Brain-inspired low-energy processors for edge computing

Moving towards a world in which billions of devices are connected to the internet, centralized processing becomes an ever-growing challenge. By mimicking the dynamics and plasticity of the brain, we enable energy-efficient edge processing at unprecedented speed, thereby decreasing costs and increasing privacy.

Keywords
- Edge computing
- Signal processing
- Neuromorphic computing
- Mixed-signal computing

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Reference

Background
By the end of this decade tens of billions of devices will be connected to the internet. This truly global connectivity offers a wealth of business opportunities, from predictive maintenance, over optimization of transport systems to consumer applications such as health monitoring. However, this transition comes with significant challenges, both technical and societal: Processing the resulting deluge of data demands enormous bandwidth, memory, computing power, and energy, while the centralized storage of potentially sensitive information poses severe privacy risks. Recognizing these challenges, significant effort is spent both in academia and industry on transferring established methods such as deep learning to edge devices based on traditional computer architectures.

Invention
The invention recognizes that traditional computer architectures are not well suited to process raw sensory data which is often noisy, and sparse in space and time. Taking inspiration from the arguably most powerful known computing system, the mammalian brain, we developed a novel method for efficiently extracting information from raw sensory data. Since the brain is a physical system, the underlying principles are most suitable for implementation in custom silicon. Furthermore, our approach tightly integrates both processing and learning, creating the possibility of self-optimizing edge-processing devices.

Applications
- Edge computing
- Wearables

Patent status

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