Trek"'s vision of ubiquitous computing and communications. The Tricorder X Prize competition to create a portable, wireless health monitoring device, is a direct homage to "Star Trek."

My former colleagues at Microsoft Research often reference the "Star Trek" universal translator as an inspiration for their work on real-time language translation. (Thank you, Rick Rashid.) More generally, our community's work on deep learning and intelligent assistants is inspired not only by technical goals, but by a motivating vision of artificial intelligence (AI) that runs deeply through "Star Trek" and the science fiction world. From weak AI to ambitions of strong AI, we yearn to build a machine that will be proud of us.

Across computing, we ponder issues of AI ethics and their instantiation in autonomous vehicles; consider the limits of silicon-based computing and quantum alternatives, and debate the future of ubiquitous sensors and digital privacy. These and other technical challenges inform our imaginations and dreams of the future. This virtuous cycle of invention and imagination drives us forward.

The Frontier Awaits

The original "Star Trek" series opened with Captain Kirk intoning the Enterprise would "boldly go where no man has gone before." It was a powerful message of exploratory optimism, though I have to admit the split infinitive has always bothered me. But the gender-specific pronoun was the wrong message, one Captain Picard rightly corrected:

Space, the final frontier. These are the voyages of the starship Enterprise. Its continuing mission: to explore strange new worlds, to seek out new life and new civilizations, to boldly go where no one has gone before.

Both versions echo the enduring words of Vannevar Bush in his seminal essay "Science: The Endless Frontier" (http://bit.ly/2e2RMqi), and speak to something deep in our nature:

... without scientific progress no amount of achievement in other directions can insure our health, prosperity, and security as a nation in the modern world.

We yearn to discover. Engage. Make it so. C

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