Neuromorphic.io

Whitepaper

World's first Blockchain-based
Neuromorphic Computing Technology

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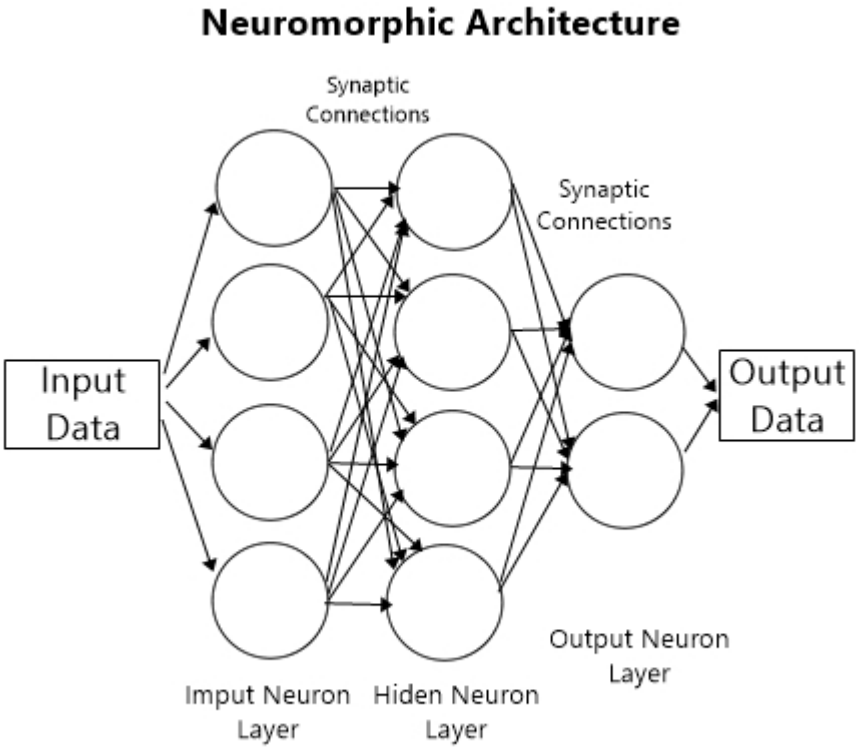
Agenda

1. Introduction of Neuromorphic Technology

The technological developments of the past years have shown us that the future will be shaped by artificial intelligence and it is obvious that the main driver called neuromorphic computing. Neuromorphic engineering has their focus on neuromorphic computers that are designed based on the model of the human brain, with the functionality of human neurons being modeled. The aim of Neuromorphic Technology is to simulate sensory organs, such as the retina of the eye, the inner ear or parts of the brain.

In the long term, these computers should make decisions or even be able to be integrated into the human nervous system. This new technology will receive a lot of attention in the future, especially in industry. As an autonomous robot, in the field of autonomous driving or sensor technology.



Source: Neuromorphic.io

In the future, cognitive computers will be developed that can analyze complex data and make predictions based on the knowledge they have learned. Central to this are neuromorphic chips, i.e. microchips that are manufactured based on human nerve networks. These chips are also intended to map human senses. The chips are supported with specific hardware that can absorb smells or noises. The chips differ from the current technology in that they are more energy efficient and require less space. The aim of the future research will be to set up a large neuromorphic system with particularly pronounced learning skills, which are developed in interdisciplinary collaboration with theoretical neuroscientists. Neuromorphic computing creates numerous new business models and opportunities to shape the future.

2. Introduction of Blockchain Technology

The blockchain is a so-called "distributed ledger" technology. Literally the term can be translated as "distributed account book", basically describes it a public, decentralized database, which is accessible via a Network is shared by different participants and in which all participants have their own copy of the ledger. Such networks, in which each participant has the entire database, are referred to as peer-to-peer networks.

In the P2P network, all participants (nodes) have the same rights and can access the same information and add information to the ledger. A single participant cannot decide whether and which entries are added to the ledger, instead a consensus process is used in which most of the Participant verified the entry. Centralized systems provide the counterpart to the distributed ledger system a central copy of a database. In such a "traditional"

system, only the owner of the ledger has access to the data and only he can add or change information.

There are multiple gradations between centralized and decentralized systems. Three key questions are relevant for their classification:

- Who decides about a copy of the ledger?
- Who can access the information contained in the ledger?
- And who can add or edit information to the ledger?

Traditional centralized systems only have a copy of the ledger that can only be edited by the owner. The system can do this be designed so that only the owner has access to the data, or that a group or an unlimited number of people has access to the information. All data are stored on a central server and the users who access this data trust that the data is correct. Most of the Internet and the current IT structure is based on this client-server model.

3. Advantages of Blockchain

Other blockchain platforms can certainly be designed differently compared to Bitcoin, for example regarding the network type or the consensus mechanism used and the encryption of data. The functionality of the blockchain shown remains in the but the core is always the same: data and information are encrypted, too Blocks summarized, validated and added to the ledger. It refers each data block onto the preceding block, creating a block chain. Other essential features that a blockchain usually are:

- Digital distribution of the blockchain on multiple computers: In a decentralized system, digital copies of the entire blockchain are stored on the computers the network participant is saved.

- Consensus models: The blockchain uses many participants in the network to participate in the validate data integrity and reach consensus what data is added to the chain.
- Blockchains use cryptography and digital signatures to create identities determine to track transactions while keeping them safe and secure not to make it visible to everyone.
- Blockchains have mechanisms to make it as difficult as possible for attackers to manipulate existing data (e.g. proof-of-work concepts).
- Blockchains have a time stamp: Due to the singular arrangement of the data in blocks, it can be seen and documented at any time when which data was registered in the blockchain - a subsequent change of the timestamp is not possible.
- Blockchains are programmable: Instructions can be embedded in the blocks that lead to corresponding actions if certain criteria are met, as well as further data on transactions contain.

4. Global Technological Development

The digital transformation is changing the way how companies create value. The rapid technological progress enables digital networking objects like machines, tools or products. A large part entrepreneurial added value has relocated to the network itself, where sensors, software and processors generate, exchange and use data. The shift in value starts from the hardware to software - the latter can be a make the product “intelligent” and therefore more valuable. So, it is possible to use the entire product life cycle to offer services.

These services are often already economically more interesting than selling a product itself. The main reasons are that they are currently the core

element of the new business models and master the interface to the customer and always take one more of the value added. Learning algorithms win at the data evaluation is becoming increasingly important. With steadily growing amounts of data, increased computing power and flexible IT architecture like deep neural networks can big data using artificial methods Intelligence turned into smart data become.

After decades of research AI is increasingly used in of the economy and is constantly evolving further to a key technology. The applications are numerous, be it in the diagnosis of diseases, in the collaboration between human and machine in the factory, as sales assistant in the shop or on the Internet, in public administration or at automated or autonomous driving. AI is the next level of digitization. It exacerbates, strengthens and accelerates the already known advantages of these development: increased efficiency, process acceleration, cost savings, improvement of customer relationships and opening new business opportunities.

5. Problems and necessary Developments

The future is the development of the “spirit in the machine”. Neuromorphic computing is the type of data processing we need on the way to real intelligence. As explained in the previous explanations is this an approach that is not based on the concepts of classic computers. Rather, networked information processing in the human brain is the godfather, in which a multitude of identical units (neurons) are connected to each other (synapses) and work together collectively. This is how decisions should be made dynamically. Each unit carries out its calculations based on the output of many other units connected to it and generates its own output from it, which in turn is processed by others. In this way, autonomous artificial

intelligence is created, in which the result cannot be predicted from the information entered. The decision-making process would then no longer be a rule-based system.

In this context, questions arise as to who takes responsibility for the decision of such technologies. Who takes responsibility when machines make decisions? When neuromorphic computing comes to different results than human beings, it is often not clear how it comes about. Then one speaks of a black box. Sometimes this is wanted, for example when commercial providers fear imitators. Sometimes the black box is a result of complexity. Especially in deep learning, the models are often so complex that even experts can no longer understand how the machine came to be. A black box is not acceptable for important decisions. An important step in building trust in artificial intelligence is to explain how the machine gets its results. Neuromorphic computing takes a different approach: computers should become more powerful through different wiring. So far, most computers have been designed in accordance with the Princeton architecture: the processor and memory are separated from one another and exchange data with one another via a data bus. By contrast, memory and processor are combined in neuromorphic computing. The model is the wiring of the nerve cells in the brain. The developers expect the changed architecture, e.g. machine learning with a fraction of the amount of data required today and lower energy consumption. Neuromorphic computing is not to be confused with artificial neural networks. Artificial neural networks use software to simulate the behavior of nerve cells on classically built computers. Neuromorphic computing is about building computers differently, i.e. the hardware.

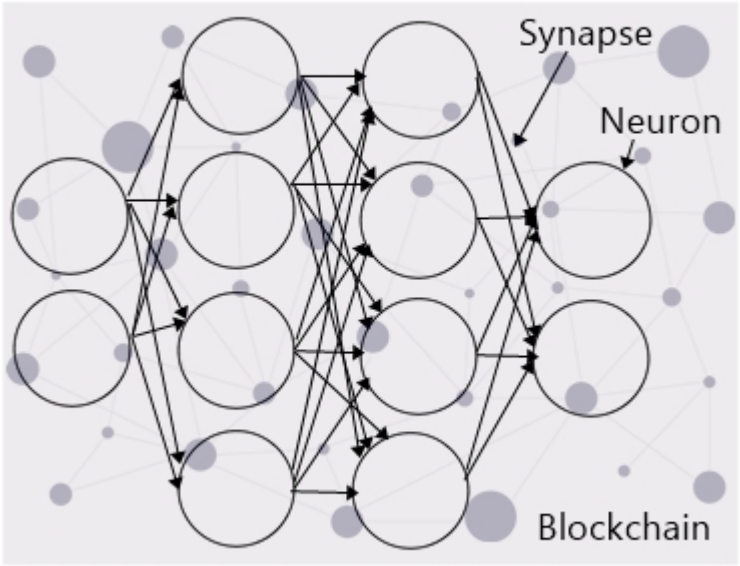
6. The Neuromorphic.io Solutions

6.1. Blockchain-based Neuromorphic Computing

Classical computer architecture has proven itself over decades. When it comes to machines learning human characteristics, however, it is disadvantageous. Classic computers process commands one after the other, and they must transport the data from memory to the processor and back. That is very inefficient and leads to enormous computing effort in machine learning. Neuromorphic computers will help to solve these issues.

Our research wants to transfer the advantages nature has to learning into complex artificial neural systems. That's why our goal is to develop a chip, that is modeled on the structure of the human brain. It will include electronic synapses and neurons that process and store information at the same time. Though this, we plan to develop marketable in energy efficiency and hardware costs.

Blockchain-based Neuromorphic Architecture



Source: Neuromorphic.io

From a technical point of view, neuromorphic computing in combination with deep learning can mimic the perception tasks of the human brain such as image or speech recognition. But other tasks, such as understanding conversations or causal relationships, are not fulfilled. To create more powerful and intelligent machines, often colloquially referred to as artificial general intelligence, deep learning must be combined with neuromorphic technology. If an AI system doesn't really understand its tasks or the world around it, this can also lead to dangerous consequences. Even the smallest unexpected changes in the environment of a system can cause it to go wrong. Neuromorphic computing systems are logically analogous to neurons, but there are still problems with the definition of trust-building processes and a lack of trust what should not be underestimated.

For this reason, it is necessary to develop a trust-based technological extension. A neuromorphic system based on blockchain technology can create a solid basis for trustworthy processes. As part of our specific research approaches, we will establish blockchain technology as the basis for new neuromorphic computing systems.

Artificial intelligence processes based on powerful neuromorphic computing systems will be hungry for a huge amount of data. Only If it’s possible to properly assign, evaluate and process this huge amount of data in this case, it can result in a well-functioning AI. Our blockchain-based neuromorphic computing systems will enable the comprehensible processing of this immense amount of data and will represent an indispensable development for future technologies.

6.2. B2B-Marketplace DApp

There is no doubt that neuromorphic computing is a disruptive technology that will give nations and all their components the foundation for the future. Until now, it was primarily universities that were interested in the neuromorphic chips. But there is a movement in the market, that large players are becoming more interested in this technology. Future potential is now coming on board like many Fortune Global 500 companies.

In view of this development, it becomes clear that a decentralized interface between research institutes and companies is required. Our future development efforts will include the transformation concepts for intelligent, systemic integration and networking technical Infrastructures for neuromorphic engineering and computing. Our developments will lead to a decentralized platform for companies and educational institutions. Our decentralized application (DApp) consists of smart contracts that are visualized on a front end and executed on a peer-to-peer network. The frontend will be especially for use in companies and research institutions. The backend consists of our smart contract that is written in solidity. Our DApp could run on the Ethereum blockchain as it is a peer-to-peer network. And because decentralized applications use blockchain technology, they are not controlled by a central authority. This means that we do not need a central server for our DApp. Our B2B-Marketplace DApp will create great added value for everyone involved. The applications will provide numerous contents and complex functions. Our Neuromorphic Token NMP will act as the main digital unit in the DApp. We will attach great importance to the fact that all content and transactions within the application are encrypted and decentralized. This DApp has the potential to revolutionize technology and research exchange.

6.3. Supplier-Network

In addition to the development of the neuromorphic computing technology and the presented decentralized marketplace, according to our forecasts, a comprehensive list of technology suppliers is required. Companies can only keep up in the tougher global competition if they concentrate on their core competencies. They can expand their skills by purchasing technologies in the presented B2B-marketplace for neuromorphic computing. However, this increases the share of external value creation and thus the dependency on the supplier network. Companies should therefore have a close-knit supplier network and pursue at least a multiple-supplier strategy. With a well-designed network, companies can react quickly and flexibly to delivery failures, commission another supplier at short notice and thus keep the damage to a minimum.

We will evaluate, categorize and provide the numerous suppliers from the area of neuromorphic computing based on complex algorithms and make them available in a blockchain-based supplier network. With the help of blockchain and the use of smart contracts, the transparency of the neuromorphic engineering and computing supply chains could be mapped in a decentralized network. This means that the supplier of neuromorphic chips is also supplied by numerous companies. If there are any uncertainties in this delivery process, this also has an impact on the delivery process of the technology manufacturer. By mapping the entire supplier network on a blockchain, the neuromorphic computing manufacturer could be informed in real time about the process of the supply chain. This enables a so-called “Single Version of Truth”, since all the actors involved act in the same network. Numerous details that are otherwise regulated in correspondence could also run via this blockchain and a smart contract. The need for

transparency is increasing, particularly due to the increasing globalization in recent years.

In addition, we will enrich our supplier network with aspects of trust. Companies can not only obtain the information about the suppliers, but also can view the trustworthiness, delivery speed, capacities and prices. We will present the aggregation of the individual components under the term "Trust Index". This blockchain-based decentralized “Trust Index” for global neuromorphic engineering and computing suppliers will use our NMP-token.

7. Neuromorphic Token NMP

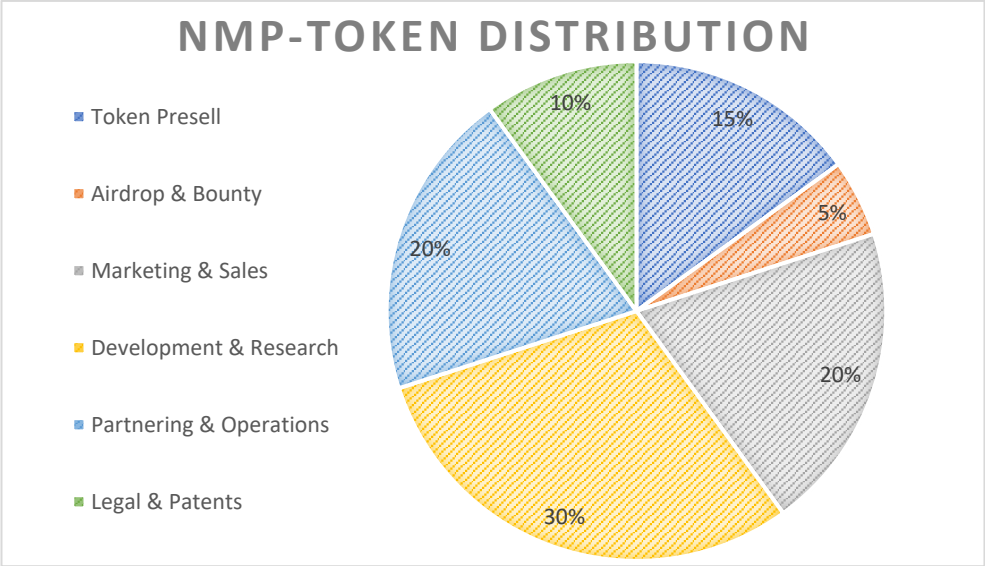
We will use our NMP token as the basis for our planned technological developments. The specified NMP-tokens serve as company shares and as a medium of exchange for the respective company performance. The idea behind this is that in order to fulfill a contractually agreed service, there is no longer any need for human intermediaries or intermediaries such as lawyers or service employees, but that the agreed contractual services practically process themselves and - central aspect - also at the same time for compliance with the agreement made to care. The actual engineering achievement lies less in the respective blockchain, which guarantees the correctness of the information, but in the concrete application and the infrastructure that is based on it.

7.1. NMP-Token Distribution

There will be a total of 10 million NMP-tokens. This number is designed in such a way that it is suitable for our business activities, planned technological developments and networks. In addition, this relatively small

number should support the planned market price. First, the existing NMP-tokens are sorted into different usage categories.

15 percent of these tokens are sold in advance to interested investors at a fixed price. These timeframe of these presell and selfdrop phases are published on our website. After the presell phase, it is no longer possible to purchase the tokens directly from us.



Another 5 percent are used to quickly reach the critical mass of investors and interested parties. In this phase, 5 percent of the total tokens are awarded as part of an airdrop and bounty awards. We do not sell the tokens intended for this phase.

Another 20 percent of the tokens are used to raise the profile of our company. We will also use the marketing activities to market our research efforts, technological developments and products and to present them to the markets.

We will use most of the tokens for our company's core competencies. 30 percent is earmarked for research and development in neuromorphic

computing technologies. By selling these tokens at market prices, we will finance our employees, additional research activities and technological developments.

Another 20 percent of the NMP tokens are used to enable transactions within the B2B marketplace apps and the supplier network. The token based on our smart contract will ensure transparency and support the use of our DApp and the supplier network by companies.

We will also use 10 percent of the NMP tokens to patent the technological developments in the field of neuromorphic computing. This opens further earning opportunities for us in the future and our products are protected against plagiarism. We will also use these tokens to secure ourselves against legal disputes.

8. Roadmap

Our professional and experienced team set ambitious goals to realize our vision. It is important to set a time frame for the respective milestones.

Q1 2020

ICO launch, building corporate and institutional connections. Starting multiple research projects with international universities. Building a community of investors and companies.

Q2 2020

Developing the B2B-Marketplace DApp by using NMP-Token. Listing NMP-Token on Exchanges. Advance the Development and Research or blockchain-based neuromorphic computing technology.

Q3 2020

Start developing the supplier-network. Partnering with multiple Fortune Global 500 companies. Progress of development our blockchain-based neuromorphic computing.

Q4 2020

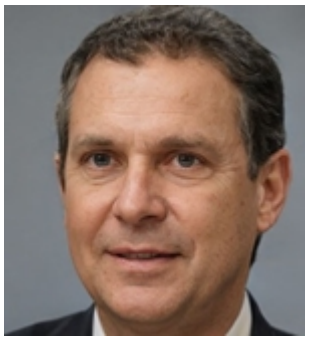
Launch the B2B-Marketplace DApp. Implement NMP-Token in neuromorphic computing development in all partnered companies. Listing NMP-Token in 20 exchanges in total.

Q1 2021

Development of the first prototype of our blockchain-based neuromorphic computing technology. Launch of the decentralized Supplier-Network with 150,000 qualified companies.

9. Team

Our team consists of numerous renowned scientists and experienced business experts. We placed great value on having enough experts as team members, especially in the technological area. Of course, we will get many new employees as we continue to do business, but we are already well equipped to achieve our vision.



Our managing director has been Mr. **Michael Brandt** (born May 11, 1967 in Mannheim) since 2019. With his many years of experience in business development for the Deutsche Telekom shower, Michael Brandt will use his contacts for the future development of our company. His business administration degree creates a solid scientific foundation for his tasks.

With **Thomas Voigt** (born June 15, 1971 in Rostock) we have a real expert in the field of neuromorphic computing and software development on board. He worked for the international company Bosch for many years. There he gained experience as a senior data engineer in the field of artificial intelligence. He has been Vice President of Software Development and Product Development with us since 2019.

Christoph Seidel (born July 21, 1981 in Hamburg) is an expert in the field of neuromorphic computing research. Thanks to his many years of experience at the Fraunhofer Gesellschaft, he has a good foundation for research activities in our company. His research focus was Artificial Intelligence and Neuromorphic Engineering, which is why he is an important part of our company.

Marcel Beck (born November 05, 1985 in Uelzen) is a graduate of the Ludwig Maximilian University in Munich. In 2018 he completed his master's degree with a focus on media, management and digital technologies. He is our community manager and is a link between the investors and our company. He is also a crypto expert with years of experience in the field of cryptography and therefore offers added value for our entrepreneurial activities.

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