Thoughts on the future and shortcomings of areas in computer science

John Horgan is an American science journalist and author who promotes scientific and technological realism.
His book, The End of Science (1996), discussed the limits of knowledge and concluded that science is inevitably going to end. This sparked controversy which led to the writing and publication of his revision of said book. The article, The End of Science Revisited^1, adds to his earlier work and refutes some of the criticism directed towards said work. Horgan also comments on many of the sciences overly positive and naïve claims of new possibilities. The article itself includes multiple parts, which go through several different scientific and technological branches, ranging from mathematics and nanotechnology to neuroscience. In this essay we will focus on two of those parts, titled: 'computers and chaoplexity' and 'seeking artificial common sense'^2.

Horgan starts of by agreeing that computers have been an irreplaceable tool. He mentions that "(c)omputers in particular have vastly increased scientists' capacity for data acquisition, analysis, storage, and communication." Horgan also notes the potential of optical and quantum computing, even though quantum computers may never be household machines. He primarily sees computers as tools to enable simple but effective calculations. The article then goes on to what was coined 'chaoplexity'. Chaoplexity is a portmanteau of chaos and complexity, which is used by Horgan to combine the two fields for convenience. Some chaoplexologists, Horgan writes, believe that much of the seemingly random factors in nature are actually "the result of some underlying, deterministic algorithm." Horgan mentions that some seemingly chaotic phenomena do follow simple, computable rules, but most macroscopic systems are way too complex and interdependable for such calculations, as examplified by the butterfly effect.

In his next section Horgan brings forth the advances and apparent failures of artificial intelligence. He highlights the successes of "devices that can translate languages, recognize voices, judge loan applications, interpret cardiograms, and play chess". These are again, somewhat simple tasks when comparing to a general AI, capable of its own thoughts, its own actions and learning. A general AI has been claimed to be 'just over the horizon' ever since the 1960s, according to Horgan. However, the superhuman AIs like HAL from '2001: A space odyssey' never seemed to arrive and, according to Horgan, might never do so. Horgan cites AI theorist Roger Schank, who states that such a level of AI "could never exist"^3 and that machines will continue to be programmed to focus only on a few and simple tasks, for example playing chess. Chess is, as John Horgan mentions, a game tailored to computers. The pieces have limited moves and the board is small enough for combinatorial computations. Changing the game's complexity to a nineteen-by-nineteen Go board, makes it clear that computers have immense difficulty beating expert human players in a broader setting. Despite this, some are hopeful that AIs will learn or adapt to more complex situations. Horgan replies, "adherents of certain computer-driven fields—notably artificial life, chaos, and complexity—seem to view computers not as tools but as wands that will magically solve even the toughest puzzles. [...] Chaoplexologists have argued that with more powerful computers and mathematics they can solve conundrums resistant to conventional scientific reductionism, particularly in "soft" fields such as ecology, psychology, economics, and other social sciences." Currently, at least, the complex systems found in the "soft" sciences are not only hard simulate, but also very difficult to translate from the real world to the computer's mind and vice versa.

The article provides food for thought about the hard limits of knowledge. Science and knowledge, like nature, is not infinite and therefore bound to end

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at some point. Just like Horgan puts it, "science itself tells us that there are limits to our knowledge". I, for one, agrees with Horgan's thoughts about the finiteness of science, the seemingly artistic nature of mathematics, the possibilities of optical computing and the often premature celebrations of new discoveries. I personally find the future of technology and research unreachable from where I stand, as I both lack the deeper general knowledge of things to come in the scientific world. However, on the subject of fusion power I'm very hopeful for its research, development and possible, although probably minor, revolution. Aside from all that, I learned (or rather was reminded) to keep faith in science, but not to overindulge in it. I should posses an attitude of "hopeful skepticism.", as Horgan puts it.

Excellent

Walter Grönholm, 731 words (excluding title, 742 incl.)

Footnotes:

^1 Published on IEEE Computer, January 2004, pages 37-43
^2 Pages 39-40 of said article
^3 D.G. Stork, HAL's Legacy: 2001's Computer as Dream and Reality, MIT Press, 1997.

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