# BCI Automation

A Step towards a completely automatic world…

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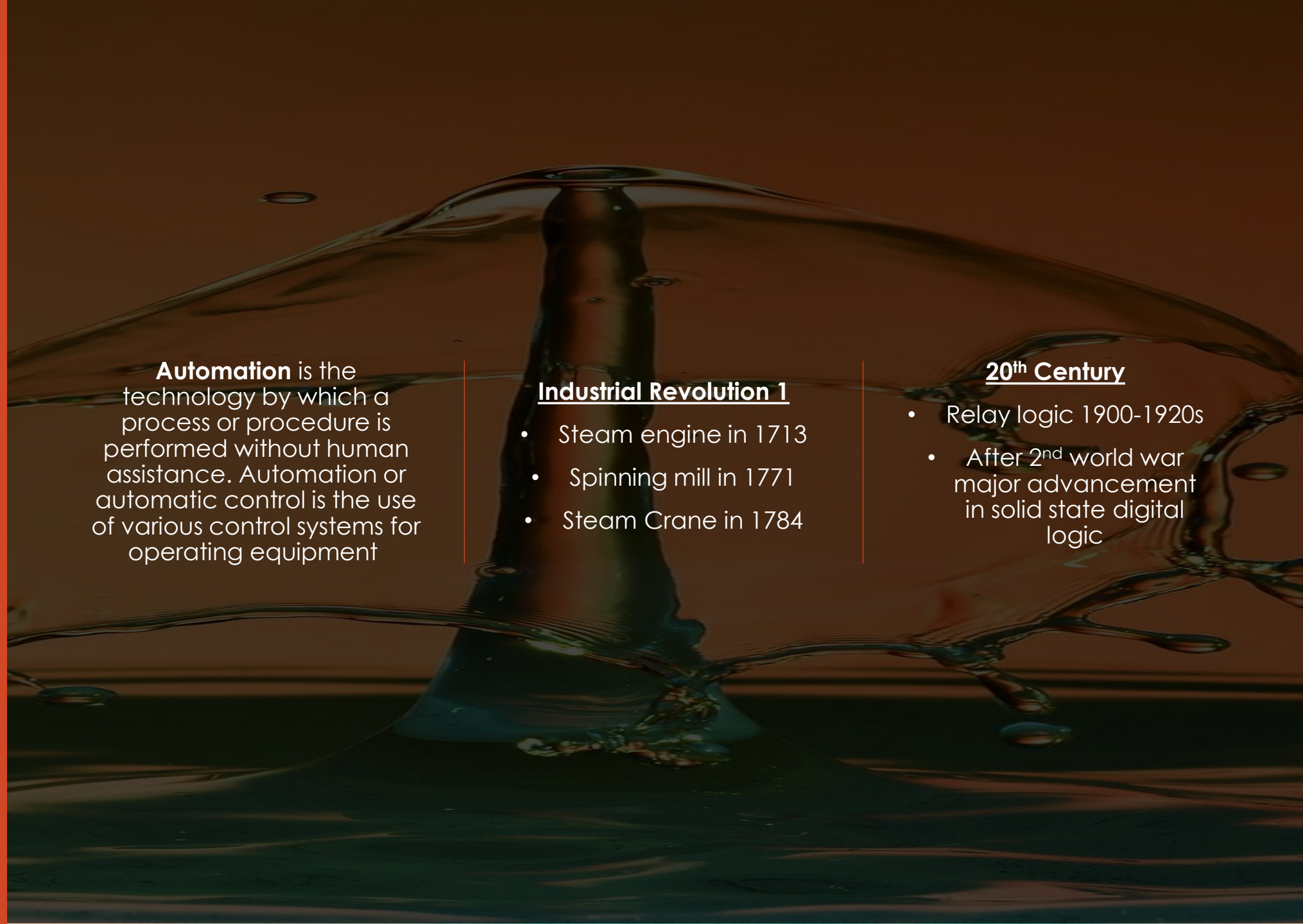
# History of Automation



**Automation** is the technology by which a process or procedure is performed without human assistance. Automation or automatic control is the use of various control systems for operating equipment

**Industrial Revolution 1**

- Steam engine in 1713
- Spinning mill in 1771
- Steam Crane in 1784

**20th Century**

- Relay logic 1900-1920s
- After 2nd world war major advancement in solid state digital logic

# Types of Automation

Fixed Automation(Hard)

Programmable Automation(Soft)

Flexible Automation

# Advantages

- ✓ Increased Productivity
- ✓ Reduced cost
- ✓ Higher accuracy
- ✓ Increased consistency in output
- ✓ Performs tasks which are beyond human capabilities

# Disadvantages

- X Unpredictable or Excessive development cost
- X High Initial cost
- X Displaces workers due to job replacement
- X Further environmental damage and could compound climate change

# Future of Automation

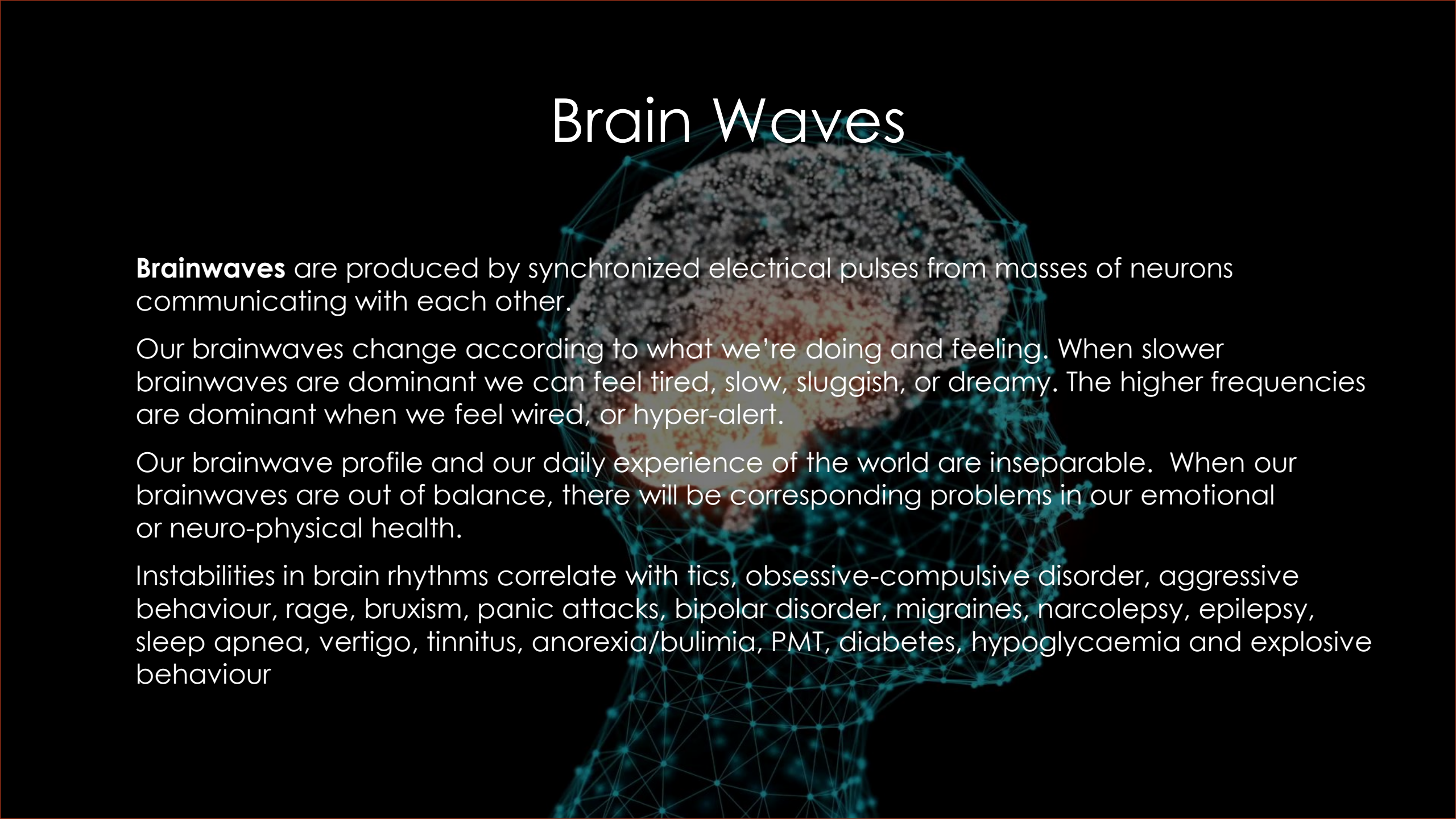

Leverage AI/ML to automate the automation.

For automation to go to the next level we need to think about auto coding.

Internet of Things(IOT)

# Brain waves Automation

# Brain Waves



**Brainwaves** are produced by synchronized electrical pulses from masses of neurons communicating with each other.

Our brainwaves change according to what we're doing and feeling. When slower brainwaves are dominant we can feel tired, slow, sluggish, or dreamy. The higher frequencies are dominant when we feel wired, or hyper-alert.

Our brainwave profile and our daily experience of the world are inseparable. When our brainwaves are out of balance, there will be corresponding problems in our emotional or neuro-physical health.

Instabilities in brain rhythms correlate with tics, obsessive-compulsive disorder, aggressive behaviour, rage, bruxism, panic attacks, bipolar disorder, migraines, narcolepsy, epilepsy, sleep apnea, vertigo, tinnitus, anorexia/bulimia, PMT, diabetes, hypoglycaemia and explosive behaviour

# Different Types of Brain waves

| Brain Wave Type | Frequency range | Mental states and Condition |
|---|---|---|
| **Delta** | 0.1Hz to 3Hz | Deep, Dreamless sleep, non-REM sleep, unconscious |
| **Theta** | 4 Hz to 7 Hz | Intuitive, Creative, recall, fantasy, imaginary, dream |
| **Alpha** | 8 Hz to 15 Hz | Relaxed, but not drowsy, Tranquil, conscious |
| **Low Beta** | 12 Hz to 15 Hz | Formerly SMR, Relaxed yet focused, integrated |
| **Midrange Beta** | 16 Hz to 20 Hz | Thinking, aware of self and surrounding |
| **High Beta** | 21 Hz to 30 Hz | Alertness, agitation |

# Electroencephalography (EEG)

**Electroencephalography** (**EEG**) is an electrophysiological monitoring method to record electrical activity of the brain.

EEG refers to the recording of the brain's spontaneous electrical activity over a period of time, as recorded from multiple electrodes placed on the scalp.

# BCI(Brain Computer Interface)

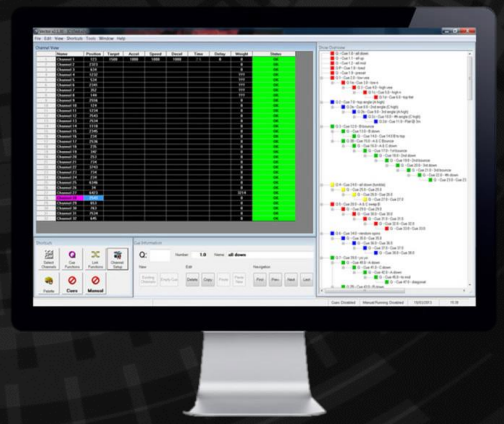
A direct communication pathway between an enhanced or wired brain and an external device.

The field of BCI research and development has since focused primarily on neuroprosthetics applications that aim at restoring damaged hearing, sight and movement

## How it works:

1. Auditory/ visual/ Stimulus trigger

2. EEG Recorder >> Preprocessing >> Feature Extraction>> Classification



3. Transmission trough wireless/wired medium>> processing data>> output

# Block Diagram

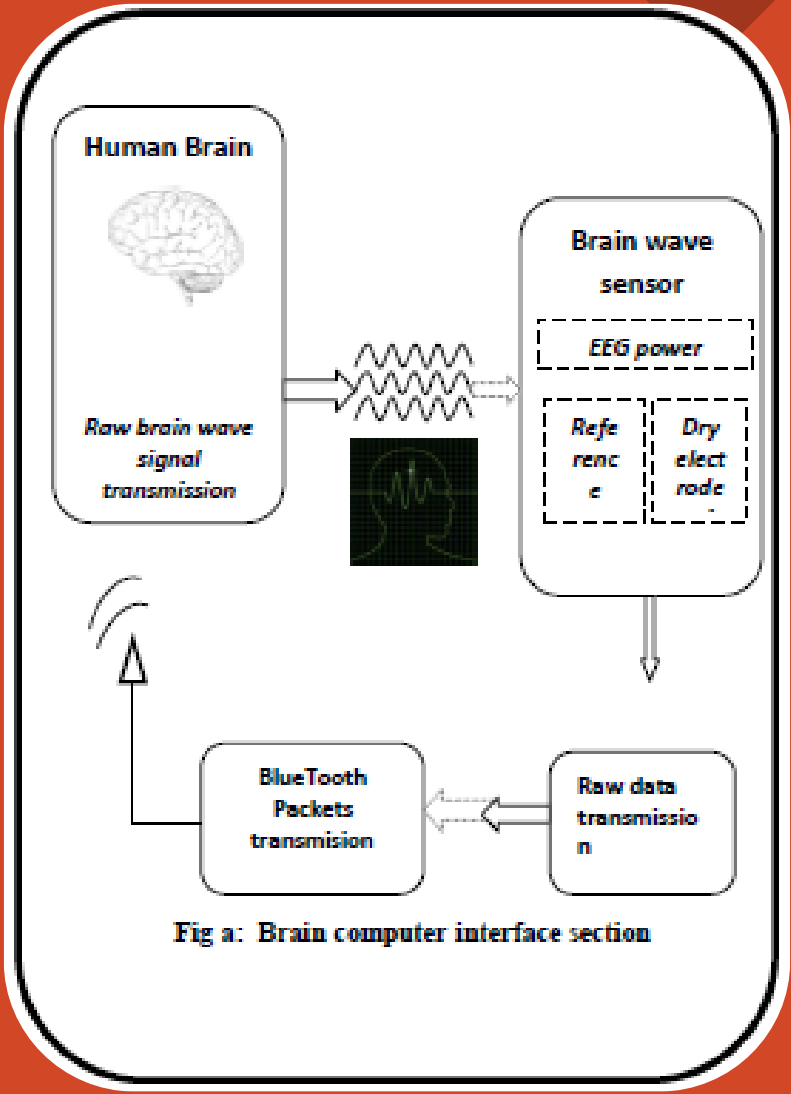
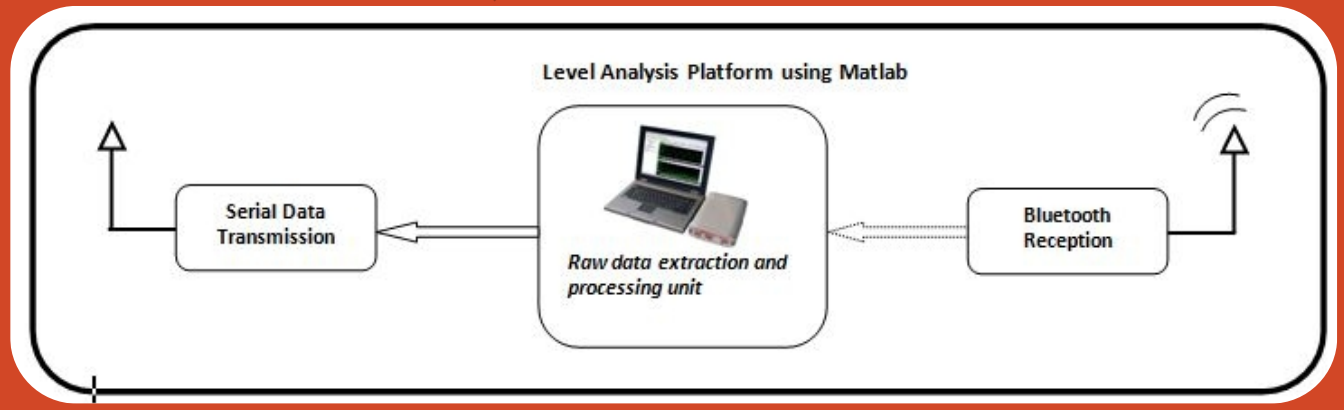
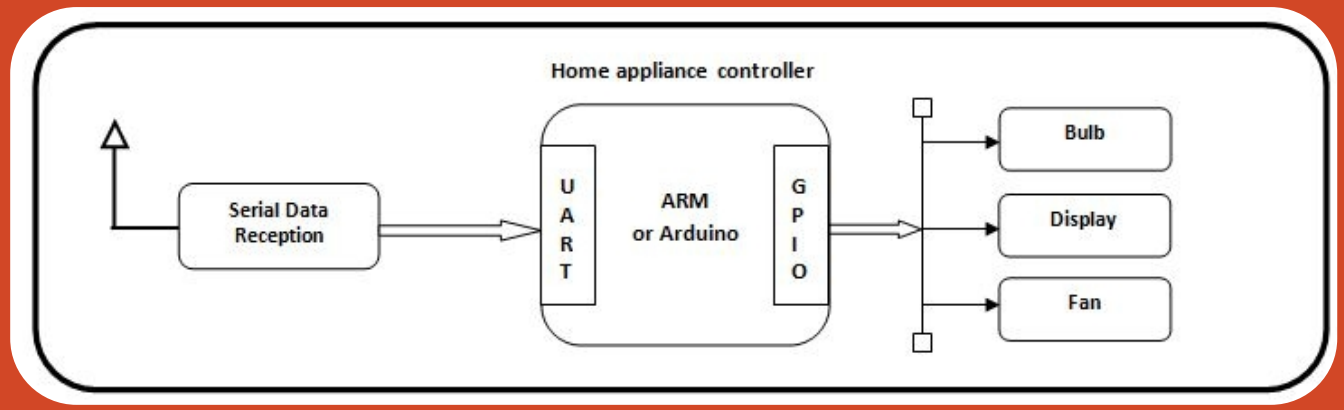
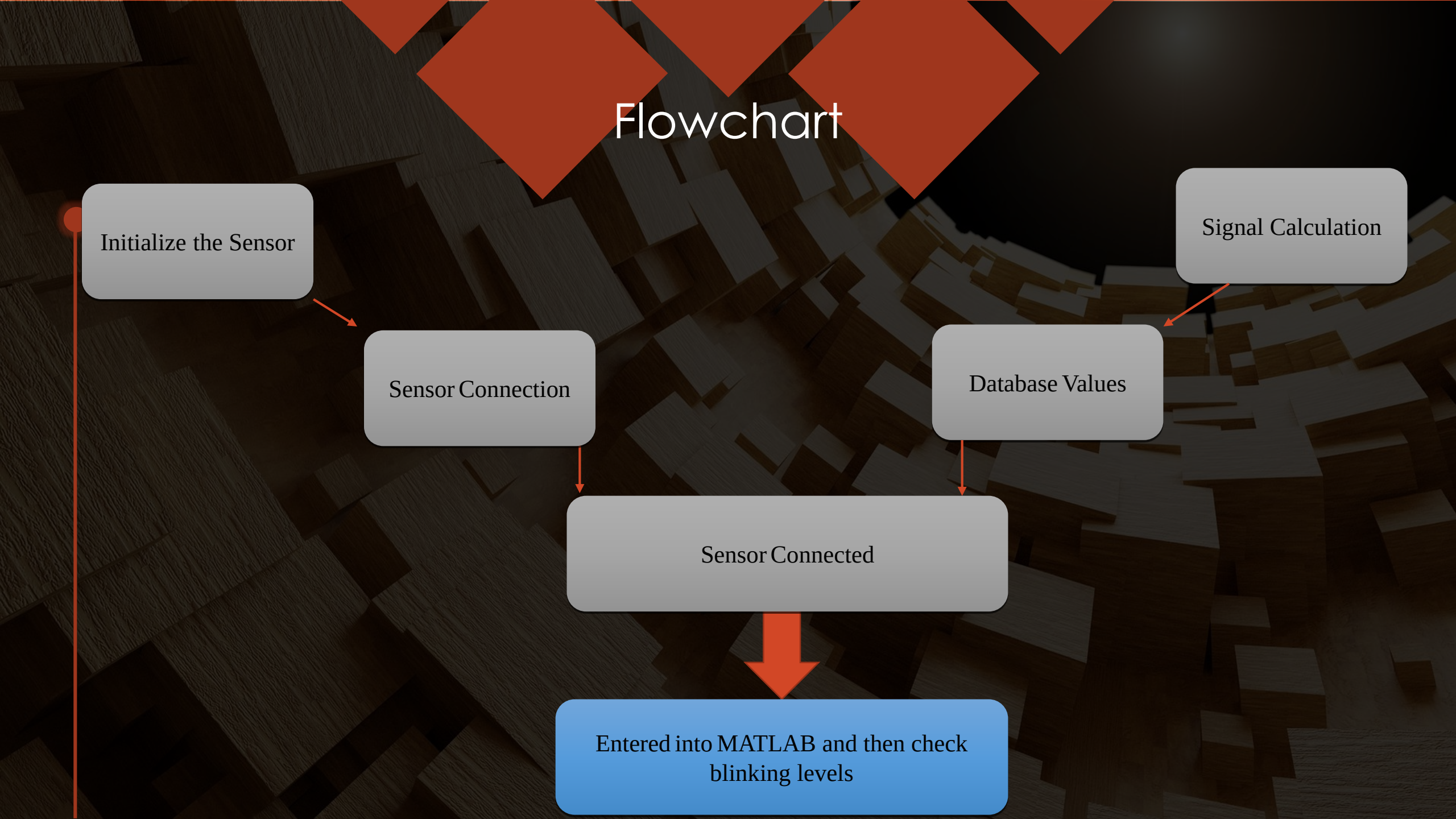



Fig a: Brain computer interface section



# Flowchart


Initialize the Sensor
Signal Calculation
Sensor Connection
Database Values
Sensor Connected
Entered into MATLAB and then check blinking levels

# Application

Visually impaired

Remote accessibility

Handicapped

Old age personnel

# THANK YOU!