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Rise of the machines

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Artificial intelligence is hammering on the doors of the Radiology Department. Should we let it enter?

Photo: Jørgen Alexander Kamfjord

The dream of constructing artificial people was well described in Greek mythology, where Pandora (1) may well be the best known representation of a 'robot'. Most people are probably not giving it much thought, but the robots have already arrived – a long time ago – and they are generally benevolent. They do things I cannot be bothered doing myself, and the quality of their work is excellent. The dishwasher and the vacuum cleaner are the cornerstones of my happy marriage, because they effectively remove a source of problems associated with living together: clutter. They allow me to spend quality time with my family, and I am genuinely fond of my robots.

Lately, the robots have been taking on increasingly complex tasks, and many of them make use of technology that is covered by the umbrella term of artificial intelligence. Super-smart machines are everywhere: the search engine of my computer understands what I need to know (and buy), some sort of Babel fish on Skype enables me to talk to people from all over the world, and robotic cars are rushing around in the streets. It is almost as if the future has already arrived.

Intelligence is a concept which is difficult to define. It normally includes an ability to understand complex causal connections, learn from experience and make use of learnt information to solve problems. Artificial intelligence is computers with these qualities. The concept includes computer programs that are based on a wide range of symbolic and statistical approaches to learning and reasoning, and that are able to change their own architecture in order to solve tasks in an increasingly better way. In combination with increasing access to computational power and enormous health data sets, one methodology in particular – so-called deep learning (2) – will enable artificial intelligence to find its natural place in every part of the health services.

Radiology is the discipline that lends itself most easily to deep learning. The exceptionally fast technological development in medical imaging generates insane heaps of work for a group of professionals who will soon find it impossible to keep pace. Radiologists are increasingly tied to their computer screens to visually assess a growing flow of diagnostic images. The complexity and number of imaging methods available are growing, but multimodal image data are well suited for automated processing by systems that are based on deep learning and high performance computing. Artificial intelligence will be able to ease virtually every part of the radiology work-flow, from the reading of referrals from general practitioners to the compilation of structured reports, and everything that happens in between.

Witnessing image analysis conducted by well-trained algorithms is like witnessing pure magic. Many, however, suspect that this is black magic. Leading voices suggest that the lid of Pandora's box (1) is now ajar (3, 4), and that we should be considerably more cautious. Like all other technology, artificial intelligence can be used for good as well as evil. Just as quantum physics provided the seed for both the nuclear bomb and MR imaging, it is easy to envisage that artificial intelligence may lead to trouble. Therefore, the health service should – to a much larger degree than is currently the case – take a firm grip on developments to ensure that the robots know who is the boss, and that they are well trained for doing their job: to declutter.

When artificial intelligence is let into the Radiology Department, this will bring dramatic change, but it may well be that the department will be grateful for the robots' assistance. Artificial intelligence is the future, but may also enable us to turn back time to an era when radiologists were not only analytic machines, but were allowed to spend quality time with their patients.

The future appears to be closer than ever.

LITERATURE

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