UNIVERSITÄT BERN

unitectra
Technology Transfer of the Universities of Basel, Bern and Zurich

Technology Opportunity, Ref. No. UB-23/176

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

Inventors M.A. Petrovici, W. Senn, J. Jordan, P. Haider, B. Ellenberger, L. Kriener

Reference Haider, P., Ellenberger, B., Kriener, L., Jordan, J., Senn, W., & Petrovici, M. A. (2021). Latent equilibrium: A unified learning theory for arbitrarily fast computation with arbitrarily slow neurons. Advances in Neural Information Processing Systems, 34, 17839-17851.

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 International Patent Application WO 2023/046504

Contact Unitectra, Technology Transfer University Bern, Dr. Martin Binggeli, Hochschulstrasse 6, CH-3012 Bern, +41 (0)31 681 3231, mail@unitectra.ch