

New book details the ‘artificial brain’ breakthrough that will make computers smarter

Computers might be smart, but they can’t learn new skills the way the human brain does. But a new book, *Higher Intelligence*, is challenging that conventional view and is set to revolutionise the world of computing.

The book, *Higher Intelligence*, tells the story of a 10-year, breakthrough R&D project to develop and prototype an ‘artificial brain’ chip that will help computers learn new skills to carry out tasks, rather than having to be programmed.

It is written by Perth-based computer expert Peter van der Made, The book is published by Vivid Publishing and is available as a printed book and as an e-book through Amazon and Barnes & Noble from the 7th of March.

“Producing a computer chip that can help computers learn for themselves is the key to the next generation of computers and artificial intelligence,” Mr van der Made says.

“Bill Gates said as much in 2004 when he told a class of engineering students: ‘If you invent a breakthrough in artificial intelligence so machines can learn, that is worth 10 Microsofts’.

“A year before he said those words, we had already started our quest to develop computer chips that can learn.

“In essence, we have now developed such a chip and made our prototype. The next stage for us will be to attract funding to get it to the market.”

Mr van der Made says the book details his decade-long quest to research and develop the artificial brain chip and the race by computing groups around the world to achieve something similar.

He says developing the artificial brain chip involved dumping the microprocessor concept for computing and instead studying how the human brain and nervous system operates.

“Current computers are great tools for number crunching, statistical analysis, or surfing the internet. But their usefulness is limited when it comes to artificial intelligence,” he says.

“The synthetic brain chip we have developed evolves through learning rather than being programmed. The fact that the human brain learns as it gathers and applies knowledge is one thing that has been overlooked in the development of past AI systems”

“This book presents a fresh look at the brain works, explains what intelligence really is beyond data, and gives an insight into future intelligent systems.

“With that knowledge, we can start building intelligent machines now, using technologies that are already available.”

To obtain a copy of *Higher Intelligence*, go to www.amazon.com or www.barnesandnoble.com

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Author biography:

Mr van der Made has some 40 years' experience in computing and has developed several computing innovations, as well as five patents.

A decade ago, he developed and patented the vCIS computer immune system which was sold to ISS (now IBM); and in 1982 he developed a high resolution graphics accelerator for PCs which was sold to Taiwan's First International Computers.

He is Chief Scientist with the computing R&D firm, vWISP, based in Technology Park, Western Australia.

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Author Q & A sheet

Q: What is Artificial Intelligence?

- a. Artificial Intelligence is a branch of computer science. Intelligence is the human ability to comprehend, adapt, and to learn from new experiences and to apply that knowledge to solve problems. Artificial Intelligence is the science behind machines that can do the same. Like C3PO in Star Wars. Practical Artificial Intelligence does not exist at this time.

Q: What do you mean; don't we have smart phones and intelligent cars?

- a. Attempts to re-invent intelligence has seen 70 years of failures, and an application of 'Intelligence' that is different from the understanding of human intelligence. The use of 'Intelligent' to describe an anti-skid mechanism in a car is misleading. An anti-skid mechanism does not learn or comprehend. It is not aware of anything. It just measures certain road conditions and follows a program to control the vehicle. It is a cause-and-effect machine. 'Smart' is another term that is being abused. Smart means to have a quick mental ability. Have you ever seen a phone with any mental abilities? Everything that contains a microprocessor is labeled 'smart' or intelligent which has anesthetized people to the real meaning of those words.

Q: Why is learning so important?

- a. Learning is the 'secret sauce' that makes the brain work. Without learning the brain is just a matrix of cells. The brain looks the same everywhere, from the visual cortex to the motor cortex and everywhere in between. What gives those cells different functions is the knowledge that is stored in them. That knowledge gets there primarily by learning. Only the most basic framework is defined in DNA. Jeff Hawkins described the prediction mechanism of the brain in his book 'On Intelligence'. Before this prediction mechanism can operate, the brain must learn. Neural columns need to be filled with knowledge before the chain reaction of predicting can take place.

Q: What are the advantages of real Artificial Intelligence?

- a. Over our lifetime we have seen that more and more processes are being automated. Machines that develop intelligence by learning are a paradigm shift in the level of automation that we'll see take place, and that means that we can compete with low labor cost countries in Asia. But the development of real A.I. has benefits beyond automation. Artificial brain chips can be used in prostheses so that artificial limbs can be controlled like natural limbs. They will be used in artificial cochlear and retina implants. The world is about to shift to a new reality

Q: How did you become interested in the brain and neuroscience?

- a. Every computer scientist who works in A.I. sooner or later wonders why the brain can do so many things that a computer program cannot do. I had this experience several times during my 40 year career, for instance while I was working on my computer immune system. We got a behavior pattern out of the analysis engine that would look obviously malicious to a human, but we had a difficult time getting the program to recognize it as malicious.

Q: In your book you describe how we can evolve an intelligent machine. What would an intelligent machine do that a computer cannot do now?

- a. As I said before, cognitive computing does not exist at this time. Cognitive meaning the mental process of perception, reasoning, learning and factual knowledge. The most important feature of an intelligent machine is that it learns from sensory input, and then applies what it has learned. An artificial brain that works by these principles is far superior to a computer. The Synthetic Brain evolves by learning. The matrix of nodes is the hardware layer and learning builds the 'knowledge' software layer on top of it. It a giant information carrier that learns at many levels, by feedback at the cellular level, at the column level and at the module level.

Q: And how do you envision that process to happen?

- a. Like many other things we start small, maybe with a single brain chip which learns to perform a simple task, like recognizing a shape, or a specific sound pattern. We then copy that learning model into a library. We do this for every task we develop. Soon the library will contain hundreds of such simple tasks. We combine those tasks by uploading them to larger brains that contain many chips. Here the separate tasks are woven together by leaning. Learning fills in the gaps and it never stops. On top of the uploaded knowledge more complex tasks are learned, which then again are copied into the library. This process continues to build machines of increasing complexity until we start to approach the intelligence of the human brain.

Q: Will intelligent machines take over the world?

- a. There has always been a fear of new technologies, and intelligent robots are no exception. We see that in Hollywood movies like Terminator and Robocop. If we follow the path that I outlined then we will gradually build up our knowledge along a defined growth path. There will be no sudden 'singularity' that is smarter than humans that wipes us all out. It will be a more gradual procession of dedicated machines of increasing intelligence. Dedicated machines that I'm thinking of here are things like an artificial cochlear, an artificial retina, artificial limbs and walkers that plug into the brain, vision based security devices, trainable toys and a

sniffing device that learns to recognize smells. Put all that together and you'll have the basics of a humanoid robot.

Q: By what year do you think we will have intelligent robots?

- a. Based on the results of tests with my learning prototype device, I'd say that we will be able to make our first synthetic brain chip by 2014. If we extrapolate the shrinking size of electronics over the last 40 years, I would expect to see a compact artificial brain with the intelligence of a human by 2050.

Q: What will happen when we have intelligent robots like C3PO? What will we do for a living when all the jobs are done by robots?

- a. Not all the jobs will be done by robots. Human creativity is not likely to be automated. So there will be jobs for engineers, artists, authors, musicians, scientists, dancers, circus performers and a heap of other creative tasks. We will all enjoy a bit more free time; time to spend on going to a concert, or to the circus, just to enjoy ourselves while the machines work. People like factory workers, delivery men, bus and taxi drivers, maintenance workers, kitchen hands, and dog walkers will have to look elsewhere for employment. That is not necessarily a bad thing. We need to look at other ways of wealth distribution than the 40-hour work week. Maybe ownership is a solution – everyone 'owns' a share in the robotic factories and shares in the profits.

Q: What about ethics, how will society react to these changes?

- a. There will be some upheaval. Changes always have caused problems but once they are solved people are generally better off, when more wealth is generated and distributed to the population. Look at the computer revolution of recent years. We could not go back to a manual society now without causing a serious drop in productivity and living standards. Robots will be protected under property law. Any other rights will diminish their usefulness. The famous three laws of Asimov are nonsense. We can only indoctrinate a humanoid robot not to harm a human being. Without programming we cannot put such absolute controls in place and programmed machines will never be more than cause-and-effect machines.

Q: Will the military be using this technology to build killer bots?

- a. As with any new technology, it can be used for good or for evil. The military will definitely be using robotic technology. They are doing it now with programmed Unmanned Aerial Vehicles (Drones) that fly over enemy territory and kill people. Those things are inaccurate and cause an excess of collateral damage and civilian suffering. We could build a better drone that targets only specific terrorists and presents less of a risk to the population at large