# A Wearable device for Continuous Detection and Screening of Epilepsy during Daily Life

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***Abstract*: Imbalance in the nervous system causes Epilepsy disease which may lead to death. The most common symptoms of epilepsy disease are sudden fluctuations in heart beat rate and involuntary muscular movements (seizures).The wireless electronic diagnosing system used here is meant for epilepsy patients only. Occurrence of seizures predicated by this system. With the aid of this system, the patient can lead a healthy life. Since the occurrence of seizures is unpredictable, it will be difficult to leave the patient alone. The electronic system used here is a wearable device which predicts the occurrence of epilepsy disease. The signals from human body is used to detect the occurrence of epilepsy disease.When the device detects the symptoms, it transmits a coded signal to produce control signals for switching an alarm device, doctor or relatives mobile phone using wireless communication with help of GSM modem and GPS is used to trace out the exact location of the patient.**

***Keywords*: Heartbeat sensor, Accelerometer sensor, Brain sensor, GPS, GSM.**

## INTRODUCTION

Epilepsy is a progressive neurological disorder that affects more than 65 million people worldwide. The human brain constantly sends out electrical signals, and their brains frequently emit extra electrical bursts in people with the disorder, causing electrical storm and manifesting in seizures. Researchers proposed a generalized, patient-specific seizure prediction technique capable of alerting patients with epilepsy within few minutes of a seizure probability. A disruption in the brain's electrical activity causes epileptic seizures

Obtaining signals form the patient`s body are developed by present technologies. The heart beat and muscular movements can be detected by many sensors accurately. Micro electromechanical systems (MEMS)are firmly attached to the body to predict the muscular convolutions which is very accurate. The sensors used are small in size and can be firmly attached to the body. The accelerations resulting from epileptic convolutions are sensed using MEMS accelerometer which is very accurate and precise.

## LITERATURE SURVEY

[1] A disruption in the brain's electrical activity causes epileptic seizures. Many forms of epileptic seizures occur. Study says there are many forms of epileptic seizures occur. These seizures occur with little or no warning and about one third of people with epilepsy are resistant to treatment that controls these seizures

Machine learning techniques have been shown to be successful in the creation of predictive seizure therapies, the development of Internet of Things (IOT), portable low-power devices with network connectivity to help patients.

Researchers utilized deep machine learning and based on the data, created a complex analytical tool for reading the patient's electroencephalogram (EEG) data from a wearable cap or other portable device for collecting EEG information. So, it could predict algorithm with sensitivity of up to 81.4 per cent and false prediction rate as low as 0.06 an hour.

However, while this still leaves some uncertainty, but expect that as access to seizure data increases, sensitivity rates can be improved. The algorithm can produce optimized features for everyone, using convolutional neural network that is highly attuned to observing changes in brain activity based on EEG readings.

[2] Actually nearly 50 million people in world affected from the Epilepsy disease hence it is most chronological disorder. Now a days most of research has been started to avoid and diagnosis the Epilepsy. Here, based on both signal and image processing can predict along with the comparison of performance of different extraction method and classifiers, we can detect the epilepsy. To know the more information about the disorder in the brain we use the muti model approach which improves the specificity of the system as soon as possible to avoid fault detection.

In world wide nearly 50% are affected by convulsive seizure and 40% are affected by non-convulsive seizure this is because of positive and negative activities of neuron transmitters which may lead to severe head injury, brain infection and many more.

[3] EEG signal has been developed by using short time Fourier transform (STFT) and convolution neural network (CNN). The actual research data and parameter setting are the 2 main components which verifies feasibility. As per the comparison the average accuracy of the signal is 86% by using support vector machine (SVN). The epileptic seizure detection will be stable and will perform high using this signal as it increases accuracy to 90%. The connection between EEG and epileptic seizure is based on the EEG signal has been a main approach. They are only a few applications based on deep learning they are EEG signal, re-processing of signals, Time-frequency analysis, these are the overall framework of the algorithm

[4] Epilepsy is a neurological disorder, which is affecting a large number of people all over the world.

For its detection of epilepsy electroencephalograph (EEG) is commonly used in clinical approach.

As epilepsy is the major problem, affecting a large number of people. Ensemble of pyramidal one-dimensional convolution neural network (P-1D-CNN) models was proposed.
But as a result, CNN model required a huge volume of data, to overcome this problem CNN works on the concept of refinement and re-centralization and proposed to augmentation scheme.
AS a result, CNN model will ease the burden of neurologist and will assist the patient before the seizure occurs.
About fifty million people in the world are affected by Epilepsy i.e. neurological disorder. The examination of one-day EEG recording of a patient required more time and more work. Classifying epileptic and non-epileptic EEG brain signals are develop and design to assist neurologists conclusion. As per the conclusion about 61% less memory is required for P-1D-CNN but storage and memory requirement for variable devices might a issue, also through mobile devices system can be deployed in a centralized cloud environment.
Warning alarm can be generated to alert doctor or patient. The device will increase the efficiency and reduce the burden of neurologist in detecting epilepsy. As model is having limited data it is easy to deploy on chips and also for training purpose.

[5] There are 10-20 electrode settling used for recording human signals. Earlobes electrodes are connected to left and the right earlobes. EEG signals helps in diagnosis physiological abnormalities of the brain and CNS of human beings. EEG helps in detection of Epilepsy a chronic disorder affecting 10% of world's population. Epilepsy includes visual scanning of EEG recordings for spikes and seizures. Powerful method was proposed i.e. the wavelet transforms (WT) which is used for analyzing non-stationary signals. Our objective in developing this to prove software solution for analyzing long term recordings and to detect seizure. Wavelets divides continuous time signals into different scale components. Detection of signals and analyzing became very difficult so support vector machine [SVM] has been widely used in classification and regression.

[6] Electroencephalogram (EEG) signals are stored and used to study the electric activity of the brain. Electrical signals generated by the brain representing status of the whole body. Here mainly five subsets are used; two subsets are used for healthy patients during eyes closed and opened. Another subset is used seizure free place that is epileptic zone and hippocampal formation of opposite hemisphere of brain and last subset contains seizure activity. First two subsets records are taken by relevant depth electrodes and the remaining are additional strip electrodes onto lateral and basal region of neocortex.

[7] By using two phase congruence, detection of two EEG data of epilepsy and seizure is done. The methods based on magnitude detects accurately comparing results. We propose an effective method for distinguishing a set containing the seizure activity. Electroencephalogram which is used for testing problems related to electrical activity of the brain is assumed to be a non-stationary signal. Hence, calculating phase congruence using wavelet transform is more efficiently used.

[8] Another method used is in the form of CMOS integrated device for detecting epilepsy disease. Low power detector is used, which helps in extracting seizure onset information from body signals (wherever disease is affected), within a given time period.This low power detector observes the neural signals time to time. It provides patient's specific tun-able parameters to adjust seizure onset patterns. The performance for detection from a patient is verified using (EEG) electroencephalographic recordings. In order to reduce the power and to keep the circuit simple, it is compared with the amplifier.

[8] We demonstrate feasibility of incorporating tool valid for seizure detection. An algorithm creating an analog seizure is used as a detecting device. Cost care of epilepsy diseases is found up to 25% billions. Earlier, the approach for patients were protected in a cost -effective manner which helps in checking quantification of seizures. The analog implementation is incorporated into ASIC. As analog ASIC implementations has many applications it is extensively used in removing the unwanted noise.

[10] Nowadays epilepsy is one of the most common neurological disorder so here ambulation recording system is used to obtain the EEG recording from the patients. Elman network performing more better than the other neural networks , it is not the time to consuming actual traditional method of analysis being time consuming .Here we using four different types of artificial neural networks for detecting epilepsy, they are Muti-layer perception (MLP) , Elman network (EN) , Artificial neural network (ANN) , Learning Vector Quantization (LVQ). Among all these four ANN s the Elman network yielded is the best result.

**Table 1: Literature Survey**

| Author | Year | Techniques | Advantages |
|---|---|---|---|
| Farzad Samie, Lars Bauer | 2018 | Machine learning techniques | It learns when patterns change in brain. |
| Ihsan Ullah ,Hussein | 2018 | One-dimensional deep convolutional neural network (CNN) model | the model is easy to train having limited data |
| R Vetrikani , T Christy Bobby | 2017 | Muti model approach | It improves specifications by retrieving more information about brain disorder |
| Yuzhen Cao, Yixiang Guo, Hui Yu | 2017 | Short Term Fourier Transform (STFT) and CNN | Using deep learning it gives the best performance |
| AbdellAtif Abuimara | 2015 | Signal amplitude | Can be predicated from small time interval |
| Asha S A ,Sudalaimani C,Devanand P | 2013 | SVM and ANN | Capable of high degree discrimination |
| Bruno Direito ; Francisco Ventura ; César Teixeira | 2011 | Support vector machines (SVM) | Create individual tailored solutions |
| Muhammad Tariqus Salam ; Mohamad Sawan ; Anas Hamoui | 2009 | CMOS technology | No false alarms |
| Nuresh C,Bhavaraj,mark G.Frei,Ivan Osorio | 2006 | Standard statistical tools | Low power consumption, increase battery life |
| V. Srinivasan ; C. Eswaran ; N. Sriraam | 2004 | Ambulatory recording system | Elman network performs better |

## CONCLUSION

Nowadays, modern technologies are in leading edge developing many automation's. Using the convolution neural network (CCN) and short time Fourier transform (STFT), EEG signals can be developed. EEG signal has main approach of the research of the epileptic seizure due to the connection between the EEG and epileptic seizure. The predication and diagnosis of epilepsy seizure depends on the signal processing or the image processing, here without using multi model tool there is a possibility of fault identification which leads to either fault treatment or delay treatment which may also lead to death. Especially a wearable device is developed which is cost effective this device helps million victims of epilepsy. By using this device, the patient can move freely like normal person. Prevention is better than cure. Prediction of occurance of epilepsy is necessary for preventing loss of life.

## FUTURE SCOPE

A wearable device can be used for epileptic patient especially while driving and sleeping. When the person is in remote area it helps to identify the exact location of the victim and sends message to doctor and their relatives through GSM. This device can be manufactured in large scale also. It is also useful in detecting other Brain related diseases.

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