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Question ?	Answer !
writer	Jatin
Editor	Ashita
Status	Review Complete
Plagiarism	Low 7% [Report link](./plag_reports/plag_neuromorphic_computing.pdf)
Content	NeuroMorphics, Intel chip at CES
Verdict	Good Candidate.

Neuromorphic Computing

Humans are the smartest species and we soon realized that evolution is a far better inventor than us, and natural selection has highlighted the best of its inventions. So, we started mimicking the nature around us.

Biomimicry
A lot of our inventions are inspired by nature.
Classics such as the echolocation used by sonars or the velcro in your laptop bag. Or the recent ones like, the earthquake-resistant water cube architecture at the Beijing Olympics, the Burj Khalifa which is inspired by a desert flower, or the 50-foot-long kingfisher beak of the bullet train.
The applications of Biomimicry are endless. But is that all we can learn from nature?

Neuromorphics
Let's mimic the brain. Because, why not?
A Brain smart enough to know its own existence is definitely one of the most powerful creations of evolution. It's been a fantasy for long enough to upload the brain onto a computer. Except for this time, we managed to do it.
In December 2017, Scientists completed the brain mapping of an earthworm known as C. elegans. They built a Connectom which is a software program with all of worm's 1000 cells, 302 neurons as well as their functions completely mapped.
They basically built a digital brain of the earthworm, then uploaded it to a robot, left it in a small to see what happens next.

Now comes the interesting part. The robot mimicked the behavior of the earthworm, navigated the room, turned back when it saw a wall, and so.
But you may say what's new in this, we have had robots capable of navigation and avoiding walls for a long time. How is this different?
The difference is, we didn't program it to avoid walls; we didn't program it to navigate the room. All we did was digitalize the worm's brain. All of this was actually done by the digital brain itself and this was all just software with a few sensors.

Neuromorphic Computing
The new age Artificial intelligence algorithm are greatly based on imitating the brain structure. Google's famous image classification algorithm also use a sophisticated network of artificial neurons. But there's a major problem.
Our traditional hardware was not made to handle brain like algorithms. These new algorithms required much more power and efficiency than that provided by our classic hardware.

> “There must be a better way to do this because nature has figured out a better way to do this,” - Michael Schneider, physicist, NIST.

Interestingly, this year at CES, Intel showcased its research in neuromorphic computing. The Tech Giant launched a first of its kind neuromorphic chip code-named as Loihi, which uses an asynchronous Spiking Neural Network. The chip is based on a new computing paradigm inspired by how neurons work in a human brain and scrape off the traditional computing architecture consisting of CPU and memory. This chip gets self trained over time unlike classic machine learning models which need huge data for training.

Neuromorphic computing treats data in an analog fashion. Instead of sending information as zeroes and ones, we send information as an analog signal.
Each signal can have varied intensity, and thus have more than two values. As a result more information can be sent with same effort. This greatly reduces the amount of power needed by neuromorphic computing systems. The chip is said to be 1000 times more energy efficient than the traditional silicon based chips. The chip serves as hardware counterpart to the Deep Neural Networks and is meant to make computations faster.

The difference between classical systems and neuromorphic ones is just analogous to the difference between a Morse coded message and speech. The former encodes data using just dots, and dashes, making meanings easy to understand but the message is lengthy to communicate. Speech, however, can be difficult to interpret but each individual utterance holds much more data. Thus, the latter is very efficient.

Thus, Neuromorphic Computing is the new power wave in the field of Artificial Intelligence and it can probably compute faster than the human brain.