

# BRAIN WAVE TECHNOLOGY

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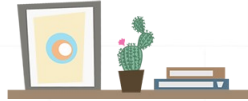
**MADE BY SAMARA SIMHA REDDY  
R161445**





# CONTENTS

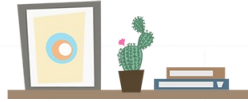
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- Introduction
- Neural activities
- Brain waves
- Detection & Analysis
- Applications
- Pros and Cons
- Conclusion

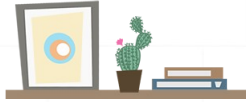


# INTRODUCTION



- Brainwave technology is a direct technological interface between a brain and computer system not requires output from the user by using EEG analyzer. It is also known as a Direct Neural Interface(DNI) & Brain-Machine Interface(BMI) & Brain Computer Interface(BCI).
- We can communicate from brain to brain and also this technology is mainly used for physically and mentally challenged people.
- This is one of the most trending technologies in this competitive world.

# NEURAL NETWORKS

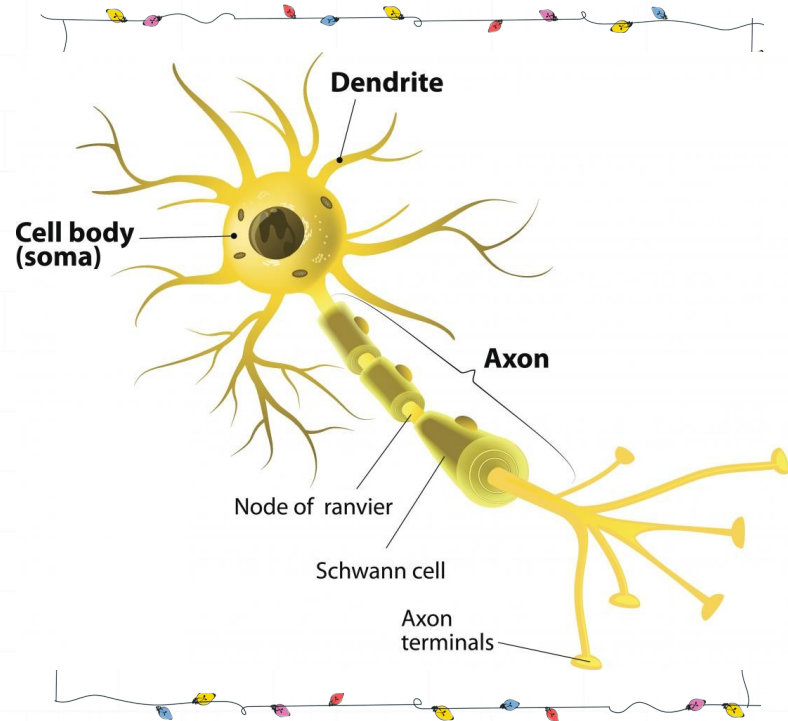


- **What neurons do?**

A neuron is an electrically excitable specialized type of cell that processes and transmits information through electrical and chemical signals with the presence of synapses, which are complex membrane junctions that transmit signals to other cells with the aid of Cell body, Dendrites & Axon.

- **Action potential**

A brief electrical charge that travels down a neuron's axon.



# ION CHANNELS CONTROL THE MOVEMENT OF IONS THROUGH THE NEURONAL CELL MEMBRANE.



## Location

### Passive Channels

- Cell membrane on Dendrites.
- Cell body & Axon.

### Chemically gated Channels

- Dendrites.
- Cell body.

### Voltage gated Channels

- Axon Hillock, all along unmyelinated axon.
- Nodes of Ranvier in myelinated axons.

## Function

### Passive Channels

- Makes Resting Membrane Potential.
- .

### Chemically gated Channels

- Makes synaptic Potentials.
- .

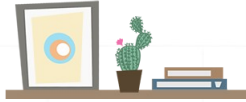
### Voltage gated Channels

- Generation & Propagation of Action Potentials.
- .



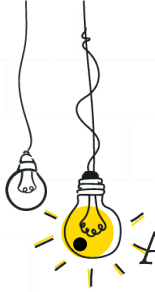
# BRAIN WAVES

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- Brainwaves are the electrical impulses produced as your brain cells communicate with one another.
- Brainwaves tell us a great deal about how you feel and function, your thought habits, stress levels, underlying mood and overall brain function.
- Using sensors on the scalp, we can measure and monitor this activity. With brain analysis software(EEG), we can identify what specific activity is giving rise to your symptoms.

# NEURAL ACTIVITIES



A potential of 60–70 mV with negative polarity may be recorded under the membrane of the cell body.

- This potential changes:-

If an action potential travels along the fibre, which ends in an excitatory synapse, an excitatory postsynaptic potential (EPSP) occurs in the following neuron.

If two action potentials travel along the same fibre over a short distance, there will be a summation of EPSPs producing an action potential on the postsynaptic neuron providing a certain threshold of membrane potential is reached.

# TYPES OF BRAIN WAVES



Awake, normal,  
alert, consciousness



Calm, extremely aware,  
quietly alert



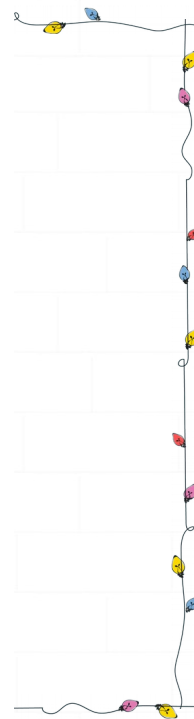
Relaxed, lucid, calm,  
not thinking



Deep relaxation,  
meditation, mental  
imagery



Deep, dreamless sleep

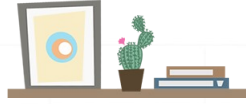




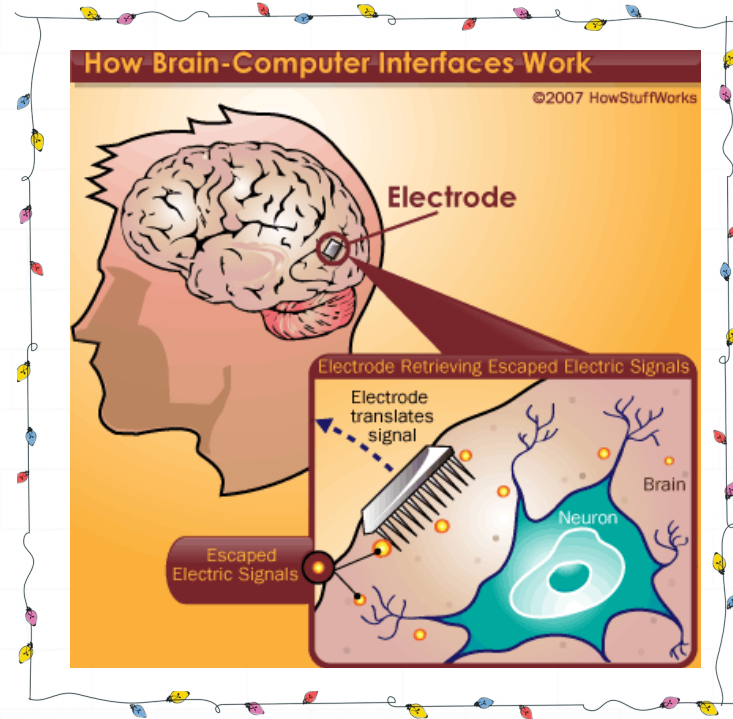


# **DETECTION & ANALYSIS**

# 1. INVASIVE BRAIN COMPUTER INTERFACE



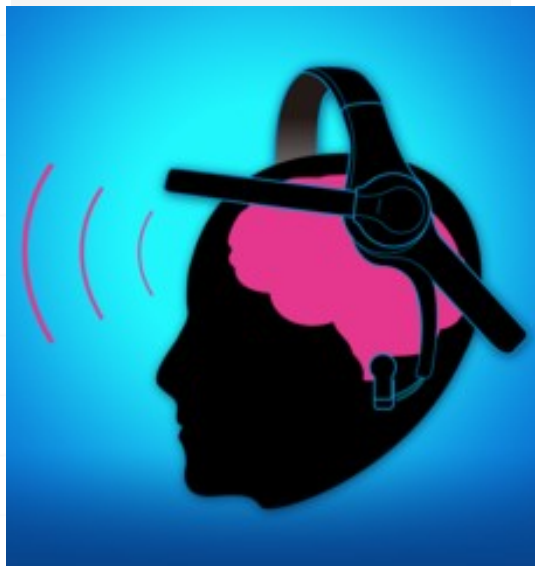
- Invasive Brain Computer Interface devices are those implanted directly into the brain and have the highest quality signal.
- Ex: Mindwave mobile headset



# MINDWAVE MOBILE



headset



working



wearing



# INTERFACE

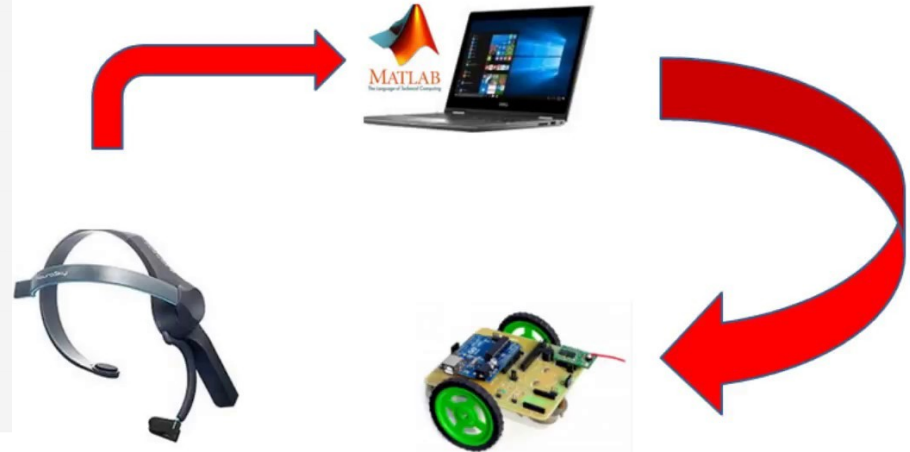
Attention  
Detection



Interfacing Mindwave Mobile with Arduino

Arduino interface

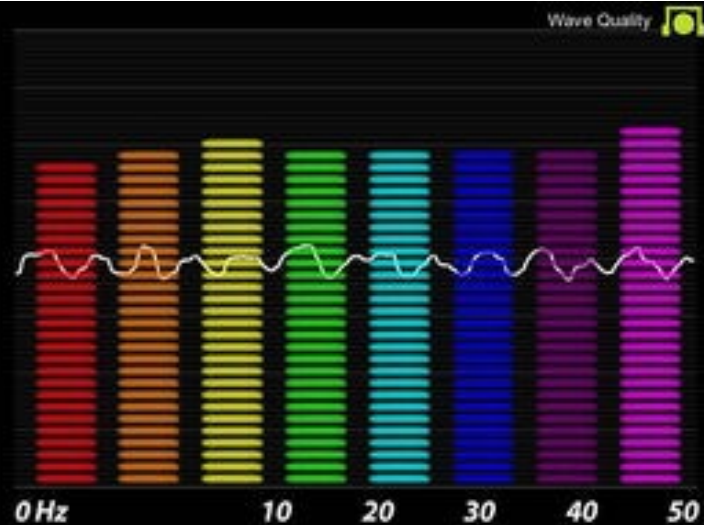
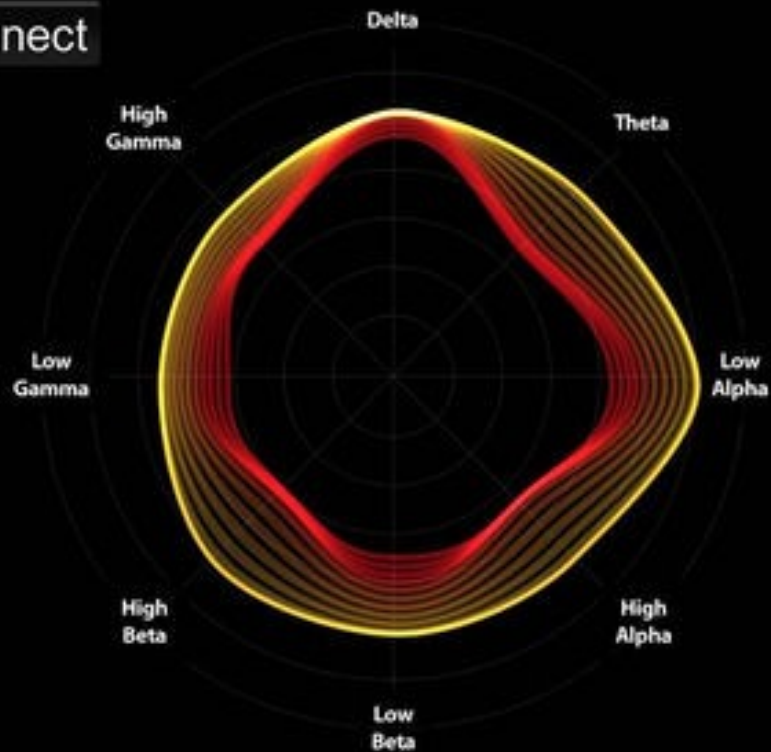
## Block Diagram



Computer interface



# Connect



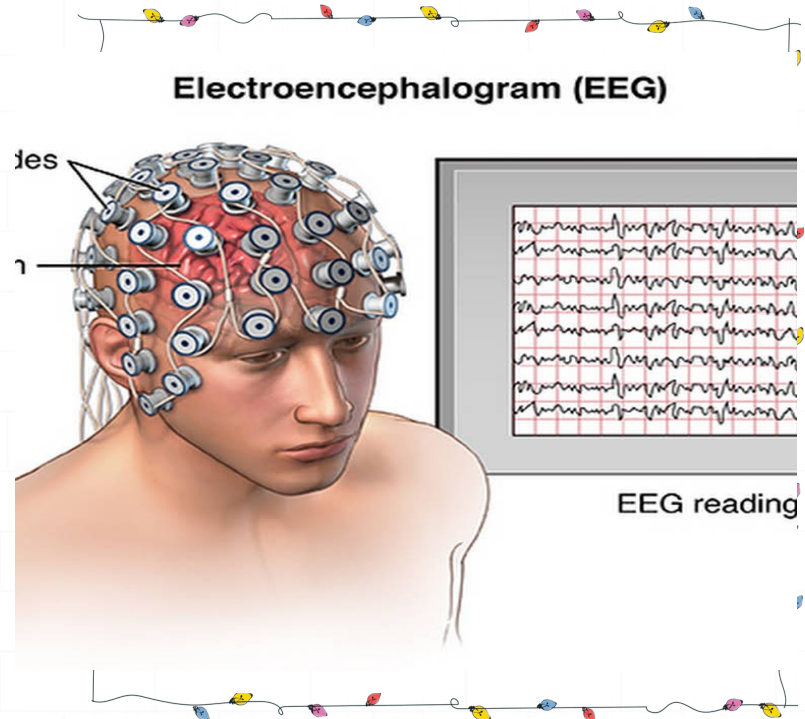
## 2. NON-INVASIVE

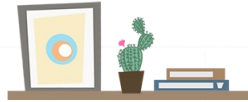
- EEG, the most used non-invasive

### Methods.

Electroencephalography is an electrophysiological monitoring method to record electrical activity of the brain.

An EEG tracks and records brain wave patterns. Small flat metal discs called electrodes are attached to the scalp with wires.





# BRAINWAVES CHARACTERISTICS

- Main source of EEG is synchronous activity of thousands of cortical neurons.
- Everyone's brain signal is a bit different even when they think about same thing.
- In abnormal adults, EEG shows sudden bursts of electrical activities. These abnormal discharges may be caused by a brain tumor, infection, injury or strokes.



# FEATURES

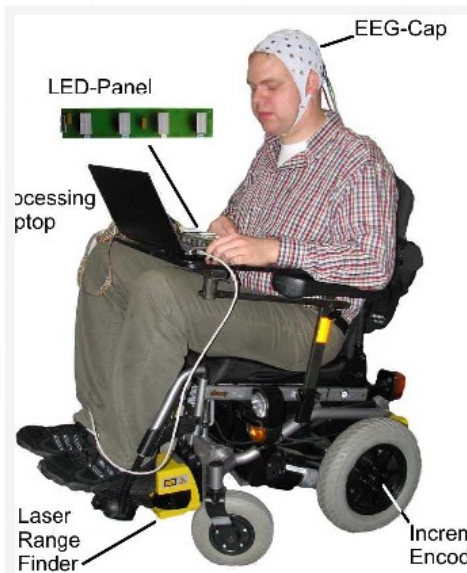
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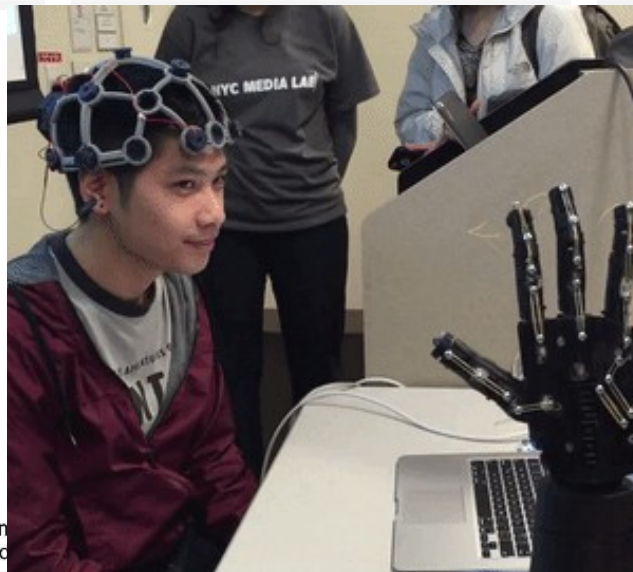
- Can detect multiple mental states simultaneously.
- Reference node on ear clip is to remove ambient noises.
- Provides EMG feature for eye blink detection
- By changing some connections, we can use it as brain figure prints.



# APPLICATIONS



Brain controlled wheel chair for paralyzed persons.



Brain controlled robot



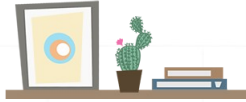
Music therapy





# MILITARY AND SECURITY

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- Improve threat detection and identification .
  - At Viewpoint Of Accessibility,the Brain wave is the most Adequate.
  - Brain wave are unique to individual.
  - In future,it could be possible to fill the surrounding information in our brain without wasting a time for gain it.
  - Games to increase our brain activity.
  - Used to relax our mind.



## PROS

- It uses to relax our brain.
- Greater accuracy and much faster time.
- BCI's can improve a direct pathway between a human or animal brain and external device like computers etc.
- BCI's has increased the possibility of treatment of disability related to nervous system.

## CONS

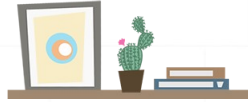
- Complexity of brain.
- Information transmission rate is limited to 20 bits/sec.
- Adaption and learning is difficult.
- It is very expensive.
- Research is still in beginning state.



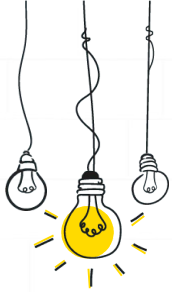


# CONCLUSION

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- The use of Brain Wave signals as vector of communication between man & machines represents one of the current challenges in signal theory research.
- This is the new emerging area which is mainly for the patients in the treatment bed.
- We can explore ourselves with this emerging technology in future.



# THANK Q

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**R161445**

