

Understanding the difference between 'human smart' and 'computer smart'

October 31 2013

A common assumption in the cognitive sciences is that thinking consists of following sets of rules (as it does in a computer). A recent research paper published in Elsevier journal *Cognition* argues that unlike digital computers, which are designed to follow rules, the computations performed by the neural networks that make up our brain are inherently context dependent.

People sometimes make seemingly strange mistakes like thinking that 798 is an odd number despite knowing how to identify odd and even numbers. Mistakes like this one can be dismissed as carelessness. The experiments described in this paper—that asked people to classify numbers, shapes, and people into simple categories like evens, triangles, and grandmothers—provide exhaustive evidence that such errors are actually endemic to human cognition, and are far more common than people imagine. The errors made in the various experiments were made by adults varying in age, level of formal education, and were observed in both American and Indian participants.

Author of the paper, Gary Lupyan Assistant Professor of Psychology, University of Wisconsin, USA, argues that the reason people mistake 798 to be an odd number is that—even though they know that only the last digit matters, they can't help but also process the other digits, which in this case are odd. This makes the whole number—798—seem "almost" odd, and to some people, actually odd. Such gradedness and context dependence demonstrates just how difficult it is for some people to following strict rules and definitions.

"This input-sensitivity is critical for obtaining the enormous behavioral flexibility that humans have, but may come at the cost to the ability to perform certain kinds of formal computations. More broadly, the results tell us that the metaphor of the brain as a digital [computer](#) running formal algorithms, is seriously misleading," explains Lupyan.

The question of why people make systematic errors on such seemingly simple problems is also highly relevant for education. Educators for a long time have been uninterested in understanding why children make certain errors, focussing only on bringing them to the right answer. However, although some errors may reflect confusion or inattention, a certain class of [errors](#), actually have a much deeper source and tell us something essential about the human brain.

"Although following simple rules is surprisingly difficult, some people excel at this, and as a society we have invented devices that are capable of blindingly fast and perfectly accurate formal computations (this is what computers were made to do, after all). So the real question we are left with is not why people sometimes mistake 798 for an odd number, but how people ever transcend these limitations, which appear to be inherent to how neurons compute," Lupyan concludes.

More information: Lupyan, G. The difficulties of executing simple algorithms: Why brains make mistakes computers don't, *Cognition*, 2013.

Provided by Elsevier

Citation: Understanding the difference between 'human smart' and 'computer smart' (2013, October 31) retrieved 5 May 2024 from <https://medicalxpress.com/news/2013-10-difference-human-smart.html>

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