Interview with Peter Van Der Made, Founder and CTO at BrainChip

By Jagan G. M. / Updated October 30, 2023

When we converse with a profound adept person, we get deep into the context and appreciate the dynamics they touch for each of our questions. My interview with Mr. Peter Van Der Made (CTO & Founder of BrainChip) gave me intense satisfaction with what I'm doing. Read the complete article to understand and appreciate how Brainchip is actually into AI and other latest technologies.

This interview is part of the AI & IoT Interview Series.

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Projecting a scenario in front of you: a police department looking for a suspect in the live video stream. They don't have thousands of images of that suspect, nor does it have weeks to train a traditional neural network system. Through the deep learning networks, how do you situate this problem?

BrainChip has the ideal solution for this problem. Our older product is BrainChip Studio. This is a complete suite of tools, engineered for this very purpose and aimed at police departments. Brainchip Studio can perform 'one-shot learning' – it learns to recognize an individual from just one image and can then find that individual rapidly in massive amounts of video or live streams. BrainChip Studio was created to find specific objects or individuals. Brainchip Studio runs on a PC/ Windows 10 platform and uses a BrainChip PCIe insert board called the 'Accelerator'.

A similar system, but in significantly lower power consumption, could be built around the Akida chip within a camera. Akida goes further than that; it can be trained either in the traditional way through Machine Learning, and it can also learn on-chip through either one-shot or few-shot learning. Combinations of those two methods can be used within the same chip, creating endless possibilities for learning to recognize specific individuals or generalize and recognize many different people or objects, with incremental learning after training. The Akida technology has for instance been used to classify all 1000 categories of ImageNet. Akida runs very fast and needs very little electrical energy. It can be powered by a small battery.

With each day, a new threat gets induced in an organization network & these threats/malware are gaining great immunity to the current strong cybersecurity policies been followed. How do you elevate your technology to address these future potential risks?

The Akida chip technology is great at rapid learning of threat patterns in data streams. At the moment these patterns are learned through Deep Learning, which is expensive and slow. The rapid learning method of Akida shines in these applications; we trained the Akida technology on the challenging and large 220 Gb CSE-IDS-2018 cyber-security dataset in just 2.2 hours, and it learned to recognize all 15 attack types. With these rapid learning capabilities it is quick and easy to add new threat patterns by simply retraining the chip on a new dataset. We shuffled the dataset and used half of it for verification, resulting in a 98% detection rate. We could process 30,000 frames per second at just 20 milliwatts. We are investigating how we can use Akida's on-chip rapid learning method to add new threat patterns on the fly using incremental learning.

What animal are you the most like? What caption would you like to give for your biography book?

I do not identify with any animal. I grew up in a semi-agricultural setting where animals were not pets. They were either slaughtered for food or they were working animals. Our human bodies may be of the same general design as animals, but our brains are vastly different. If you were to take a monkey brain and scale it up three times to human size, you would not finish up with a human brain. It is the structure of our brain that makes us different from animals. Same neural cells, same synapses and glial cells, but a different construction. To make a comparison, you can build either a cathedral or a doghouse from the same bricks, but if you scale up the dog house to the size of a cathedral you just finish up with a very large dog house, and not a cathedral. It is the same with the brain.

"AI to create an AI" how do you emphasize this statement from the perspective of human intelligence associated with it.

Current AI is not intelligent. Deep Learning systems don't learn, they are trained using a sequential optimizing routine that feeds back errors and corrects weights, not unlike successive approximation routines; it makes a guess, checks the error, and correct the guess by half of what the error was until the output value and the guessed value converge. Convolutional Neural Networks are computational constructs that have very little in common with the way the brain works.

In the brain, time is of the essence. Information is encoded in the timing of 'spikes' – short bursts of electrical energy that are sent between neural cells. The interval between spikes, the intensity of spikes and location where spikes occur all contain information. Synapses store information that is released by incoming spikes. The information stored in synapses is constantly updated. Learning is a function of the timing of spikes. The brain is a very dynamic system that is changing all the time. Intelligence is shaped by its environment through constant learning.

As I stated earlier, the brain has a very defined structure, which varies in different brain regions. The brain is not one homogeneous mass of neural cells. We have a right and left hemisphere, which look much the same. But we also have a cerebellum and a hippocampus, the limbic system and other brain regions each with their own structure specific to their function. Even insect brains are far more structured and intricate than our current neural networks. Brains predict the next action before sensory stimuli arrive. None of that is present in today's neural networks. To say that today's neural networks exhibit the intelligence of a honeybee is a blatant exaggeration.

The BrainChip Akida technology is using a brain-inspired spiking neural network to perform inference. It can do all the things that today's convolutional neural networks can do, but it can also run completely native spiking neural networks that resemble the learning method and processing method of the brain. For instance, to perform cyber-security threat recognition and incremental learning. Future versions of the Akida technology will incorporate more of the structure of the brain, with the aim to make AI more intelligent. This is no threat to human intelligence. With our 86 billion neural cells, 100 trillion synapses and 300 billion glial cells we are way ahead of any intelligent AI for some foreseeable future. By comparison, the largest AI networks today are up to a few million neuron equivalents and miss all of the structure that makes the brain intelligent.

To sustain the market's hunger, it is very essential for any technology organization to excel in innovation & initiatives. How BrainChip is bracing up for this?

BrainChip's aim, from inception, has always been to create better AI. We don't follow the general trend in the market with their massive parallel multipliers, and up to 200 layers that are promoted as AI chips. We defined our event-based Spiking Neural Network technology before 2008, when we filed our first patent. We have accomplished everything that Deep Learning has to offer, using a very different philosophy, a philosophy that has a clear path to the future. Where standard CNN technology runs into a brick wall when they try to go beyond image classification, our event-based Spiking NN excels.

Our philosophy is based on copying the function and structure of the brain, and to apply that technology to solve today's problems. That is why Akida can be used to process, after a simple conversion process, today's Deep Learning based CNNs, as well as going forward from that point to do incremental learning and on-chip training. This has many advantages, beyond incremental learning. Akida can learn from the environment in which it exists, an ability that we will expand in future generations of Akida with episodic memory, that is to remember sequences of events. An example of sequence memory is when you retrace your steps to find your car in a busy parking lot. Sequence memory has real-world applications in text and speech interpretation and robotics.

It can also process large amounts of video or data at an extremely low power consumption, which is good for the environment. It was stated that training one Deep Learning CNN uses enough power to run five electric cars for a lifetime. With Akida, that power requirement is reduced to the power needed to run a flashlight. Event-based processing is a 'green' technology.

AI Time Journal would like to congratulate Brainchip for being awarded the patent on "AI Dynamic Neural Network". Can you provide us some insights on it and the challenges you find in placing this as a market product?

This is a supporting patent from our first patent "Autonomous learning dynamic artificial neural computing device and brain-inspired system", which describes the event-based spike processing method used in all BrainChip products. This second patent describes a way that information can be shared between two or more Akida devices. For instance, when an Akida chip is used in a car and it learns something new, it would be beneficial if it could share that knowledge with all other Akida devices used in similar functions in other cars. It may learn about a new object to avoid, or a better optimization. Through a library, which may exist in the cloud, it can share this information with other devices. This is a product enhancement, rather than a stand-alone product.

Fun with the thoughts: If you were to time travel to 1938, how would you use your technology to stop world war-2?

Preventing WW2 (or any future war) is not a matter of technology, it is a matter of public opinion. Hitler was not the only bad guy at the time, there was a whole organization behind him, as well as much of the public. Journalism is a tool, that like any other tool can be used or abused. The nazis clearly abused it as much as they could, murdering anyone who did not agree with their thinking and controlling the media. In any war, which I believe is a form of mass insanity, politicians shape public opinion through propaganda.

One thing that politicians have not fully realized yet is that future wars will not be fought primarily with bombs and guns, but with AI. The nation with the best AI strategy will win. They will be able to use autonomous search and destroy vehicles, infiltrate and disrupt the enemy's computer systems by invasive AI bots, disrupting their manufacturing abilities and food distribution systems, and create a chaos in traffic management and energy generating plants. Various forms of AI, both programmed and hardware based, will be used to defeat an enemy without ever firing a shot. The writing is already on the wall.

Which famous technology celebrities would you award these titles and why?

1 Five Star Honors (Excellence in Performance)

Our engineering team at BrainChip, who have worked vigorously over the last 7 months to create the Akida chip design from our research prototype.

2 Perfect Presence (On-Time)

The Akida chip. Entering the market at a time when the first edge AI products are being designed, needing high performance, at low power consumption. The right technology at the right time and the right price.

3 Cheers (Best team efforts)

For the entire BrainChip team, in France, USA, Australia and India for a great team effort across four continents, yet in perfect harmony, working 24 hours a day through different time zones.

4 Highest of High Fives (Excellence in Innovation, Initiatives)

To the many researchers and scientists at universities and institutions who have contributed to the Akida technology, either through direct involvement, or through published papers, online education and lectures.

About The Author

Jagan G. M.

I strongly believe that People with great passion can make the impossible happen. With interest in technology, I clutch the role of Technology Business Manager in the IT Industry, and additional roles such as Executive Magazine Coordinator, Corporate Event Organizer, CXO & Technocrats Interview.

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