Unveiling the Future of AI
BINNs-Biologically Inspired Neural Networks

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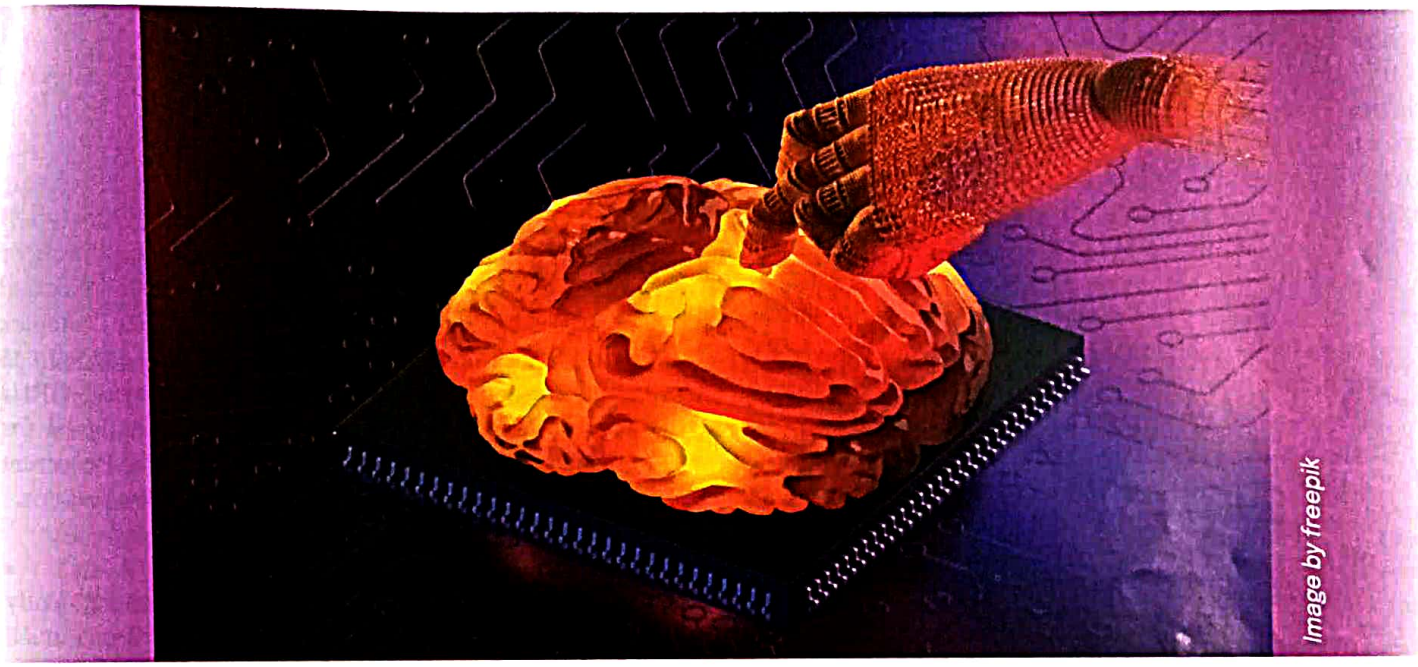

BIOLOGICALLY Inspired Neural Networks (BINNs) are a subset of artificial neural networks which derive inspiration from biological systems. There are several kinds of BINNs, as given below:

- **Spiking Neural Networks (SNNs):** they derive inspiration from the behaviour of biological neurons, in which spikes or action potentials are used to transmit information. SNNs are used in neuroscience research to simulate biological neural activity. Our brains are complex, with many neurons and synapses connecting them. Traditional Artificial Neural Networks use continuous values for computation; in contrast, BINNs, like neurons, use discrete electrical impulses and spikes for transmitting information.

In ANNs (Artificial Neural Networks), continuous processing of input signals takes place. By contrast, in SNN, event-driven processing takes place — each neuron accumulates input signals over time and generates an output spike after a certain threshold. Tasks like pattern recognition and synchronisation are relatively challenging for traditional ANNs. The precise timing of spikes is important for tasks mentioned above (such as pattern recognition and synchronisation). In SNNs, the precise timing of spikes encodes information, thus making SNNS more suitable for these tasks. In SNNs, the strength of synapses (connections) between neurons can change based on the timing of spikes, which allows them to adapt and learn from the external environment. This is termed as Spike-Time-Dependent Plasticity (STDP).

Applications of SNNs

- ***Neuromorphic Hardware:*** is specialised hardware designed to mimic the brain's structure and function. SNNs, closely related to neuron structure and arrangement, are of tremendous use in IoT devices, autonomous vehicles, robotics, and neuromorphic hardware. The SNNs provide ultra-efficient-low power processing.
- ***Sensory Processing:*** the tasks that involve sensory data processing, such as speech, recognition, image and video analysis and sensor fusion, can effectively be handled by SNNs as they efficiently handle sensory data processing by leveraging the temporal aspect of spikes.
- ***Brain-Computer Interfaces (BCIs):*** allow efficient communication between humans and machines and have been used in persons with motor disabilities. The BCIs enable these persons to control devices directly with their thoughts. SNNs have found significant applications in BCIs.
- ***Cognitive Computing Sytems:*** are capable of reasoning, learning and problem solving and try to replicate human-