

## **Neuromorphic Chip Market - Growth, Trends, Covid-19 Impact, and Forecasts (2023 - 2028)**

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### **Report description:**

The neuromorphic chip market is expected to register a CAGR of 46.2% over the forecast period. Keeping pace with disruptive technologies, such as Artificial Intelligence (AI) and Machine Learning (ML), various embedded system providers are keen to develop brain chips, which not only be processed fast but will also have responses like human brains for those systems to think and act humanly.

#### Key Highlights

Neuromorphic is a specific brain-inspired ASIC that implements the Spiked Neural Networks (SNNs). It has an object to reach the massively parallel brain processing ability in tens of watts on average. The memory and the processing units are in single abstraction (in-memory computing). This leads to the advantage of dynamic, self-programmable behavior in complex environments.

Companies, such as BrainChip Holdings Ltd, are forming multiple partnership activities to utilize neuromorphic chips in curbing the spread of COVID-19. BrainChip Holdings Ltd partnered with precision immunology company Biotome Pty Ltd during the pandemic to develop a fast, accurate COVID-19 antibody test. The companies will explore how the Akida neural processor could improve the accuracy and information quality of the antibody tests while Biotome is developing by providing advanced AI capacity at the point of care.

Neuromorphic chips can be designed digitally, analog, or in a mixed way. Analog chips resemble the characteristics of the biological properties of neural networks better than digital ones. In the analog architecture, few transistors are used for emulating the differential equations of neurons. Therefore, theoretically, they consume lesser energy than digital neuromorphic chips. Besides, they can extend the processing beyond its allocated time slot. Thanks to this feature, the speed can be accelerated to process faster than in real-time. However, the analog architecture leads to higher noise, which lowers the precision. Digital ones, on the other hand, are more precise compared to analog chips. Their digital structure enhances on-chip

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programming. This flexibility allows artificial intelligent researchers to accurately implement various kinds of an algorithm with low-energy consumption compared to GPUs. Mixed chips try to combine the advantages of analog chips, i.e., lesser energy consumption, and the benefits of digital ones, i.e., precision.

Neuromorphic architectures address challenges such as high-power consumption, low speed, and other efficiency-related bottlenecks prevalent in von Neumann's architecture. Unlike the traditional von Neumann architecture with sudden highs and lows in binary encoding, neuromorphic chips provide a continuous analog transition in the form of spiking signals. Neuromorphic architectures integrate storage and processing, eliminating the bus bottleneck connecting the CPU and memory.

## Neuromorphic Chip Market Trends

### Automotive is the Fastest Growing Industry to Adapt Neuromorphic Chip

The automotive industry is one of the fastest-growing industries for neuromorphic chips. All the premium car manufacturers are investing heavily to achieve Level 5 of Vehicle Autonomy, which is anticipated to generate massive demand for AI-powered neuromorphic chips.

The autonomous driving market requires constant improvement in AI algorithms for high throughput with low power requirements. Neuromorphic chips are ideal for classification tasks and could be utilized for several scenarios in autonomous driving. Compared with static deep learning solutions, they are also more efficient in a noisy environment, such as self-driving vehicles.

According to Intel, four terabytes is the estimated amount of data that an autonomous car may generate through almost an hour and a half of driving or the amount of time a general person spends in their car each day. Autonomous vehicles face a significant challenge in efficiently managing all the data generated during these trips.

The computers running the latest self-driving cars are effectively small supercomputers. The companies such as Nvidia aim to achieve Level 5 autonomous driving in 2022, delivering 200TOPS (trillions of operations per second) using 750W of power. However, spending 750W an hour on processing is poised to have a noticeable impact on the driving range of electric vehicles. ADAS (Advanced Driver Assistance System) applications include image learning and recognition functions among various automotive applications of neuromorphic chips. It works like conventional ADAS functions, such as cruise control or intelligent speed assist system in passenger cars. It can control vehicle speed by recognizing the traffic information marked on roads, such as crosswalks, school zone, road-bump, and so on.

### North America is Expected to Hold Major Share over the Forecast Period

North America is home to major market vendors, such as Intel Corporation and IBM Corporation. The market for neuromorphic chips is growing in the region due to government initiatives, investment activities, and others. Recently, the US Department of Energy's Office of Science awarded a team led by Oak Ridge National Laboratory with USD 6 million to design an energy-efficient chip to pursue improved neural networks. The initiative by DOE supports the development of hardware and software for brain-inspired neuromorphic computing.

The miniaturization of neuromorphic chips that help in different applications contributes to the market's growth. For instance, in April 2022, Rain Neuromorphics, a startup dealing with analog AI chips headquartered in the United States, raised USD 25 million in a Series A funding round. The company aims to leverage the funds for its product development of AI chips.

Furthermore, emerging interest from venture capitalists, coupled with continuous funding from the region's governments, is driving the market's growth. Recently, Canadian startup Tenstorrent announced that it raised USD 200 million and achieved unicorn status. The company delivered its AI chip for real-world applications in the first half of 2022.

Further, the miniaturization of neuromorphic chips that help in different applications contributes to the market's growth. Such

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chips can be utilized in small and portable AI devices. For instance, in March 2022, Google and UC Berkeley academics announced that the researchers had developed a deep-learning approach called PRIME that generates AI chip architectures by drawing from existing blueprints and performance figures.

The penetration of neural-based chipsets in commercialized applications is also propelling the growth of the market. For instance, Intel recently introduced its next-generation neuromorphic processor, Loihi. Loihi is a research-focused product offering significant improvements over its predecessor in performance, programmability, deep learning capabilities, and energy efficiency. As companies based in the region continue to expand the capabilities of their existing products, the region is anticipated to witness new avenues of growth in the market studied.

### Neuromorphic Chip Market Competitor Analysis

As the market for neuromorphic chips is very niche and in the initial phase of development, the market has a few players, such as BrainChip Holdings Ltd, Intel Corporation, SynSense AG, among others. Top players are growing intensely in this consolidated market scenario through various market development strategies, such as collaboration, market expansion, product innovation, and R&D activities. Hence the market concentration is medium.

In April 2022, Accenture and the Indian Institute of Science (IISc) Bengaluru partnered to conduct cloud continuum and neuromorphic computing research and development (R&D) at the Accenture Centre for Advanced Computing in India. Accenture and IISc are to collaborate on research projects and develop intellectual properties and next-generation computing technologies that enable AI at the edge, such as cloud, quantum, edge, and neuromorphic computing, as well as sustainable software engineering.

In March 2022, Brainchip, a company involved in the commercial production of ultra-low power neuromorphic AI chips and IP, announced that it has SalesLink, a European technology solutions provider, to optimize local market sales throughout the region to expand the commercial reach of its Akida neuromorphic computing platform.

### Additional Benefits:

The market estimate (ME) sheet in Excel format  
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