Computers could revise past conclusions with AI

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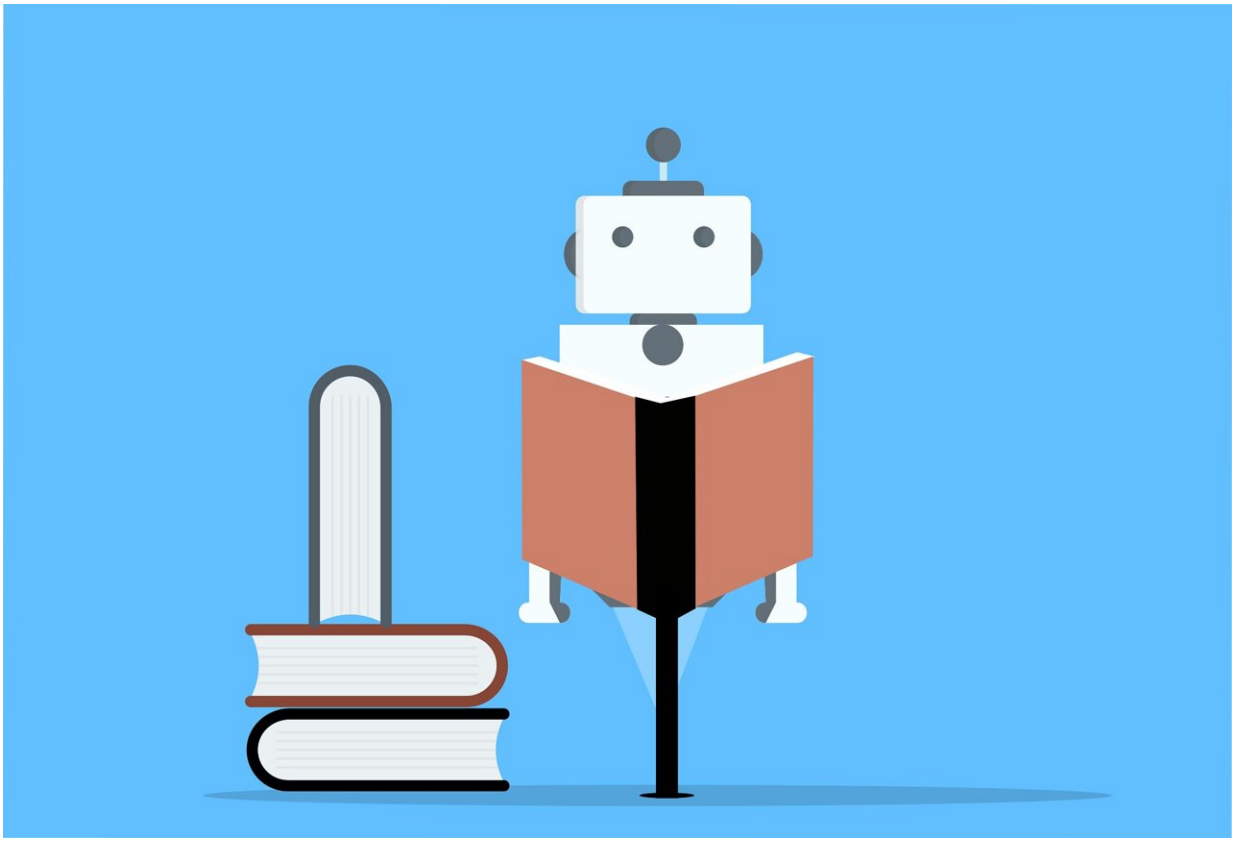

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To better automate reasoning, machines should ideally be able to systematically revise the view they have obtained about the world. Timotheus Kampik's dissertation work presents mathematical reasoning

approaches that strike a balance between retaining consistency with previously drawn conclusions and rejecting them in face of overwhelming new evidence.

When reasoning and when making decisions, humans are continuously revising what their view of the world is, by rejecting what they have previously considered true or desirable, and replacing it with an updated and ideally more useful perspective. Enabling machines to do so in a similar manner, but with logical precision, is a long-running line of artificial intelligence research.

In his dissertation, Timotheus advances this line of research by devising reasoning approaches that balance retaining previously drawn conclusions for the sake of ensuring consistency and revising them to accommodate new compelling evidence. To this end, he applies well-known mathematical principles from economic theory to formal argumentation, an approach to logic-based automated reasoning.

The devised approaches Timotheus Kampik has used allow a machine to revise, with mathematical precision, previously inferred conclusions only as much as necessary in face of overwhelming evidence and to remain consistent, otherwise.

"This allows machines to avoid being 'single minded' and stubborn, but also to abstain from 'zig-zagging around' in face of a continuous stream of new information that may mildly, but not compellingly, contradict previously drawn conclusions," says Timothy Kampik, Ph.D. student at the Department of Computing science at Umeå University.

While the contributions of the thesis are primarily theoretical, applied perspectives are provided, in particular in two joint works with a legal reasoning scholar and a telecommunications industry expert, respectively.

"When I started working on the problem, I was convinced my work is merely of intellectual relevance. I was surprised to meet scholars from other disciplines, as well as industry practitioners who found some of the ideas of my work sufficiently interesting to start collaborating with me. This may be an indication that our branch of artificial intelligence research is slowly moving towards large-scale applicability," says Timotheus Kampik.

More information: Principle-based Non-Monotonic Reasoning—From Humans to Machines.

Provided by Umea University