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Neuralink Technology

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Abstract : *With each passing day, we discover new and latest inventions that use artificial intelligence to facilitate our use of devices. This sudden surge in the usage of AI has increased insecurity among humans that it can leave us of no use.This increased insecurity led people to think about what can be done to make our future secure among robots and artificial intelligence. And out came the solution, mix both the bits of intelligence and achieve a symbiosis between humans and AI. To achieve this, we can use the latest Artificial Intelligence technologies such as "Neural Lace" technology or Brain-Machine Interface (BMI). This paper will discuss the use of Brain-Machine Interface, Artificial Intelligence, and Neural Network to achieve symbiosis with AI. This paper also consist of how neuralink works and how this can be the future of technology.*

Keywords *- Artificial Intelligence, Brain-Machine Interface, Neural Network., Neuralace, Neuralink*

I. INTRODUCTION

Neuralink is an ambitious neurotechnology that's aiming to upgrade nature's most complex organ which is the human brain. It uses specially made nano chips which can be directly implanted into human brains using specially made surgical robots which can perform brain surgery to implant the nano chip inside human brain with extreme precision and this surgical robot can be used to avoid any human mistake while performing the surgery**Error! Reference source not found.** ,this Neuralink can help to treat brain disorders and other medical problems, and give us the power to interact and control machines using our minds.

This Brain Machine interface i.e. Neuralink can help to solve many problems which are faced by today's world, the main problem which can be solved using this technology majorly includes medical problems, this medical problem can be paralysis, physical disability, brain disorders, Memory loss, brain damage, depression, anxiety and addiction **Error! Reference source not found.**. Artificial Intelligence plays a major role in making this whole concept possible. Major aim of this technology is that it can be helpful for a lots of people with physical disability to can do their daily routine like normal people using this technology resulting in the great success of this technology to help human race.

As the technologies are upgrading day by day this brain machine interface can be used in future to solve all the problems that a human being faces and many more advantages can be achieved using this technology. The idea currently falls quite firmly in the realm of sci-fi and is either utopian or dystopian, depending on whom you talk to. Neuralink is referred to as a "Fitbit in your skull, with tiny wires", but this is no easy install. It would require to insert 3,072 electrodes connected to 96 thin, flexible threads into your brain.

These are between four and six μm (micrometer, which is one-thousandth of a millimeter) in diameter, making them far finer than human hair, and they are connected to a brain-to-machine chipset called N1, measuring just 23mm by 8mm **Error! Reference source not found.**. The implant that transmits neural signals is called the Link. This paper shows the implementation, its working, how it can be used in future, its advantages and its limitations.

II. WHAT IS NEURALINK?

Neuralink is a gadget that will be surgically inserted into the brain using robotics by neurosurgeons**Error! Reference source not found.**. In this procedure, a chipset called the link is implanted in the skull. It has a number of insulated wires connected from the electrodes that are used in the process. This device can then be used to operate smartphones and computers without even touching it. A nano device is used to achieve brain machine

interface and this nano device has many thin flexible threads or micro wires that connects with our brain and helps to understand the functionality of brain thereby analyzing our brain and using artificial intelligence to process the data generated and use those data for the further use. This uses Artificial Intelligence for its operation. Neuralink currently focuses on manufacturing of medical devices. These devices have the potential to help individuals with a wide range of injuries and neurological conditions. For Paralyzed people physical mobility can be restored using this technology. To achieve this, Neuralink use the Link to read signals in the brain and use them to stimulate nerves and muscles in the body, this allows the person to once again control their own limbs**Error! Reference source not found.**.

1.How can neuralink be used?

Neuralink, in its initial phase the project will focus on helping the healthcare industry. The machine can help paraplegics with simple things like using a phone or interacting with a computer. It can also be used for the treatment of epilepsy. This technology will also be able to help regain someone's eyesight even if they have lost their optic nerve as the main motive of this technology is to gain control over human brain to help humans so if we gain control over nerves, we can also control optical nerves achieving humans to regain his/her eyesight's. This technology, in theory, will be able to fix anything that is wrong with the brain. It can also be used for restoring the memory, speech and motion of a paralyzed person **Error! Reference source not found.**. Post a complete symbiosis of the tech and the human brain it will also be able to help humans interact with one another without having to actually talk. This can help the person who is not able to speak or hear to interact with each other. Neuralink can be used to connect brain with machines so we would be able to control may electronic smart devices using only our brain and this may result in helping to easy use may electronics device without any physical contact **Error! Reference source not found.**.

2.Brain-Machine Interface (BMI)

Brain-Machine Interface (BMI) or Brain to Machine Interface (B2M) BMI is an interface that lets us connect to any machine that can read our brain inputs. For this, we require to have a high bandwidth rate, but we have a very low bandwidth as we use only two of our thumbs to input into the machine or the smartphone. Even if we are using images, videos and audios we cannot get the same bandwidth as we can get by transferring directly from the brain to the machine. Brain-Machine Interfaces has the power to help people with a wide range of clinical problems such as sensory and motor functions that are not functional. BMI hasn't been widely popular with clinical disorders as they had a modest number of channels to transfer signals but Neuralink took the first step in creating an extensible broadband channel for transmitting signals using wire and electrode networks**Error! Reference source not found.**.

3.Neural Lace

Neural Lace is a science-fictional concept introduced by Scottish author Iain M. Banks in his series of novels "The Culture". Neural Lace is also a Brain-Machine Interface (BMI), which can help humans compete with Artificial Intelligence. This Neural Lace technology is currently being funded by Elon Musk as an effort to accomplish the same vision which has an aim to make human brain able to compete with the Artificial Intelligence in the future. An idea of how Neural Lace works can be understand by using a computer to acquire new information and learn new skills which will make this technology a revolutionary technology. Neural Lace is an ultra-thin mesh which will be implanted inside the skull and will form a body of electrodes which will be able to monitor the function of human brain. The ultra-thin mesh is inserted by means of a tiny needle that contains wrapped mesh. After the mesh is implanted inside the brain, it automatically integrates with the human brain and this creates a perfect symbiosis between human brain and machine. This technology will the best thing that human might have invented.

4.Working of Neuralink.

Neuralink works like neural network in a human body. Neurons are like the means of transporting our thoughts and actions. Whatever we feel, see, feel, touch, taste and think goes through the neurons for further processing. The number of neurons in a human brain that govern the functioning of the brain is estimated to be 100 billion. Neurons consist of dendrite, a cellular body (known as Soma) that contains the nucleus and axon. Axon from a neuron is connected with Dendrite from another neuron by Synapse that contains neurotransmitters. Neurotransmitters are activated by an electrostatic impulse called action potential. When the proper type of pulse is sent through the synapses, a chain reaction is initiated between the neurons. It's how neurons function and

transfer information. The data was then split into train-test groups, and two model variations were built: A Convolutional Neural Network (CNN) and an FNN (Fully-connected Neural Network)**Error! Reference source not found.**.

Neuralink is completely based on neurotechnology and Artificial Intelligence. Neuralink tries to interpret neural signals which is coming from the human brain and this interpreted signals are then externally processed using computer and at this stage it uses Artificial Intelligence to analyze and process the signals generated**Error! Reference source not found.**. Further computers can be used for the applications of this processed signals. The Chip which is placed Inside the brain can be wirelessly charged and hence can be efficiently used. Also the data generated can be analyzed by scientist to cure many brain disorders.

III. METHODOLOGY

The work present in this paper addresses many medical problems which people faces, these people includes paralyzed patients, physically disabled people, blind and deaf people etc. and many more. Brain Machine Interface can solve this problem and Neuralink has achieve brain to machine interface. For working of Neuralink a chip needs to be implanted inside the brain which is done by specially made robots operated by neurosurgeons. This chip then helps to control our brain using Artificial Intelligence and computer. Brain Machine Interface can be very vital in future and can help us to cure many diseases which would be helping billions of people. Many researches we done to show people the working and uses of brain machine interface and this was finally achieved using Neuralink Technology which uses brain machine interface**Error! Reference source not found.**.

One research was done by scientists on a macaque monkey named Pager to study and demonstrate the working of Brain machine Interface using Neuralink, the chip was implanted in the brain of that monkey for six weeks and neuralink stated analyzing and learning the monkeys neural network and that monkey was able to play some video games only by using the chip. If the monkey plays the game correctly, he would be rewarded with a sip of banana smoothie. This experiment was a success and showed that this brain machine interface could be possible and can work with a single small chip.

One more experiment was done on a pig named Gertrude, the pig was implanted with a coin sized chip and this chip helped researchers to see the visual representation of the working of neural network of that pig's brain. When the pig ate and sniffed straw the graph showed her neural activity.so these two experiments were concluded as a success to artificial Intelligence and Brain machine Interface**Error! Reference source not found.**.

IV. FIGURES AND TABLES

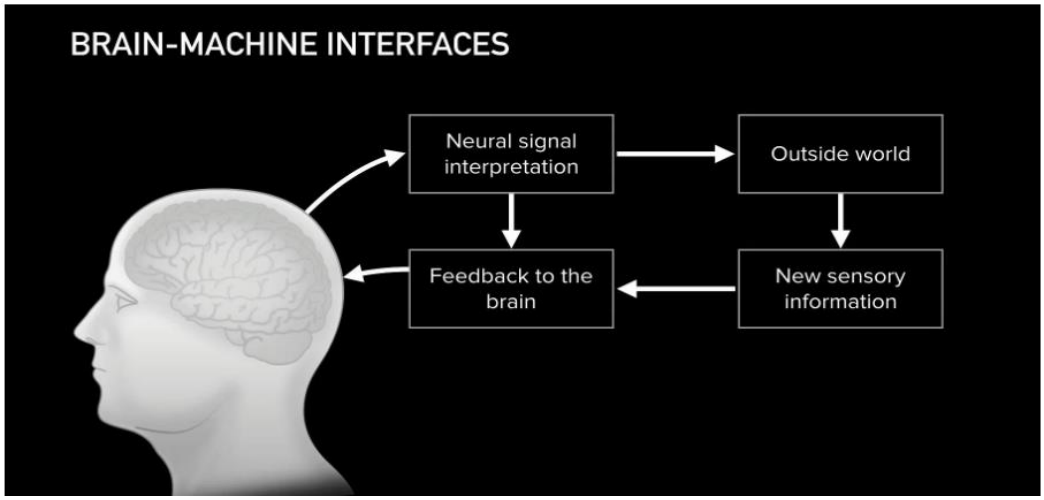

Fig 1: brain-machine interface

This figure shows how brain machine interface processes the neural signals coming from the brain and helps to analyze those signals and replicate this signals with an external machine.

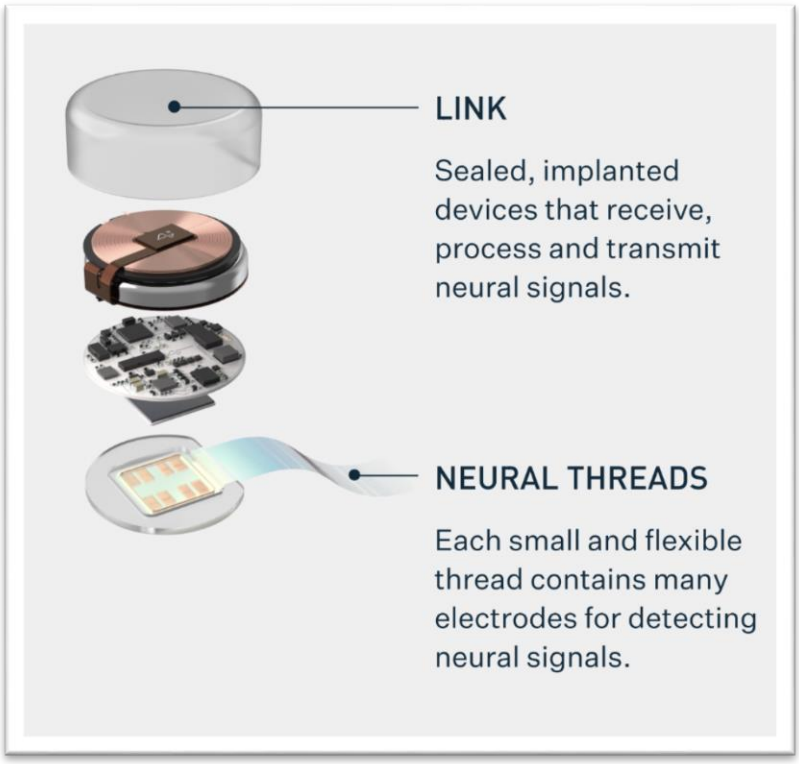

Fig 2: Neuralink device

In this figure we can see the components present inside the nueralink device, this device consists of links and neural threads which can be implanted directly to a human brain. This chips are very small and can't be easily noticed from outside.

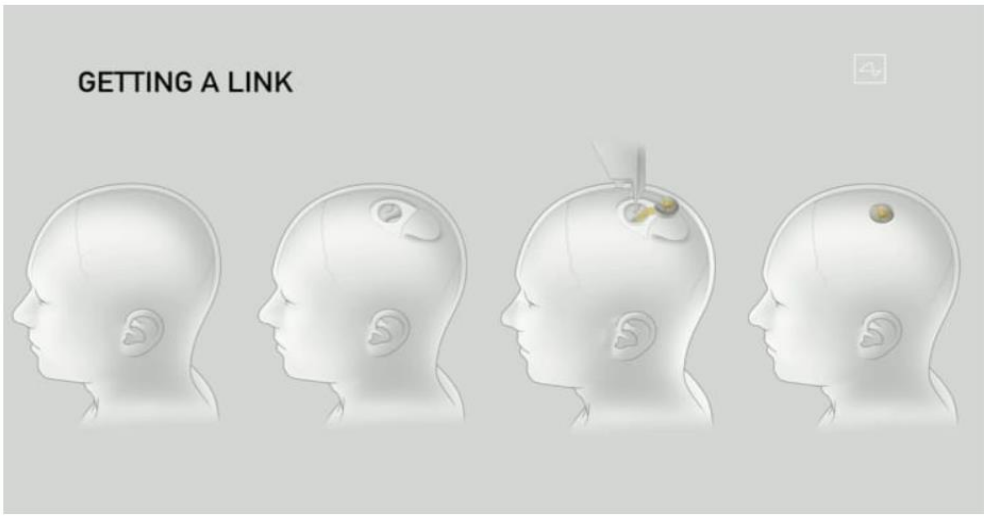

Fig 3: installation of chip in human brain

This figure shows how a nueralink chip can be installed directly into a human brain with a high tech robot which performs neurosurgery with high precisions which helps in the installation of the nueralink into a human brain.

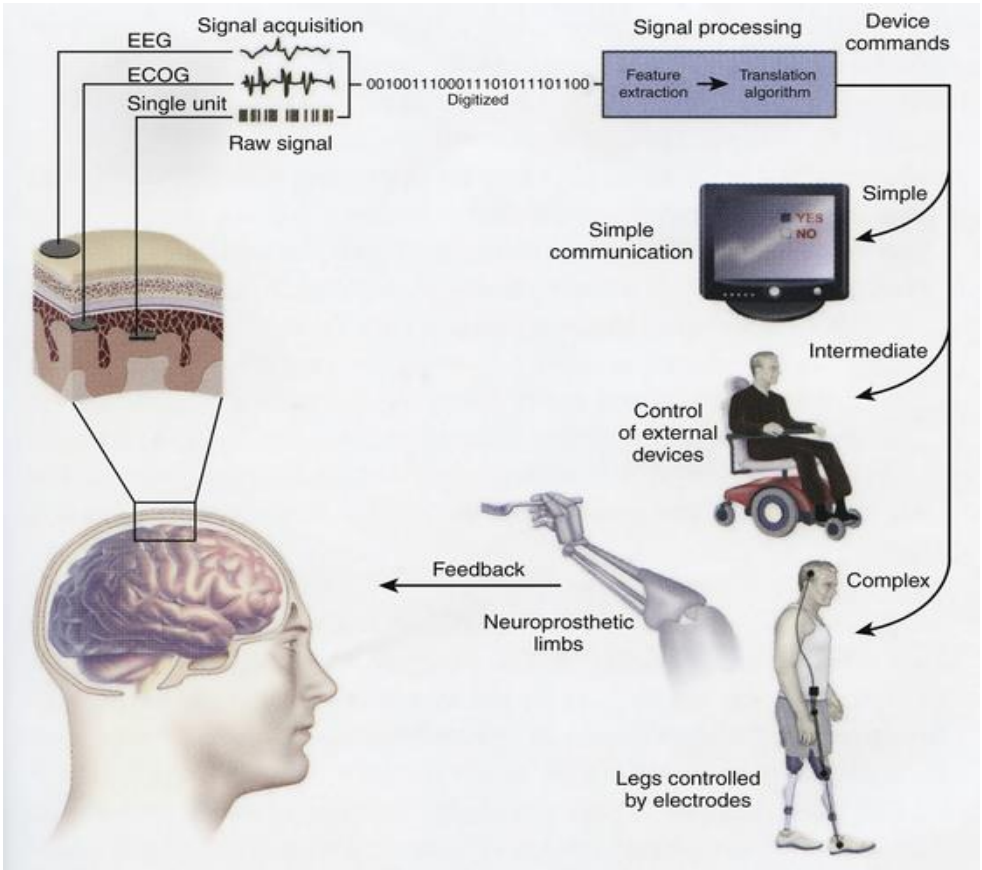

Fig 4: working of neuralink

In this figure we can see how a nueralink works and how it can be used by a person having physical disabilities. Nueralink can help in gain control over our muscles which would be really helpful for a person having physical disabilities. Here you can also see how the signals are processed and used to control a human body externally.

V. CONCLUSION

The primary and the most important goal of this technology will be to help people with paralysis to regain independence through the control of computers and mobile devices. The devices are designed to give people the ability to communicate with each other more easily via text or speech synthesis, to follow their curiosity on the web, or to express their creativity through different medium such as art, photography or writing apps.

As this technology develops, we will be able to increase the channels of communication with the brain which will be connected with the device, accessing more brain areas and new kinds of neural information helping to improve the technology. Wide range of neurological disorders can be treated using this technology, to restore sensory and movement function, and eventually to expand how we interact with each other**Error! Reference source not found.**.Also many diseases with no cure would be able to treat using Neuralink.

Currently, one of the main concern for Neuralink is its chip's vulnerability to hacks and other malicious attacks **Error! Reference source not found.**.This particular problem will be a massive cause of concern for its users and enterprise due to digital death. As Neuralink relies completely on internet services for its working so it can be easily target by hackers and this will lead to the overall control of victim's mind by hacker. If this occurs, then it will lead humans to great danger. Brain surgery is less risky than we think if it is carried out precisely in sterile conditions. Some of the unknown long term impact on the brain is from decomposition by the body of the electrode materials over time. If Any Fault occurs in the device, it would be hard to remove it and reinstall it in to the brain also there is a high chance of damaging the brain as well in this process 0. Also there is chance of getting brain cancer through radiation. As brain is the very sensitive part of our body some working with brain could be a risky process. People with the above mentioned disorders can have a great impact by using this device and this technology can really be a life saver for many people having such kind of a disorder, nueralink can be said as the future of artificial intelligence and can have a great impact on humans in future.

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