



NEURALINK BRAIN CHIP: A REVIEW ON 'BRAIN-READING' DEVICE

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ABSTRACT

Neuralink brain chip a brain operating machine helps to read brain signals. It is a revolutionary invention of health science, neuro, and artificial intelligence. Which is Elon Musk's creation has a vision to cure the insecurity among us. It connects with BMI (Brain Machine Interface) which helps people suffering from diseases like; paralysis, Parkinson's, etc. It helps to study the electrical signals in the brain. By increasing signal transmission between Neuralink chip and neuron cells.

KEYWORD: Neuralink, Brain chip- Interfaces, Neurology, Brain Reading -Device.

1. INTRODUCTION

Invented and Patent by Pedram Mohesen and Randolph Nudo in 2015. After one year in 2016, Elon Musk founded an American company and bought the patent by July 2019 it had received 158 million Dollars. Neuralink brain chip is mixed of both bits of intelligence (Technology and Human) and achieves an interaction between human and artificial intelligence. It connects with BMI technology which is important in scientific and technology value. It is a revolutionary project that helps people suffering from diseases like paralysis, Parkinson's disease, etc.

In the ever-evolving landscape of neuroscience and technology, the Neuralink Brain Chip emerges as a groundbreaking innovation poised to revolutionize the way we interact with and understand the human brain. Developed by a team of visionary engineers and neuroscientists, Neuralink represents a fusion of cutting-edge neurotechnology and the boundless potential of artificial intelligence.

At its core, the Neuralink Brain Chip is a sophisticated neural interface device designed to establish seamless communication between the human brain and external technologies. Through an intricate network of electrodes and sensors, the chip interfaces directly with the brain's neurons, enabling bidirectional communication with remarkable precision and speed.

One of the most remarkable aspects of the Neuralink Brain Chip is its ability to decode neural signals with unprecedented accuracy, opening the door to a myriad of applications across various fields. From restoring lost

sensory functions and treating neurological disorders to enhancing cognitive abilities and advancing human-machine interactions, the potential implications of Neuralink are both vast and transformative.

Furthermore, Neuralink embodies a commitment to safety, reliability, and ethical considerations. Rigorous testing protocols ensure the chip's compatibility with the complexities of the human brain, while robust encryption mechanisms safeguard sensitive neural data from unauthorized access.

As we stand on the brink of a new era in human augmentation and cognitive enhancement, the Neuralink Brain Chip stands as a beacon of innovation, promising to unlock the full potential of the human mind and redefine the boundaries of what's possible. Join us as we embark on this extraordinary journey toward a future where man and machine converge in unprecedented harmony.

2. METHODOLOGY

Elon Musk's innovative project involves a multifaceted approach combining neurosurgery, a Brain-chip-interface, and a Brain reading device. Neuralink's methodology is the thin hair-like structure called 'threads', that connect to the directly in neuron. These wires will be surgically placed inside the brain using a robot, whose wire is thinner than a strand of hair.

It is a critical surgical procedure to set threads by using a special risk factor; this surgical technique is safe and efficient, minimizing trauma to the brain and recovery process for the patient. The brain consists of special sales

called neurons that transmit signals to other cells in the body like our muscles and nerves.

The electrodes up the Neuralink chip can read these signals which are then translated into motor controls. This could control external technologies like computers or smartphones are bodily functions like muscle movement.

The Neuralink Brain Chip employs a minimally invasive surgical procedure to implant ultrafine electrodes into specific regions of the brain. These electrodes interface with neurons, enabling high-fidelity recording and stimulation. Advanced signal processing algorithms decode neural activity, facilitating bidirectional communication between the brain and external devices. Rigorous testing ensures safety and reliability, with an emphasis on neural tissue compatibility and data encryption. Continuous refinement through iterative testing and feedback drive the evolution of the Neuralink system, ensuring its efficacy and ethical deployment in enhancing human capabilities and treating neurological disorders.

3. STRUCTURE OF NEURALINK

3.1. Threads

Threads are the ultra-thin, flexible polymers, which will contain the electrodes and will transfer the signal to the transmitter. Increase production is made possible by wafer-level microfabrication Which patents the thin film device with 3072 electrodes connected in each wafer. [mask et al 2019]



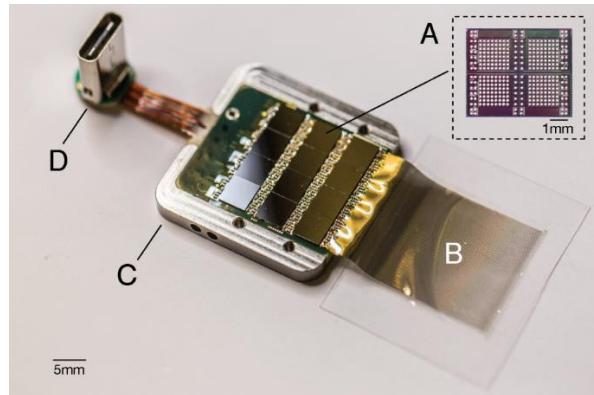
Neuralink contains 48 or 96 threads in each area and each thread contains 32 separate electrodes. Mainly this method is used to stick very integrated chips to the axon part of the neuron which has a higher signal in this area. which is implanted by the surgical robot. Every thread ends with a 16 -50 um square loop to make threading the needle easier.

Injecting this type of 1024-electrodes thread into the outside layer of the brain avoids any veins or arteries.

These electrodes communicate with the brain cells which are connected to a Bluetooth link that goes straight outside of the computing device.

3.2. Amplifier

The electrodes are built around the Neuralink custom application-specific integrated circuit (ASIM). Which consists of 256 individually programmable amplifiers on cheap analog-to-digital converters (ADC) and peripheral control circulatory for serializing the digitized output.



These amplifiers play a critical role in accurately capturing and processing brain activity, enabling seamless communication between neurons and the device. By boosting weak electrical signals, the amplifiers ensure reliable data transmission, essential for decoding neural information with precision. Their design focuses on minimizing noise interference and maximizing signal fidelity, crucial for deciphering complex brain patterns. Ultimately, these amplifiers facilitate the seamless exchange of information between the brain and external devices, unlocking the potential for revolutionary advancements in neurotechnology.

4. The Future of Neuralink Brain chip

The future of the Neuralink brain chip holds the potential to revolutionize the way we interact with technology and understand the brain. Here are a few possible directions it could take.

1. Medical Applications: Neuralink brain chip could be used to treat neurological disorders such as Parkinson's disease, epilepsy, or depression by providing precise stimulation to specific areas of the brain.
2. Enhanced Cognitive Abilities: It might enable humans to enhance their cognitive abilities, such as memory, learning speed, or problem-solving skills, by directly interfacing with the brain.
3. Brain-Computer Interfaces (BCIs): Neuralink could lead to advanced BCIs that allow people to control computers, prosthetic limbs, or other devices with their thoughts alone, potentially restoring mobility and independence to those with physical disabilities.
4. Virtual and Augmented Reality: Integration with virtual and augmented reality systems could create immersive experiences beyond what's currently possible, allowing for more natural interaction and deeper immersion in virtual environments.
5. Communication and Telepathy: Neuralink could facilitate direct brain-to-brain communication, enabling people to share thoughts, emotions, or sensory

experiences without the need for spoken or written language.

6. Ethical and Privacy Concerns: As with any technology that directly interfaces with the brain, there are significant ethical and privacy concerns to consider, such as consent, data security, and the potential for misuse or abuse of the technology.

7. Regulatory Hurdles: The development and widespread adoption of the Neuralink brain chip will likely face regulatory hurdles and ethical debates regarding its safety, efficacy, and societal implications.

Overall, the future of the Neuralink brain chip holds immense promise for both medical and non-medical applications, but it also raises important questions about ethics, privacy, and regulation that will need to be addressed as the technology continues to advance.

5. Future implementation in criminal Detection

The potential future implementation of the Neuralink brain chip in criminal detection could lead to significant advancements in forensic science and law enforcement. Here are some possibilities:

1. Brain Activity Analysis: The Neuralink brain chip could be used to monitor and analyze brain activity patterns associated with deception, criminal intent, or specific memories. This could potentially aid in the detection of criminal behavior or in verifying the authenticity of witness testimony.

2. Lie Detection: By analyzing subtle changes in brain activity, Neuralink's brain chip might offer more reliable lie detection methods compared to traditional polygraph tests. This could be particularly useful in interrogations and criminal investigations.

3. Memory Retrieval: Neuralink's technology might enable the retrieval of detailed memories directly from the brain, allowing investigators to reconstruct events and gather evidence more accurately.

4. Criminal Rehabilitation: In addition to detection, Neuralink's brain chip could be utilized in rehabilitation programs for criminals by targeting and modifying specific neural pathways associated with criminal behavior.

5. **Ethical and Legal Considerations:** The use of Neuralink's brain chip in criminal detection would raise significant ethical and legal questions regarding privacy, consent, and potential abuses of the technology. Safeguards would need to be put in place to ensure that individuals' rights are protected.

6. Regulatory Challenges: Implementing Neuralink's technology in criminal detection would likely face regulatory challenges and require careful oversight to ensure its reliability, accuracy, and ethical use.

While the idea of using Neuralink's brain chip for criminal detection presents intriguing possibilities, it also comes with complex ethical, legal, and practical considerations that would need to be addressed before widespread adoption could occur.

CONCLUSION

The Neuralink brain chip represents a groundbreaking technological innovation with vast potential implications for various aspects of human life. Its development opens up possibilities for medical breakthroughs in treating neurological disorders, enhancing cognitive abilities, and restoring mobility through brain-computer interfaces. Additionally, it holds promise for revolutionizing communication, virtual reality experiences, and even criminal detection.

However, alongside its potential benefits, the Neuralink brain chip also raises profound ethical, legal, and societal questions. Concerns regarding privacy, consent, data security, and the potential for misuse or abuse of the technology must be carefully addressed. Regulatory frameworks need to be established to ensure the safe and responsible development and deployment of Neuralink's technology.

Ultimately, the future of the Neuralink brain chip hinges not only on technological advancements but also on our ability as a society to navigate its ethical, legal, and social implications thoughtfully and responsibly. If managed effectively, the Neuralink brain chip could pave the way for unprecedented advancements in our understanding of the brain and the enhancement of human capabilities.

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