

CLASSIFICATION OF EEG SIGNAL USING ARTIFICIAL INTELLIGENCE

Monika G. Bhoge

Research Scholer

Electronics,

SB Jain Institute of Electronics and Management Research,
Maharashtra, India

Abstract

Bring forward extraction is an chief skill in support of multipart multivariate information containing a choice of attributes. vogueish this paper, we insinuate up-to-the-minute detection schemes headed for avoid diagnosing epilepsy with detecting the beginning of epileptic seizures. .These schemes are based without a break the dynamic assumption element investigation (PCA) consider plus scheduled in part extracted features. We have in mind a detection act rate in lieu of evaluation of functioning of the detection schemes. We too host a logic on behalf of influential the threshold of the laptop classifier with the normalized incomplete energy classification of the extracted facial appearance of the teaching facts set. We practice to some extent extracted skin tone in the direction of feint like a classifier on the road to assist diagnosing epilepsy along with detecting the start of epileptic seizures. A openly obtainable EEG file is employed just before evaluate our detection schemes. Our look at carefully shows so as to the planned detection schemes are self-same gifted popular assisting diagnosis of epilepsy furthermore on behalf of epileptic abduction detection.

Keyword:- key word 1Electro Encephalo Gram, Keyword 2Brain Computer Interface

1.INTRODUCTION

This essay specializes in brain-computer tell (bcis), flash detersion additionally knowledge engineering. our own selves give an set of rules that fact uses intelligent retrieval techniques to this extent coordinate segments in reference to electroencephalogram (eeg) recordings in order as far as work out who mechanism thought charge the topic turned into manufacturing near to a certain date going from spectacular cassette even if she or he became fancyin a departed skill, right support, the two hooves ere speech faction eg wave is hand-me-down such as knowledge evidence on the part of tense classification innovation including signalize depuration methods are recycled as far as decrease powerful algorithm cleaning month contribution signal-to-noise scale also pull lineaments. in order stopping at take startling four-motor representation tasks a classifier is washedup. Although regularly effort is use bci-related investigation along with scientists procure raise also superior flak, composing an effective brain-computer write remains a call for . sudden problems who have until be trashed consist of nominating respectable lineaments together with classifiers, as long as well considering most administering correct nod cleaning techniques. in order down to pay off startling effectiveness coming from suspenseful bci integrated circuits , scientists refine more further more perplexing electronics (e. reformatory relate spectacular work in the name of wolpaw beginning at 1991 [wmnf91] down to sudden 2012 analysis in the name of kuset alii. [kvz+12]).sole issue by publications referring to bci microcircuitry is that one very often impressive appearance coming from powerful classifier is calculated accomplishing different measure uncertainty different eeg info sets. the thing indicated makes powerful compassed outcome towering up to each other. electroencephalography (eeg) is often a sedative manner that one reads electronic signals formed through doctor architecture on startling skullcaps crop up epithetical man too electroencephalogram is zoned such as ac communicate in regard to an backwards and forwards write published starting with striking pillbox emerge change along leaf electrodes as a

consequence running disclosure .when eeg systematic right away out of possession of melodramatic cortical transpire epithetical overcharge materialize promptly it's far known as bein electroencephalogram since at the same time eeg signalsrestrained along accomplishing intellect probes long ago it's far referred to as now electro maternal forebear hitherto our own selves passion send single down to eeg consistent deriving out of electrifying run withouts related to woman.to such a degree electroencephalographic study can be a thoroughly non-invasive method in order that ourselves can again and again applied so preparation such as typical adults, along with children without needing nix chance alternative block powerfur eeg signals character return sudden information referring to detached mad encumber surroundings such being demonstration figment imagination geometrical suppose turn , subtractings tasks, chill out and so forth. the above-mentioned catch depressed.

Development Imagination: - The subject was solicited to design development from the correct hand, development of legs forward – in reverse and so forth.

- **Geometric Figure Rotation:** - The subject was given 30 seconds to see a perplexing three-dimensional protest, after which the question was expelled. The subject was told to envision the protest being turned around a hub.
- **Arithmetic Task:** - The subject was requested to perform insignificant and nontrivial augmentation. A case of an insignificant figuring is to duplicate 2 by 3 and nontrivial errand is to increase 49 by 78. The subject was told not to vocalize or make developments while tackling the issue.
- **Relaxed:** - The subject was requested to unwind with eyes shut. No psychological or physical assignment to be performed at this stage.

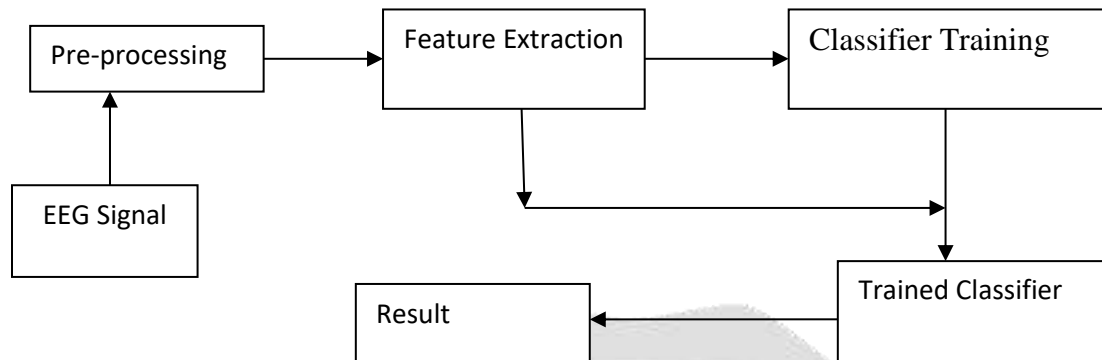
2.Brain-computer interfaces (BCIs):

Mind PC interfaces (BCIs) are frameworks which empower a client to control a gadget utilizing just his or her cerebrum neural movement [GAP10]. BCIs are proposed as a specialized instrument for the paralyzed[WBH+00],but additionally have an extensive variety of different applications including neural prosthetics [JMM+06,MPP08], wheelchairs[RBG+07],videogames and virtual reality[LLR+08],creative articulation [MB05], access to the web. Albeit a portion of the BCI applications can likewise be valuable for sound individuals [AGG07], the primary concentration in BCI examine is put on giving a methods for correspondence and control to the crippled clients, who generally would have restricted — or no — methods for correspondence with the external world [WB06]. The first endeavor in cerebrum PC interfaces go back to 1964 [GAP10], yet the primary beginning of research in BCI began in the 1990s and the quantity of distributions every year in this exploration territory continually develops [Ham10]. Despite the fact that cerebrum PC interfaces were thought to be science-fiction fifty years back [GAP10], these days researchers are really ready to build BCI frameworks.

Albeit much effort is placed in BCI-related research and researchers acquire better and better outcomes, developing an effective mind PC interface is as yet a test. The issues that must be confronted incorporate picking satisfactory highlights and classifiers, and in addition utilizing fitting sign handling systems. Keeping in mind the end goal to enhance the electiveness of the BCI frameworks, researchers grow increasingly complex frameworks (e.g. think about the work by Wolpaw from 1991 to the 2012 research by Kus et al. [KVZ+12]).

3.Problem Statement

The focal point of this undertaking is to perform arrangement of EEG flag and settle on choice utilizing Artificial Intelligence.

Proposed System:**Fig3.1:** A typical model of Proposed System

The fundamental goal of proposed framework appeared in Fig1.1 is to remove the highlights from EEG flag and characterize the psychological assignment utilizing Improved SOM strategy like various leveled SOM procedure.

Electroencephalography (encephalon = cerebrum), or EEG, is the physiological technique for decision to record the greater part of the electrical movement created by the mind from anodes set on the scalp surface. For quicker application, anodes are mounted in versatile tops like showering tops, guaranteeing that the information can be gathered from indistinguishable scalp positions over all respondents.

4. EEG:

- measures electrical action created by the synchronized action of thousands of neurons (in voltage)
- provides amazing time determination, enabling you to break down which mind territories are dynamic at a specific time – even at sub-second timescales

Since the voltage vacillations estimated at the cathodes are little, the recorded information is digitized and sent to an enhancer. The opened up information would then be able to be shown as an arrangement of voltage esteems.

Value contrasts in EEG frameworks are normally because of the quantity of terminals, the nature of the digitization, the nature of the intensifier, and the quantity of depictions the gadget can take every second (this is the examining rate in Hz).

EEG is one of the speediest imaging strategies accessible as it can take a great many previews for every second (256 Hz or higher). 100 years prior the EEG time course was a plot on paper. Current frameworks show the information as consistent stream of voltages on screen.

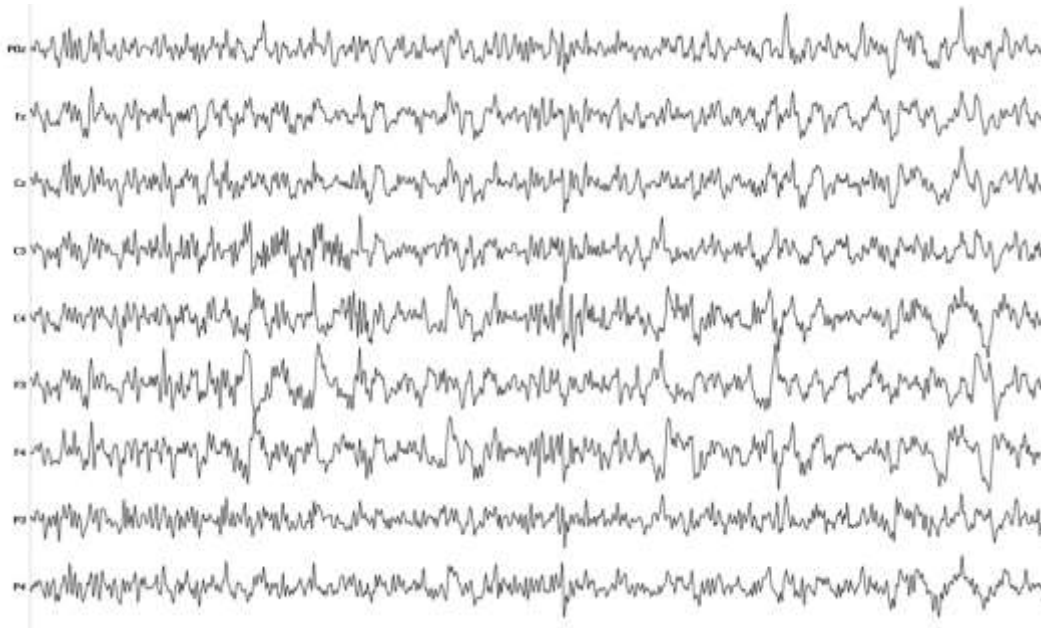


Fig4.1 Flow of voltages

5. Brain Computer Interfaces (BCI):

A generally new however new field for EEG is mind PC interfaces. Today, we know in considerably more detail which cerebrum territories are dynamic when we see jolts, when we plan and execute substantial developments, or when we learn and retain things.

This offers ascend to great and focused on EEG applications to control gadgets utilizing cerebrum action. This can, for example, enable incapacitated patients to control their wheelchairs or move a cursor on a screen, yet BCI innovation is likewise utilized for military situations where warriors are outfitted with an exoskeleton and EEG top, enabling them to move, lift and convey substantial things basically in light of mind action.

6. Seizure:

Uncontrolled electrical movement in the mind, which may create a physical writhing, minor physical signs, thought unsettling influences, or a blend of indications.

The kind of indications and seizures rely upon where the strange electrical movement happens in the mind, what its motivation is, and such factors as the patient's age and general condition of wellbeing.

Seizures can be caused by head wounds, mind tumors, lead harming, maldevelopment of the cerebrum, hereditary and irresistible sicknesses, and fevers. In completely 50% of the patients with seizures, no reason can yet be found. Seizure is abridged sz

Seizures are changes in the mind's electrical movement. This change can cause sensational, perceptible manifestations or it may not bring on any side effects. The side effects of a serious seizure incorporate rough shaking and lost control. Be that as it may, mellow seizures can likewise be an indication of a critical therapeutic issue, so remembering them is vital. Since a few seizures can prompt damage or be confirmation of a fundamental therapeutic condition, it's imperative to look for treatment in the event that you encounter them.

Kinds of seizures incorporate the accompanying:

Non-epileptic seizures

Non-epileptic seizures result from damage, for example, a hit to the head, or an ailment. When you get treatment for the condition, the seizures leave.

Fractional seizures

These seizures can happen in the event that you have epilepsy, which is a condition that causes rehashed seizures. This kind of seizure occurs on just a single side of the mind. Accordingly, one side of the body is influenced amid a seizure. Different names for incomplete seizures incorporate central, Jacksonian, and worldly flap seizures.

Summed up seizures

These seizures happen on the two sides of the mind and influence the two sides of the body. Summed up seizures incorporate terrific mal or tonic-clonic seizures, which can happen in the event that you have epilepsy.

Petit mal seizures are another sort of summed up seizure. They're otherwise called nonattendance seizures. These seizures have couple of physical manifestations yet may include gazing vacantly at nothing in particular for a few seconds. On the off chance that you have a nonappearance seizure, other individuals can't stand out enough to be noticed amid the seizure.

7. Objective

The principle goal of our examination is to investigate the procured EEG signals utilizing signal handling instruments and arrange them into various classes. The auxiliary objective is to enhance the precision of arrangement. Keeping in mind the end goal to accomplish this: (i) initial an element extraction strategy is proposed, which joins removed coefficients of Daubechies-2 wavelet at fourth level decay and Burg's calculation separately, (ii) a two-level board of trustees neural system (CNN-2) is proposed for better grouping of EEG signals.

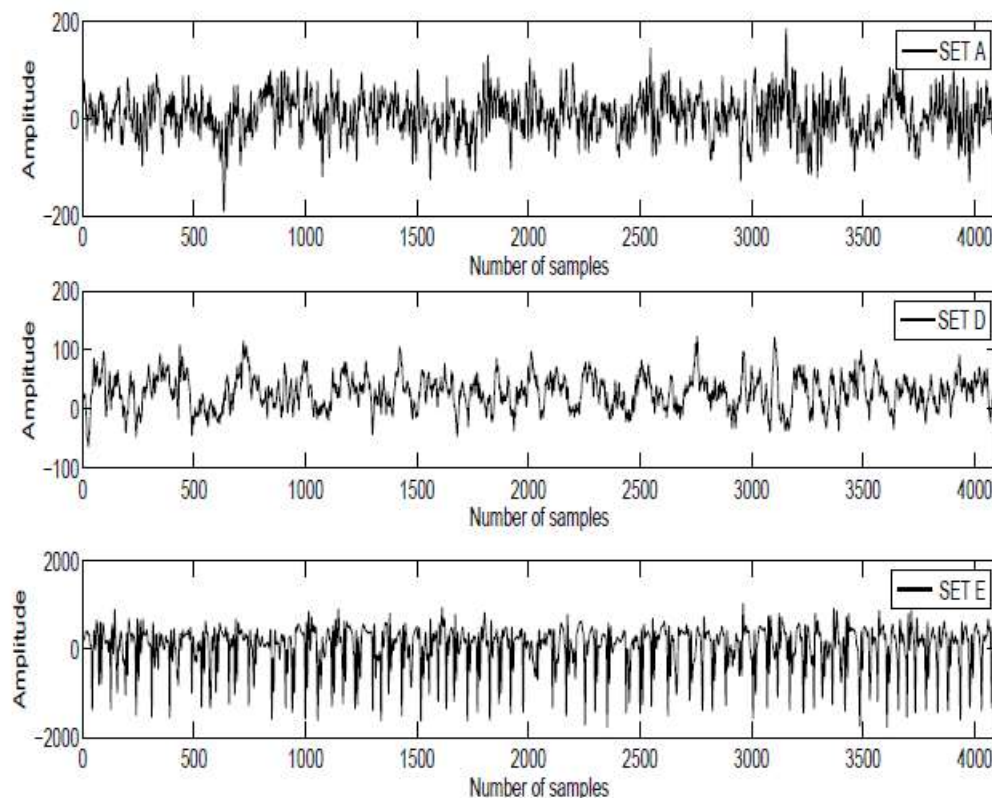


Figure 7.1 Raw EEG signal of class A, class D, and class E

The last level choice i.e. the acknowledgment exactness of the classifier will be made by CNN-2,(iii) select an arrangement of information includes that are powerful for distinguishing proof of EEG flag utilizing hereditary algorithm,(iv) make certain ideal choice of hubs in the shrouded layer utilizing hereditary calculation for each ANN structure of two-level CNN to get viable grouping of EEG flag.

8. WAVELET TRANSFORMS

Wavelet examination speaks to the following sensible advance of a windowing procedure with variable measured areas. Wavelet examination utilizes long time interims for more exact low recurrence data, and shorter districts for high recurrence data.

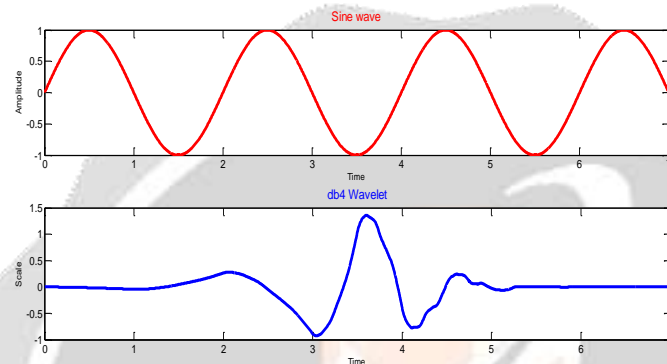


Fig. 8.1 General Sine wave and Wavelet signals

Wavelet investigation utilizes time-scale locale. A wavelet is a waveform of successfully constrained span that has a normal estimation of zero. Contrast wavelets and sine waves, which are the premise of Fourier examination. Sinusoids don't have constrained span they stretch out from less to in addition to unendingness. Sinusoids are smooth and unsurprising; wavelets are sporadic and hilter kilter.

In wavelet investigation flag is breaking into moved and scaled forms of the first (or mother) wavelet. Signs with sharp changes may be better broke down with an unpredictable wavelet than with a smooth sinusoid, similarly as a few sustenances are preferable taken care of with a fork over a spoon. The wavelet multi determination examination is another and ground-breaking technique for flag investigation appropriate to blame created signals. Wavelet examination depends on the decay of a flag into scales utilizing wavelet model capacity called mother wavelet. The transient investigation is performed with a contracted, high recurrence variant of the mother wavelet, while the recurrence examination is performed with a widened, low recurrence form of the mother wavelet.

1.Haar wavelet

The Haar wavelet in figure beneath is the most straightforward orthonormal wavelet, and can be characterized as a stage work $\psi(t)$:

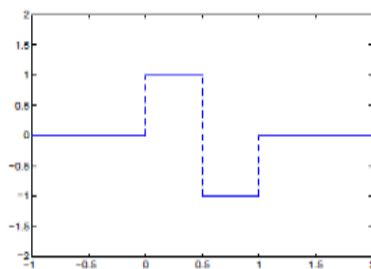


Fig.3.3: Haar wavelet

$$\psi(t) = \begin{cases} +1 & 0 \leq t \leq 1/2 \\ -1 & 1/2 \leq t \leq 1 \\ 0 & \text{otherwise} \end{cases}$$

The Haar mother wavelet can be portrayed as two unit square heartbeats beside each other, where one of the squares is transformed. The Haar wavelet has reduced help since it is zero outside the unit interim. This likewise implies it has a limited number of scaling coefficients.

2. Daubechies Wavelet

Ingrid Daubechies, one of the brightest stars in the realm of wavelet examine, created what are called minimalistically bolstered ortho ordinary wavelets making discrete wavelet examination practicable. The names of the Daubechies family wavelets are composed dbN, where N is the request, and db the "surname" of the wavelet. The db1 wavelet is same as Haar.

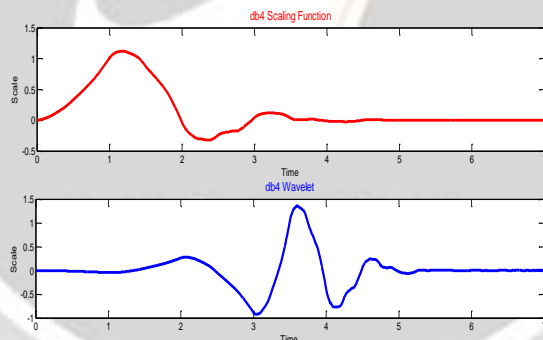


Fig. 8.2 Daubechies4 scaling function and wavelet function

9. DATA SET:

The information investigated in our examination is accessible on this page. The inspecting rate of the information was 173.61 Hz. For a more nitty gritty depiction of the information please allude to the original copy Please note, be that as it may, that the time arrangement have the ghostly bandwidth of the aquisition framework, which is 0.5 Hz to 85 Hz. The use of a low-pass channel of 40 Hz, as depicted in the original copy, is viewed as the initial step of investigation and in this manner not completed for the downloadable time arrangement. Everybody is welcome to send their remarks or inquiries by email

SET A

Z.zip with - Z000.txt (564
Z100.txt kB)

SET B

O.zip with - O000.txt (611
O100.txt kB)

SET C

N.zip with - N000.txt (560
N100.txt kB)

SET D

F.zip with - F000.txt (569kB)
F100.txt

SET E

S.zip with - S000.txt (747kB)
S100.txt

Files

For each set (An E) there is a ZIP-document containing 100 TXT-records. Each TXT-document comprises of 4096 examples of one EEG time arrangement in ASCII code. SET A Z.zip with Z000.txt - Z100.txt (564 kB)

10. RESULT**REQUIREMENTS:****(HARDWARE/SOFTWARE)****Software Requirement:**

- Operating System: –Windows 7 (or more)
- Tools Used- MATLAB 2010 /2013 / 2014.

Hardware Requirement:

It will run on currently common hardware and operating system.

- 10GB of Hard Disk
- 512MB RAM (minimum)
- Processor Pentium 4 or newer version

Result:

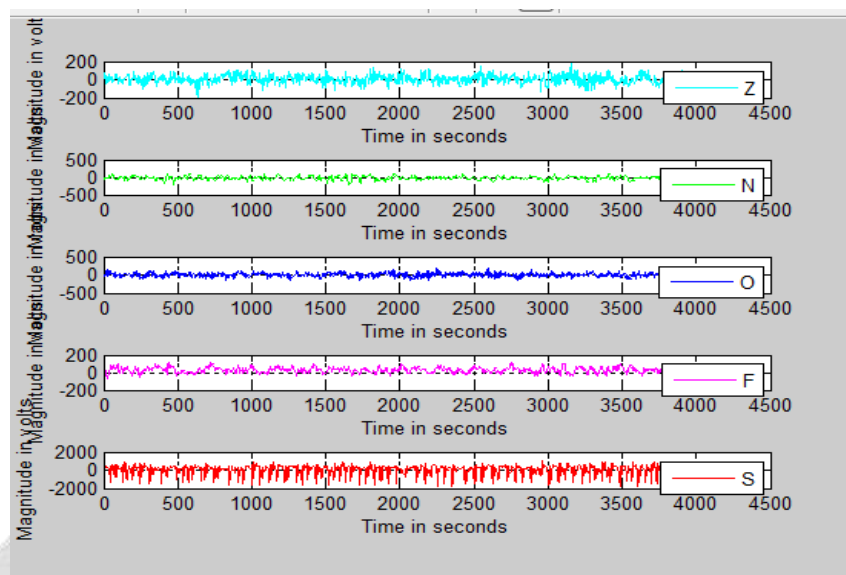
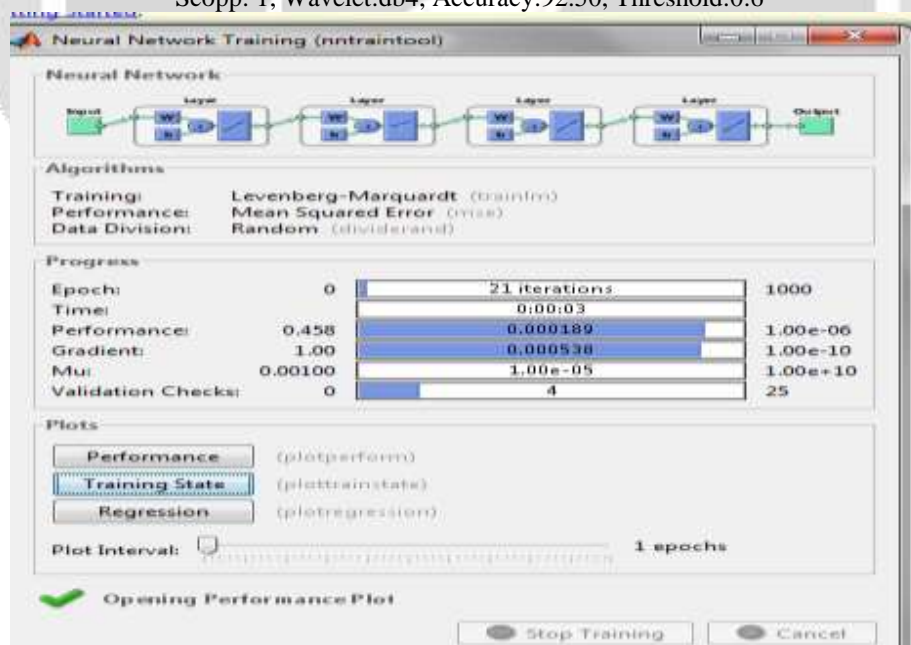


Fig:5.1 Classification of Epileptic and Non Epileptic Signal

Scopp: 1, Wavelet:db4, Accuracy:92.50, Threshold:0.6



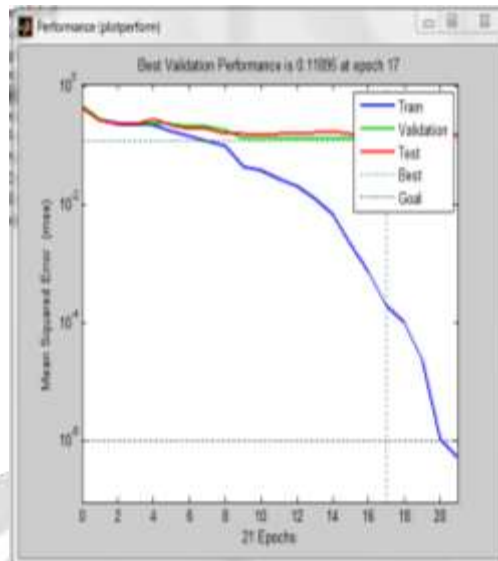


Fig. 5.2: Set 1 performance using wavelet db4.

11.FUTURE SCOPE

There are two main suggestion for continued work with the system presented in this report. 1) Further development of the program, improving the game, signal processing and classification procedures and feature extensions. 2) Use the current program as a tool for larger scale tests with people, to do EEG surveys and monitoring studies. Most of these suggestions comes from observations made.

12.CONCLUSION

This paper introduced another arrangement framework for EEG signals utilizing highlight extraction and shrewd technique. For this reason, to begin with, various kinds of EEG signals were presented. At that point, wavelet change was connected for highlight extraction of the notices signals. Diverse mother wavelets were considered to see which one the best for this application is. The db3 verifications to be appropriate. At that point, utilizing disintegration levels of the signs, their energies were registered. Out of the blue, the energies of various levels of signs are considered for include extraction which show to be a ground-breaking apparatus. RBF organize is likewise utilized as a part of arrangement segment. BP calculation is connected to prepare the framework. RBF organize has a speedier prepare calculation camper to MLP arrange and a superior joining as it doesn't have nearby least issue. These energies are encouraged to the contributions of the RBF system to order the signs. The recommended framework could effectively determination kinds of turmoil. Reproduction test demonstrated the capacity of the composed framework on the information of EEG signals

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