A

Project Report

On

Epileptic Seizure Detection from EEG signals using Machine Learning

SUBMITTED TOWARDS THE
PARTIAL FULFILLMENT OF THE REQUIREMENTS OF

Bachelor Of Engineering (Computer Engineering)

BY

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2019-20

SVPM's COLLEGE OF ENGINEERING
DEPARTMENT OF COMPUTER ENGINEERING

CERTIFICATE

This is to certify that the Project Entitled

Epileptic Seizure Detection From EEG signals Using Machine Learning

Submitted by

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is a bonafide work carried out by Students under the supervision of Prof.Khalate Y.R and it is submitted towards the partial fulfillment of the requirement of Bachelor of Engineering (Computer Engineering) Project.

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PROJECT APPROVAL SHEET

A

Project Stage-II

On

Epileptic Seizure Detection from EEG signals using Machine Learning

Is successfully completed by

at

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Abstract

Epilepsy is nothing but neurological disorders affecting a significant portion of the world's population and approximately 2.5 million people in the United States. We implemented a software based automated seizure detection system which detects a seizure from electroencephalography (EEG) signals using machine learning algorithm. The implemented system validate or test the values or signals given by user (Doctor) and then it predicates whether the epilepsy is detected or not.There are several ways to diagnose epilepsy by clinical examinations. However, the diagnosis can be best performed by electroencephalography (EEG) due to its high temporal resolution. EEG is a process of measuring electrical activity in the brain. The manual seizure detection process is a tedious and time consuming task, which necessitates automated seizure detection systems which can detect seizures quickly.

We have used Support Vector Machine algorithm for classification .It predicts whether the epilepsy is detected or not . After prediction of epilepsy it send message to patient's relatives .

Keywords: Epilepsy , Electroencephalography , Seizure , Neurological, Support Vector Machine .

Acknowledgments

It gives us great pleasure in presenting the project report on ***'Epileptic Seizure Detection from EEG signals using Machine Learning'****.*

I would like to take this opportunity to thank my internal guide ***Prof. Y. R. Khalate*** *and all teachers for giving me all the help and guidance I needed. I am really grateful to them for their kind support.I appreciate all valuable suggestions given and queries raised by her which really helped us in exploring project in deep.*

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Chapter 1

INTRODUCTION

1.1 Details Of Project Work

The purpose of this document is to present detailed description of software for accurate epilepsy seizure detection. It will detect epilepsy seizure. The implemented software take input from user and validate by using training dataset and detect the epileptic seizure. Seizures caused by epilepsy are unprovoked, they disrupt the mantel activity of the patient and impair their normal motor and sensorial functions, endangering the patient's wellbeing. Exploiting today's technology it is possible to create automatic systems to monitor and evaluate patients. An area of special interest is the automatic analysis of EEG signals. This paper presents extensive analysis of feature extraction and classification methods that have reported good results in other EEG based problems.

Several methods are detailed to extract 52 features from the time, frequency and time-frequency domains in order to characterize the EEG signals. Additionally, 10 different classification models, together with a feature selection method, are implemented using these features to identify if a signal corresponds to an epileptic state. The experiments were performed using the standard SVM and the proposed method achieve results comparable to those in the state-of-the-art for the three and four classes problems.

In this way in this project we have predict epilepsy seizure.For that prediction here we have applied or used support vector machine algorithm.There are many classification algorithms but we have used support vector macine because it gives accurate results.it requires more time for processing but it is more accurate.In medical field accuracy is very important hence it is very

much better algorithm for epilepsy detection.

1.2 Problem Statement

- To Detect the seizure at earlier stage for smart healthcare.

1.3 Objectives

- To Overcome the problem of Epilepsy.
- To detect the Seizure at earlier stage.
- Creating People Awareness about Health.

1.4 Scope Of the Project

Epilepsy seizure detection software that doctor can use to detect epilepsy seizure at early stage. In that software patient's data can be stored. It will be used for detection. With the help of various parameters of patient's data, software can detect epilepsy seizure.

After detection of epilepsy seizure Results will be send to relatives of patient's through the message.It will be helpful for relatives to take care of patients or for proper tretment of patients at right time.

1.5 Motivation Of the Project

- Seizures,affects approximately 1 of the world population.
- 30 to 40 percent of patient,antiepileptic drugs cannot effectively control seizures.
- Uncontrolled epilepsy can lead to depression.
- Uncontrolled epilepsy can lead to Higher cost.

1.6 Outcomes Of Project

- We get the result of epilepsy seizure detection
- We can take care of Patient at earliar stage.
- Reduces the problem of epilepsy.

1.7 Applications Of Project

- The earlier alert of Epilepsy seizure will get to patient family so that it will helps them real time to take care of patient.
- Doctor can continuously monitor the Patient who has this disorder with the help of EEG data which he has already stored.

Chapter 2

LITERATURE SURVEY

2.1 Literature Survey

Over many decades, research is being attempted for the detection of epileptic seizure to support for automatic diagnosis system to help clinicians from burdensome work. In this respect, an enormous number of research papers is published for identification of epileptic seizure. It is difficult to present a detailed review of all these literature. Therefore, in this paper, an attempt has been made to review the detection of an epileptic seizure. More than 100 research papers have been discussed to discern the techniques for detecting the epileptic seizure. Further, the literature survey shows that the pattern recognition required to detect epileptic seizure varies with different conditions of EEG datasets. This is mainly due to the fact that EEG detected under different conditions has different characteristics. This is, in turn, necessitates the identification of pattern recognition technique to effectively distinguish EEG epileptic data from a various condition of EEG data.

Table 2.1 : Literature Survey

Name	System Details	Characteristics
L. S. Vidyaratne and K.M. Iftekharuddin, "Real-Time Epileptic Seizure Detection Using EEG" [8]	This paper proposes a novel algorithm for epileptic seizure detection with scalp EEG that utilizes a wavelet decomposition method, known as HWPT, and FD estimation. The procedure of feature extraction and the formation of feature vector are designed such that spectral, fractal, spatial, and temporal information of seizure EEG are captured in the feature vectors.	The proposed algorithm a sensitivity of 96% with a median false positive rate of 0.1 h-1and an average detection delay of 1.89 s for the long term EEG Dataset A. Analysis of short-term scalp and intracranial EEG in Dataset B yields a 99.8% seizure detection accuracy.
M. A. Sayeed, S. P. Mohanty, E. Kougianos, and H. Zaveri, " An Energy Efficient Epileptic Seizure Detector" [6]	The proposed approach detects seizure onset based on the number of hypersynchronous pulses. The signal detection circuit provides the data for the hypersynchronous pulses.	The proposed implantable seizure onset detector monitors the brain activity in the seizure onset area.

M. A. Sayeed, S. P. Mohanty, E. Kougianos, V. P. Yanambakha, and H. Zaveri, " A Robust and Fast Seizure Detection in IoT Edge " [7]	The proposed seizure detection method utilizes the DWT, statistical features, and a naive Bayes classifier. DWT provides time frequency (TF) localization of the EEG signal. The statistical features show considerable potential to distinguish seizure and non-seizure behavior and the use of the naive Bayes classifier leads to an improved classification accuracy.	In this smart seizure detection system in the edge-IoT framework which utilizes statistical feature extraction and naive Bayes classification. The prototype of the system was implemented using Simulink R and ThingSpeak.
Smith, Md Abu Sayeed, Student Member, IEEE, Saraju P. Mohanty, Senior Member, IEEE, Elias Kougianos, Senior Member, IEEE, Hitten P. Zaveri "Neuro-Detect: A Machine Learning Based Fast and Accurate Seizure Detection System in the IoMT" [2]	In this paper, a machine learning based automated seizure detection method has been proposed in the IoT framework, which utilizes Hjorth parameters as well as statistical features, and DWT based feature extraction. The system was validated using a hardware-in-loop based simulation approach.	The experimental results show that the proposed approach is highly effective in understanding complex EEG dynamics, which leads to an improved classification accuracy as compared to existing algorithms.

Md Abu Sayeed, Student Member, IEEE, Saraju P. Mohanty, Senior Member, IEEE,Elias Kougianos, Senior Member, IEEE, Hitten P. Zaveri "eSeiz: An Edge-Device for Accurate Seizure Detection for Smart Healthcare "[1]	Support vector machine algorithm is used for classification.	It gives more accurate results.It requires more time for computation but it is more accurate.

2.2 System Architecture

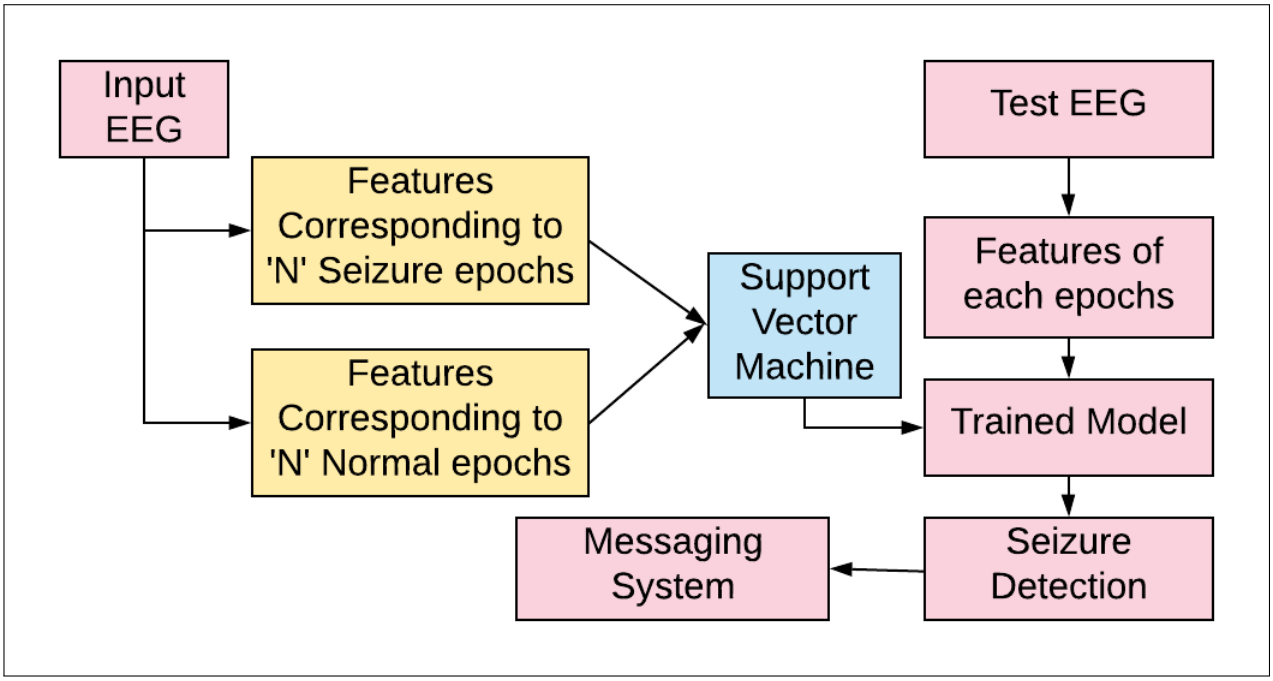

Figure 2.1: System Architecture

In this System architecture First block is of Input signals,which are nothing but EEG signals. These are given by using dataset values or aatributes.Input signals are classified into features corresponding to Seizure epochs and features corresponding to normal epochs.after that these two features blocks are connected to classifier model,which is support vector machine. it will classify the dataset into training data and testing data.It is connected to block of training model.In this architecture there is block of testing EEG which we want to predict then this features corresponding to testing data will be compared by using trained model and result will be evaluated .after that seizure detection block is connected to messaging system .Result of seizure detection(epilepsy detected or not) is send to relatives of patients by using messaging system.

Chapter 3

REQUIREMENT ANALYSIS

Software Requirement Specification

3.1 Introduction

3.1.1 Purpose

The purpose of this document is to present detailed description of software for accurate epilepsy seizure detection. It will detect epilepsy seizure. The purposed software take input from user and validate by using training dataset and detect the epileptic seizure. Seizures caused by epilepsy are unprovoked, they disrupt the mantel activity of the patient and impair their normal motor and sensorial functions, endangering the patient's wellbeing. Exploiting today's technology it is possible to create automatic systems to monitor and evaluate patients. An area of special interest is the automatic analysis of Seizure detection

3.1.2 Scope

Epilepsy seizure detection software that doctor can use to detect epilepsy seizure at early stage. In that software patient's data can be stored. It will be used for detection. With the help of various parameters of patient's data, software can detect epilepsy seizure. After detection of epilepsy seizure Results will be send to relatives of patient's through the message.It will be helpful for relatives to take care of patients or for proper tretment of patients at right time.

3.1.3 Definations,acronyms & abbreviations

- Epilepsy :
  The epilepsies are a heterogeneous group of neurological disorders and syndromes characterised by recurrent, involuntary, paroxysmal seizure activity, which is typically associated with a clinicoelectrical correlate on the electroencephalogram (EEG).

- Electroencephalography :
  It is the term given to the technique of recording electrical activity resulting from ionic current flows generated by neurons in the brain Its main clinical application is in the evaluation of patients with suspected epilepsy.

- Seizure :
  Seizure is simply the medical condition or neurological disorder in which too many neurons are excited in the same time caused by brain injury or by an imbalance of chemical in the brain that is characterized predominantly by unpredictable interruptions of normal brain function.

- EEG: Electroencephalography

- SVM: Support Vector Machine

- SD: Seizure Detector

- ECG: Electrocardiogram

3.1.4 Overview

Seizures caused by epilepsy are unprovoked, they disrupt the mantel activity of the patient and impair their normal motor and sensorial functions, endangering the patient's wellbeing. Exploiting today's technology it is possible to create automatic systems to monitor and evaluate patients. An area of special interest is the automatic analysis of EEG signals. This paper presents extensive analysis of feature extraction and classification methods that have reported good results in other EEG based problems.

Several methods are detailed to extract 52 features from the time, frequency and time-frequency domains in order to characterize the EEG signals. Additionally, 10 different classification models, together with a feature selection method, are implemented using these features to identify if a signal corresponds to an epileptic state. The experiments were performed using the standard SVM and the proposed method achieve results comparable to those in the state-of-the-art for the three and four classes problems.

3.2 Overall Description

3.2.1 Product Perspective

3.2.1.1 System Interfaces

This system is provisioned to be built on the python framework which is highly flexible.Decision regarding wich database should be taken considering the fact that data being exchanged or sorted is large, and the appropriate data management system will yield efficient performance.

3.2.1.2 User Interfaces

This software highly depends on the type and version of browser being installed in the system i.e. browser version should be used which have HTML5 support.

- Admin/Clinic Login Page
- Register Doctor Page
- Register Patient Page
- Communicate between Doctor and Patient.

3.2.1.3 Hardware Interfaces

Developing Environment

Table 3.1 : Hardware Interfaces

Sr.No.	Parameter	Minimum Requirement
1	CPU Speed	2.5GHz
2	RAM	8GB
3	HDD	1 TB

Operating Environment

Table 3.2 : Hardware Interfaces

Sr.No.	Parameter	Minimum Requirement
1	CPU Speed	800MHz
2	RAM	256MB

3.2.1.4 Software Interfaces

Developing Environment
Platforms:

- Operating System: Windows 10.
- IDE:Pycharm,Visual Studio Code.
- Programming Language:Python
- Database: SQLite

Tools:

- Documentation:TexLive(Textworks Editor) and Overleaf(Online LaTex Editor)
- Diagram:LucidChart(Online Drawing Tool)

Operating Environment
Platforms:

- Operating System:Windows 10.
- Web Browser: Chrome ,Mozila.

3.2.1.5 Communication Interfaces

- This system uses standard protocol to transmit the data to doctor or hospital as admin.the admin provides or communicate to relatives with the help of database.
- Python compatible devices.
- This Project support all types of browsers which supports HTML5.

3.2.1.6 Memory Constraints

- Minimum 8GB Ram

3.2.1.7 Operations

- Classification and Decision Making

3.2.2 Product Functions

We have to predict whether a given patient has a seizure problem or not, on the basis of 179 (Multivariate, Time-Series) variables, called features. Which means there are following possible outcomes? Label 1, 2, 3, 4, 5: 5 - Eyes open, means when they were recording the EEG signal of the brain the patient had their eyes open 4 - Eyes closed, means when they were recording the EEG signal the patient had their eyes closed 3 - Yes they identify where the region of the tumor was in the brain and recording the EEG activity from the healthy brain area 2 - They recorder the EEG from the area where the tumor was located 1 - Recording of seizure activity

3.2.3 User Characteristics

Designed for Doctors and patients.

3.2.4 Constraints

Preprocessed Dataset and Device with python installation

3.2.5 Asssumptions and Dependencies

Application will be installed on computers with windows 10 & python

3.3 Specific Requirements

3.3.1 External Interface Requirements

The system takes input from scanner,keyboard,and files in the memory.The system generates printable output on the screen and peripherals.The system uses mysql database.

3.3.2 Performance Requirements

The system is required to support multiple terminals simultaniously.The system should handle reasonable number of users without break or inconsistency.

3.3.3 Design Constraints

Design constraints are those constraints that are imposed on the design solution.These constraints are typicaly imposed by the Doctor,Relatives of patients.

3.3.4 Software System Attribute

3.3.4.1 Reliability

Designs are usually based on specifications.Reliability requirements are the part of a technical specifications document.They can be requirements that Hospital sets for its software and its own Engineers or what it report as its reliability to doctors

3.3.4.2 Availability

For the purpose of this project the software should be easily available to user and it should be easy to use.

3.3.4.3 Maintainability

Maintainability is the ease with which faults in a software system can be found and fixed.It address the user concern for how easy it is to upkeep and repair the system.

Chapter 4

ALGORITHM ANALYSIS AND MATHEMATICAL MODELING

4.1 Support Vector Machine(SVM)

4.1.1 What is the SVM Algorithm?

In machine learning, support vector machine (SVM) are supervised learning models with associated learning algorithms that analyse data used for classification and regression analysis. A Support Vector Machine (SVM) is a discriminative classifier formally defined by a separating hyperplane. In other words, given labelled training data (supervised learning), the algorithm outputs an optimal hyperplane which categorizes new examples

4.1.2 How Does SVM Work?

Steps

1. X: pre-classified data, in the form of an N*M matrix. N is the no. of observations and M is the number of features
2. Y: An N-d vector corresponding to predicted classes for each of the N observations.
3. Feature Extraction: Extracting valuable information from input X using a series of transforms.
4. ML Model: SVM Classifier
5. Y: Labels predicted by the Classifier.
6. Quality Metric: Metric used for measuring the performance of the model.

7. SVM Algorithm: The algorithm that is used to update weights w', which update the model and "learns" iteratively

4.1.3 Pseudo Code of SVM

Input:EEG Data(X,Y)
Output: Epilepsy detected or not(1,2,3,4,5 classes)
PseudoCode:
X:Independent features
Y:Dependent Features
Split X,Y into Training and testing dataset
X_train,X_test,Y_tarin,Y_test
SVM classifier: Use hyperplane for prediction divides data into two classes and gives more accurate result.
end
return class labels.

4.1.4 Hyperplane of SVM

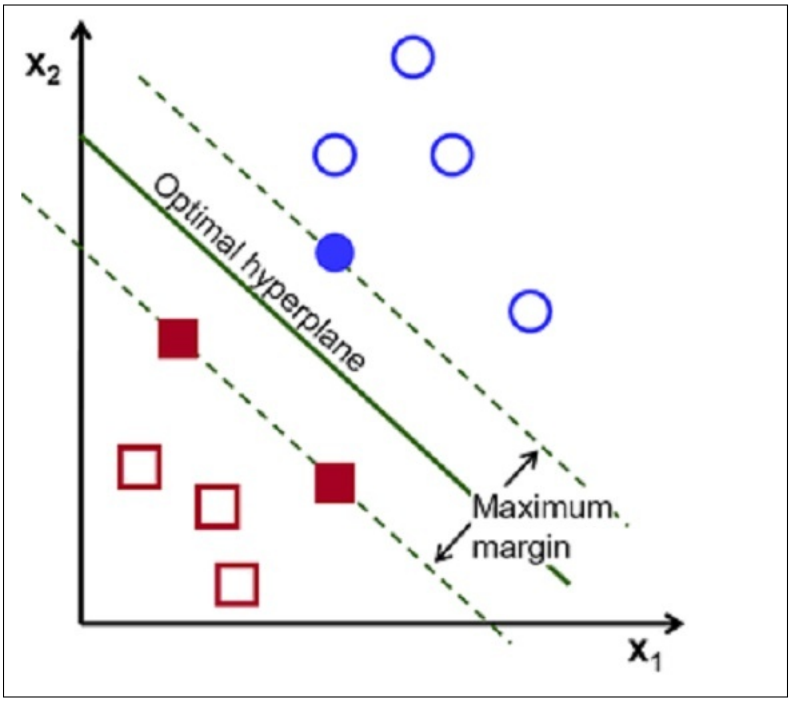

Figure 4.1: Hyperplane of SVM

4.2 Iterative Dichotomiser 3(ID3)

4.2.1 What is ID3 Algorithm?

ID3 is a nonincremental algorithm, meaning it derives its classes from a fixed set of training instances. An incremental algorithm revises the current concept definition, if necessary, with a new sample. The classes created by ID3 are inductive, that is, given a small set of training instances, the specific classes created by ID3 are expected to work for all future instances. The distribution of the unknowns must be the same as the test cases. Induction classes cannot be proven to work in every case since they may classify an infinite number of instances.

4.2.2 How Does ID3 Work?

The sample data used by ID3 has certain requirements, which are:

Attribute-value description - the same attributes must describe each example and have a fixed number of values.

- Predefined classes - an example's attributes must already be defined, that is, they are not learned by ID3.
- Discrete classes - classes must be sharply delineated. Continuous classes broken up into vague categories such as a metal being "hard, quite hard, flexible, soft, quite soft" are suspect.
- Sufficient examples - since inductive generalization is used (i.e. not provable) there must be enough test cases to distinguish valid patterns from chance occurrences.

4.2.3 Pseudo Code of ID3

Input:EEG Data(X,Y)
Output: Epilepsy detected or not(1,2,3,4,5 classes)
PseudoCode:
X:Independent features
Y:Dependent Features
Split X,Y into Training and testing dataset
X_train,X_test,Y_tarin,Y_test
ID3 classifier: it Create Decision tree based on most probable value and then gives result in less time.
end
return class labels.

Chapter 5

DETAILED DESIGN

5.1 Architectural Design

In this System Architecture First block is of input that is EEG datasets of patients.which are conneceted to Spliting unit block which classify this dataset into two parts. Training dataset and Testing Dataset.Then these classified Dataset are again connected to feature Extraction unit. which is connected to Classifier which we are going to be used.that is Support vector machine and ID3.Then it will classify the extracted features into training set and testing set.

This EEG Data processing and Seizure Detection unit again connected to Data transmission and storage unit.Wirless data transfer is done here.This is nothing but Transmission and storage unit. This unit are connected to Data access unit Doctor and hospital can access the Detection results of Seizure.then they can gives message to relatives of patients.that is nothing but alert to relatives for taking precautions about epilepsy.

In this way in our System architecture have three main units which are EEG data preprocessing and seizure detection unit.Data storage and Data transmission unit.Data Access unit.they are depends on each other.

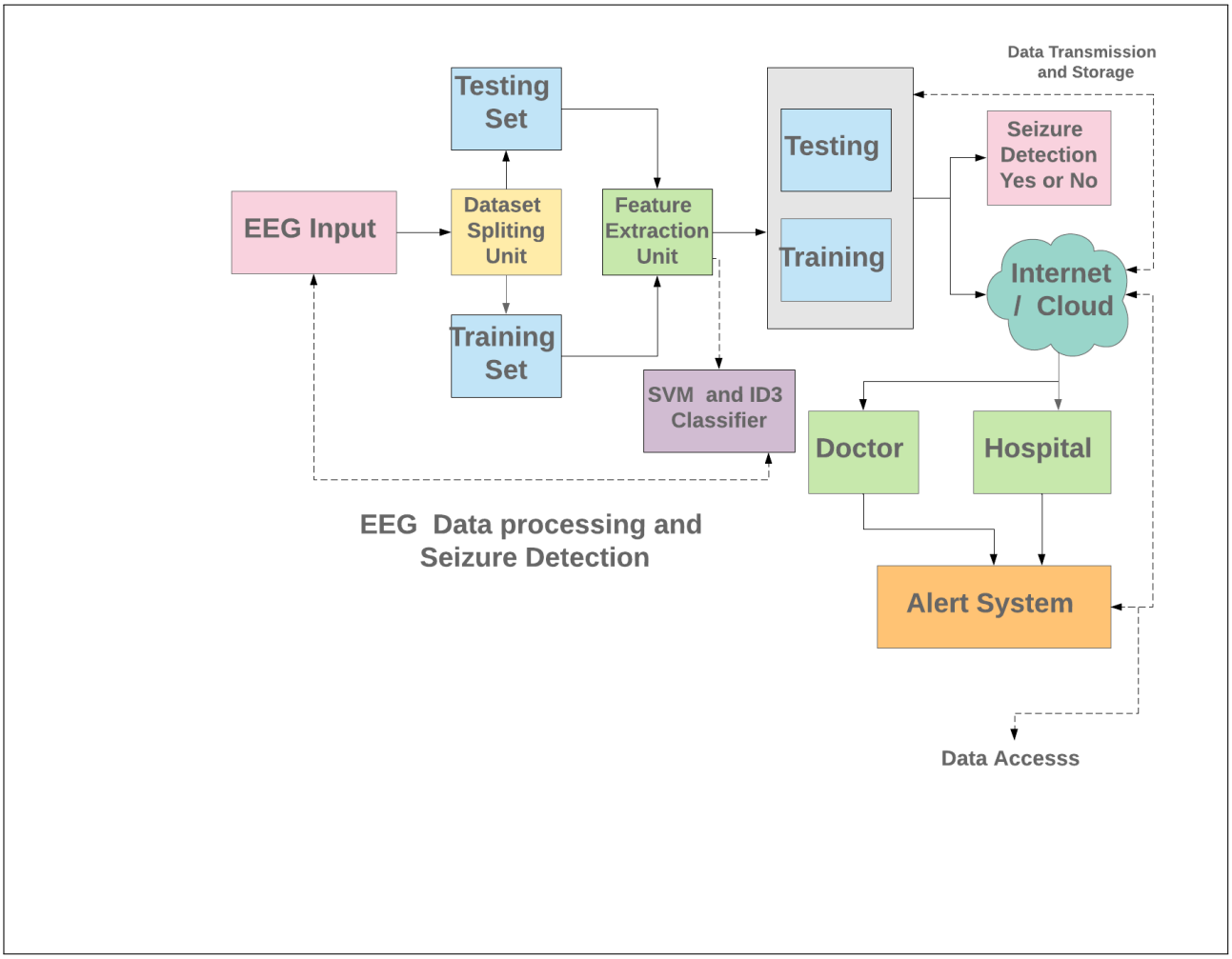

Figure 5.1: Architecture Diagram

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5.2 UML Diagrams

5.2.1 Use Case Diagram

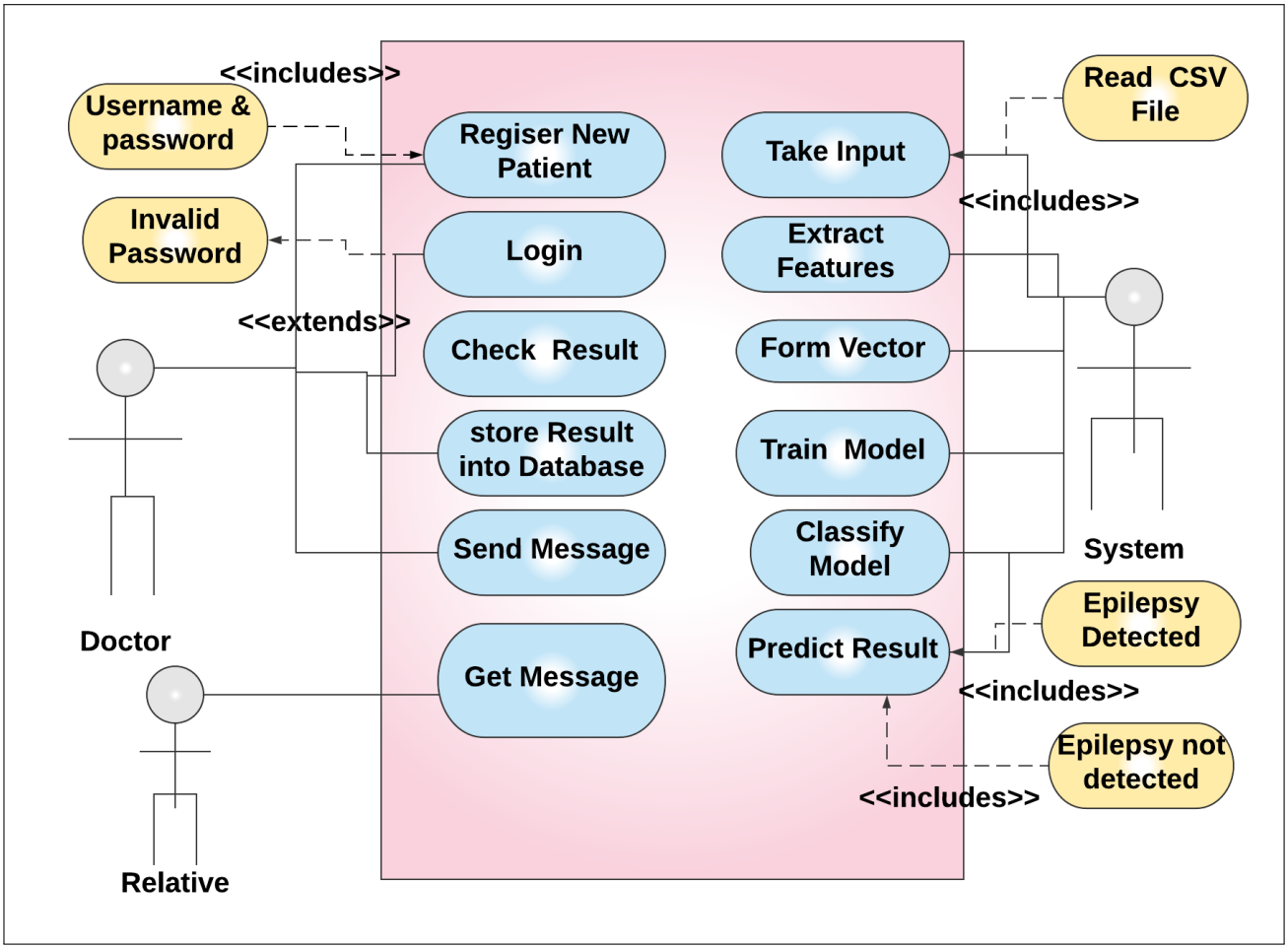

Figure 5.2: Use Case Diagram

A usecase diagram at its simplest representation of a user's interaction with the system that shows the relationship between the user and different use casesin which the user is involved.the use cases are represented by elipse.A key concept of use case modelling is that it helps us design a system from the user's perspective.Users are nothing but actor.all use cases are inside the system boundry.actors are at outside the system boundry.they are connected to use cases depending on their operations.

following are the actors:

- Doctor
- System
- Relative

5.2.2 Class Diagram

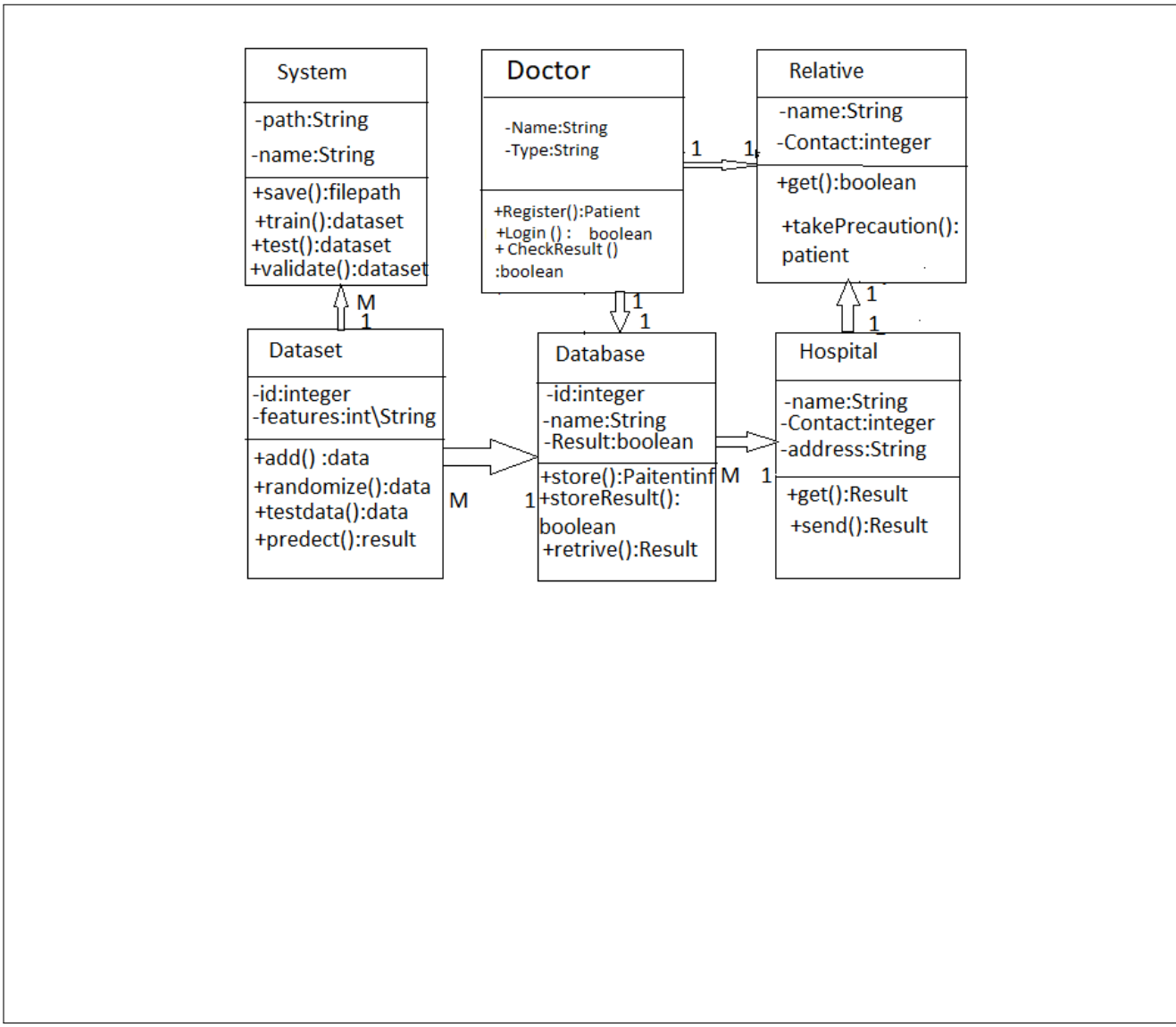

Figure 5.3: Class Diagram

The class diagram is the main bulding block of object oriented modelling.The classes in a class diagram represents both the main elements,interactions in the application,and the classes to be programmed.In the design of system, a number of classes are identified and grouped together in a class diagram that helps to determine the static relations between them.with detailed modeling the classes of the conceptual design are often split into a number of subclasses.

following are the main classes in our system:

- System
- Dataset
- Doctor
- Hospital
- Database
- Relative

In this class diagram there is relations between classes which are one to one relation or one to many relation or many to one relation or many to many relation.

5.2.3 Sequence Diagram

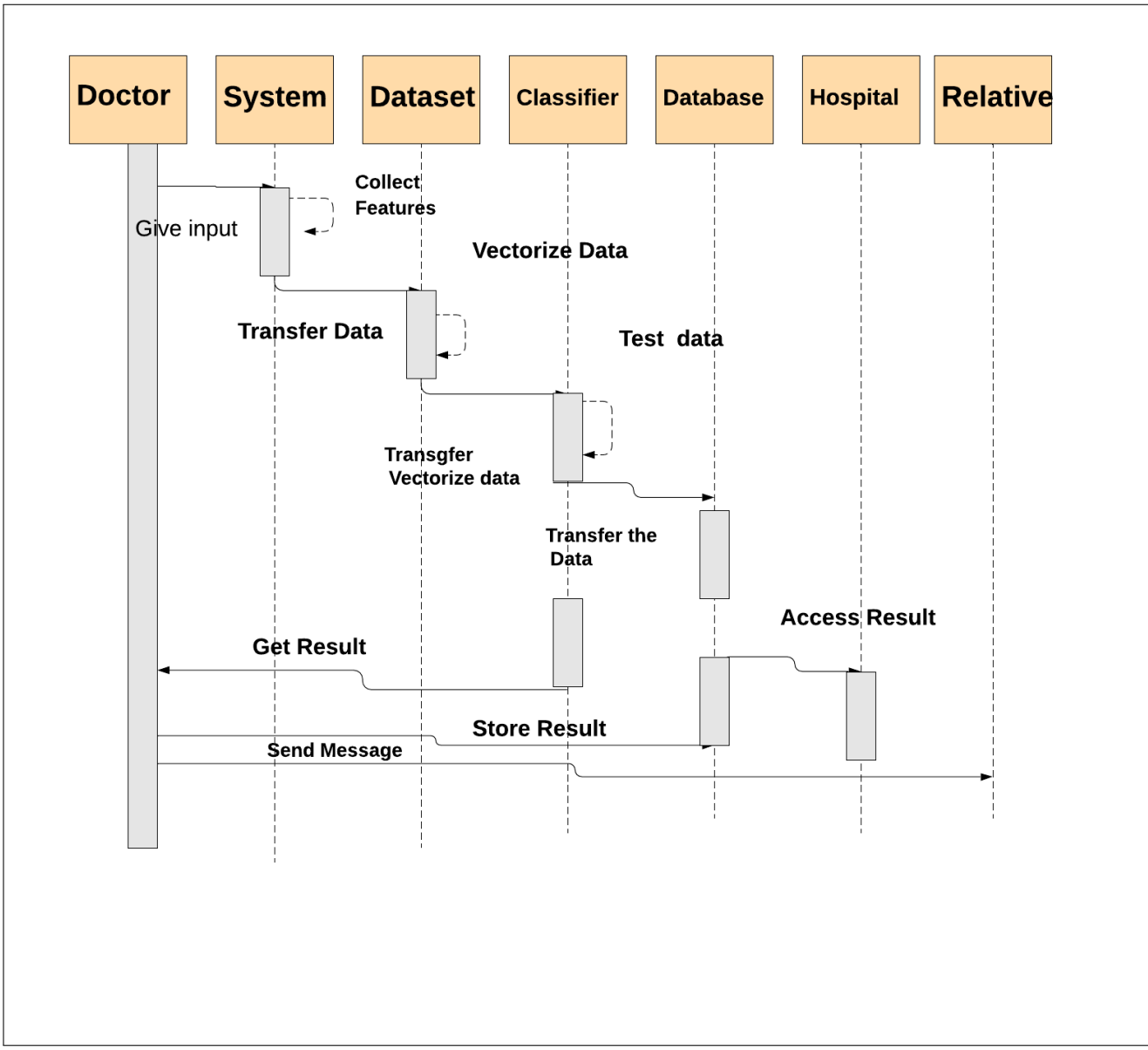

Figure 5.4: Sequence Diagram

A sequence diagram simply depicts interaction between objects in a sequential order i.e. the order in which these interactions take place. We can also use the terms event diagrams or event scenarios to refer to a sequence diagram. Sequence diagrams describe how and in what order the objects in a system function.

- **Actors** – An actor in a UML diagram represents a type of role where it interacts with the system and its objects. It is important to note here that an actor is always outside the scope of the system we aim to model using the UML diagram.

- **Lifelines** – A lifeline is a named element which depicts an individual participant in a sequence diagram. So basically each instance in a sequence diagram is represented by a lifeline. Lifeline elements are located at the top in a sequence diagram. The standard in UML for naming a lifeline follows the following format – Instance Name : Class Name

- **Messages** – Communication between objects is depicted using messages. The messages appear in a sequential order on the lifeline. We represent messages using arrows. Lifelines and messages form the core of a sequence diagram.

5.2.4 Activity Diagram

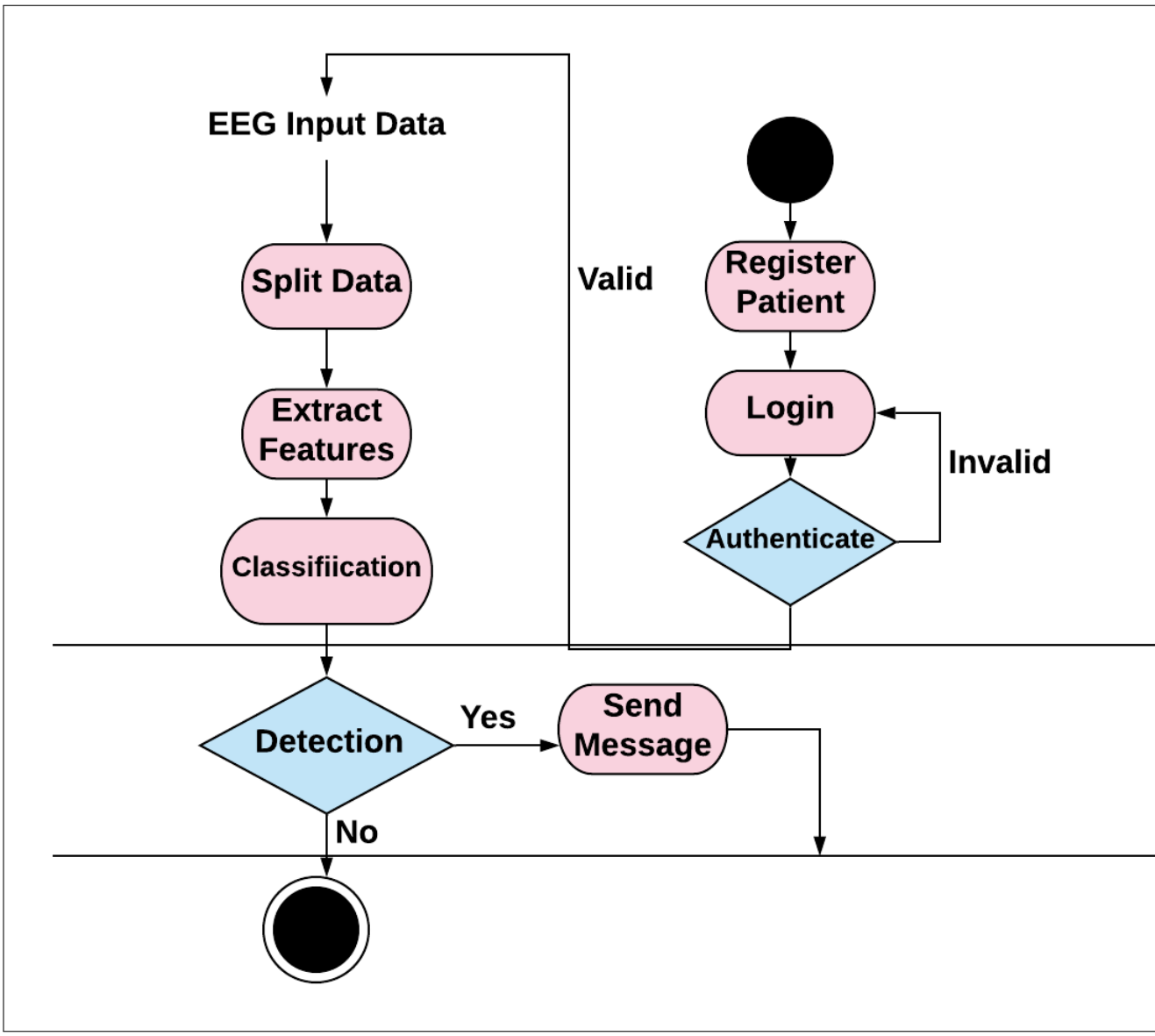

Figure 5.5: Activity Diagram

Activity diagram is defined as a UML diagram that focuses on the execution and flow of the behavior of a system instead of implementation. It is also called object-oriented flowchart. Activity diagrams consist of activities that are made up of actions which apply to behavioral modeling technology.

Activities:

It is a behavior that is divided into one or more actions. Activities are a network of nodes connected by edges. There can be action nodes, control nodes, or object nodes. Action nodes represent some action. Control nodes represent the control flow of an activity. Object nodes are used to describe objects used inside an activity. Edges are used to show a path or a flow of execution. Activities start at an initial node and terminate at a final node.

Activity Partition:

An activity partition or a swimlane is a high-level grouping of a set of related actions. A single partition can refer to many things, such as classes, use cases, components, or interfaces.

If a partition cannot be shown clearly, then the name of a partition is written on top of the name of an activity.

Fork and Joins:

Using a fork and join nodes, concurrent flows within an activity can be generated. A fork node has one incoming edge and numerous outgoing edges. It is similar to one too many decision parameters. When data arrives at an incoming edge, it is duplicated and split across numerous outgoing edges simultaneously. A single incoming flow is divided into multiple parallel flows.

A join node is opposite of a fork node as It has many incoming edges and a single outgoing edge. It performs logical AND operation on all the incoming edges. This helps you to synchronize the input flow across a single output edge.

5.2.5 Deployment Diagram

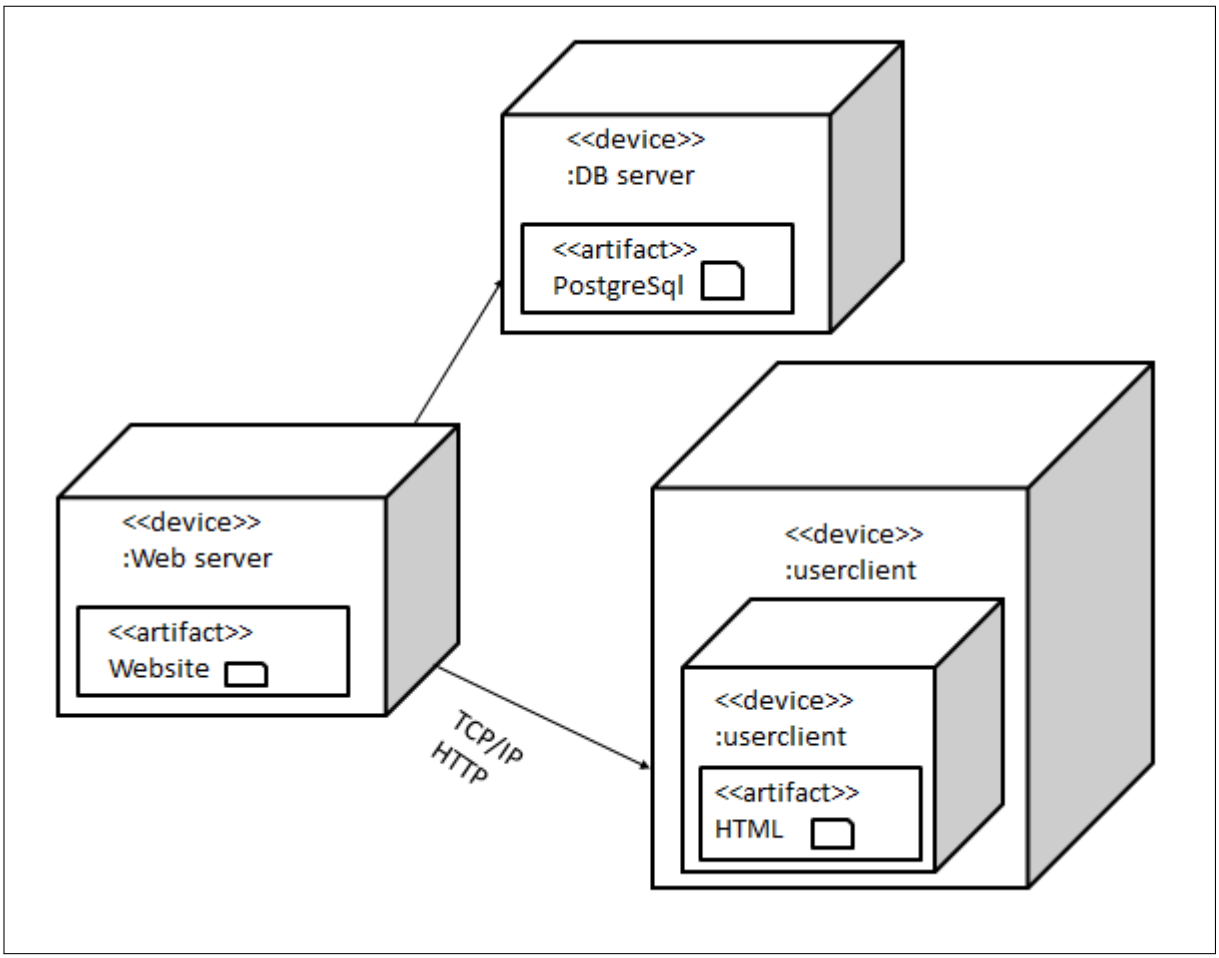

Figure 5.6: Deployment

5.3 Data Design

Epileptic Seizure Recognition Data Set This dataset is a pre-processed and re-structured/reshaped version of a very commonly used dataset featuring epileptic seizure detection.

Dataset Characteristics:	Multivariate, Time series	**Number of Instances:**	11500
Attribute Characteristics:	Integer, Real	**Number of Attributes:**	179
Associated Tasks:	Classification	**Missing Values:**	NA

Figure 5.7: Data Design

5.4 Prototyping

5.4.1 Admin Login Form

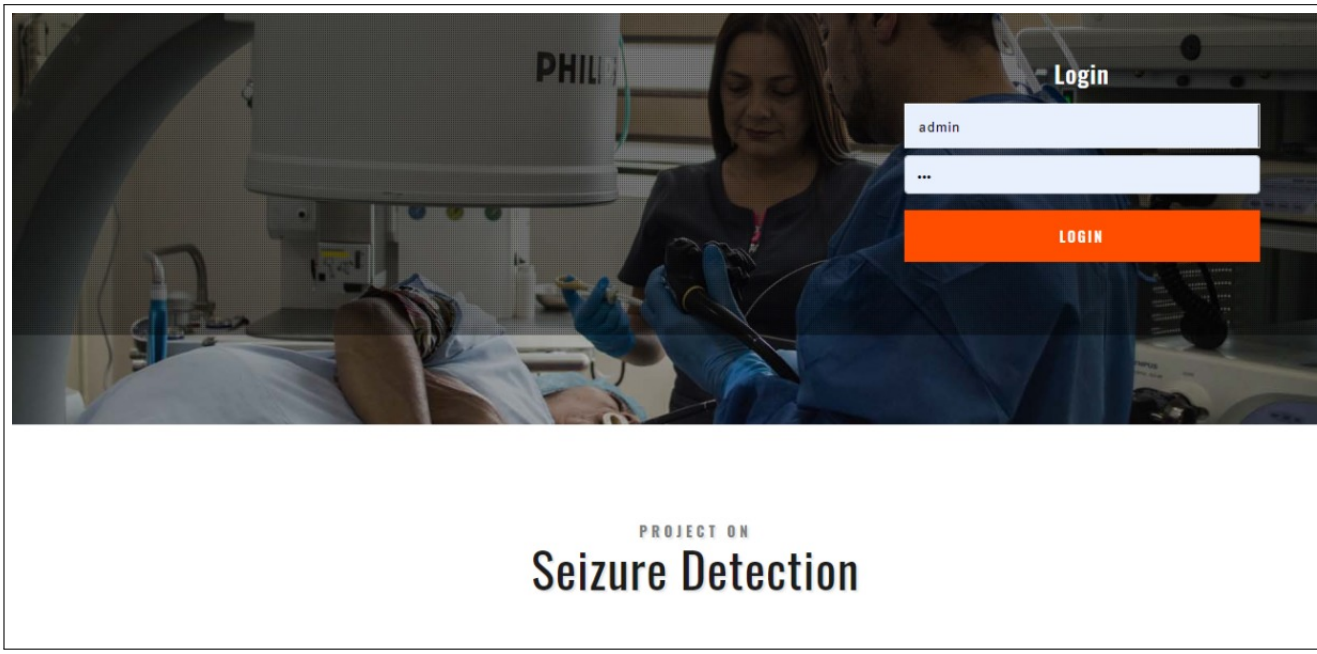

Figure 5.8: Admin Login

This is Login for admin after login admin can able to add new doctors and patient.

5.4.2 Clinic Login Form

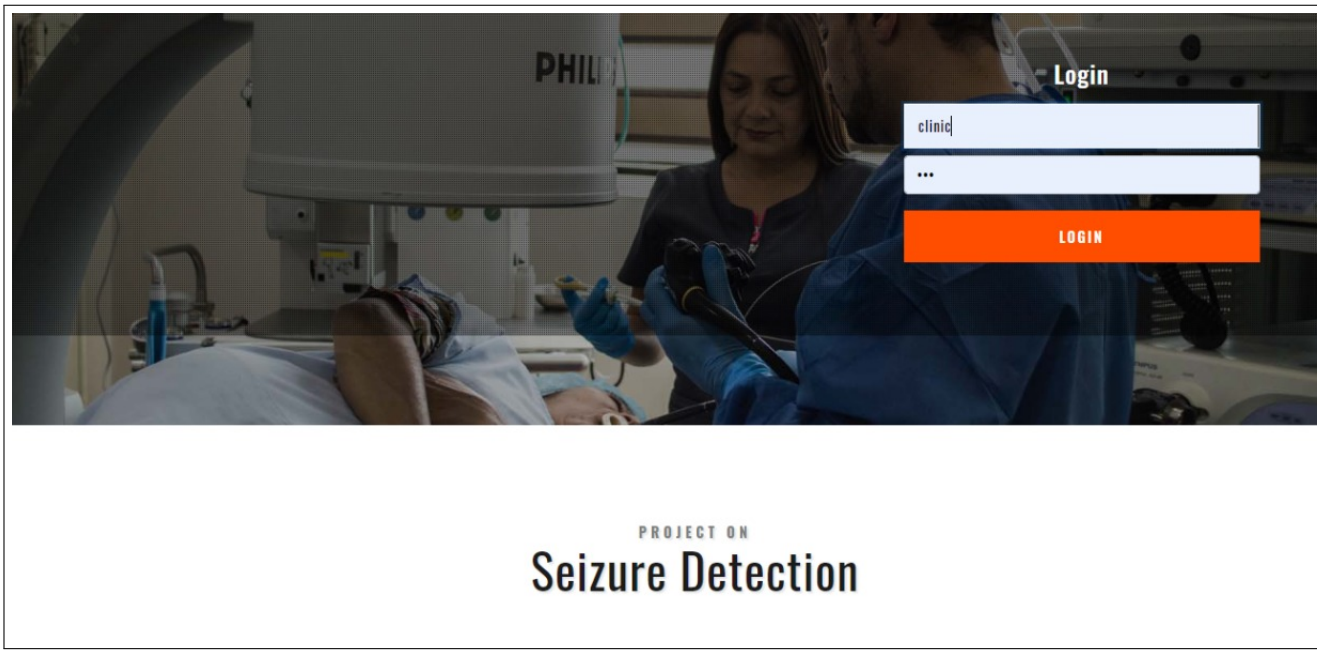

Figure 5.9: Clinic Login

This is login for clinic who can upload data of perticular patient and able to see the result of seizure detection.

5.4.3 Doctor Registration Form

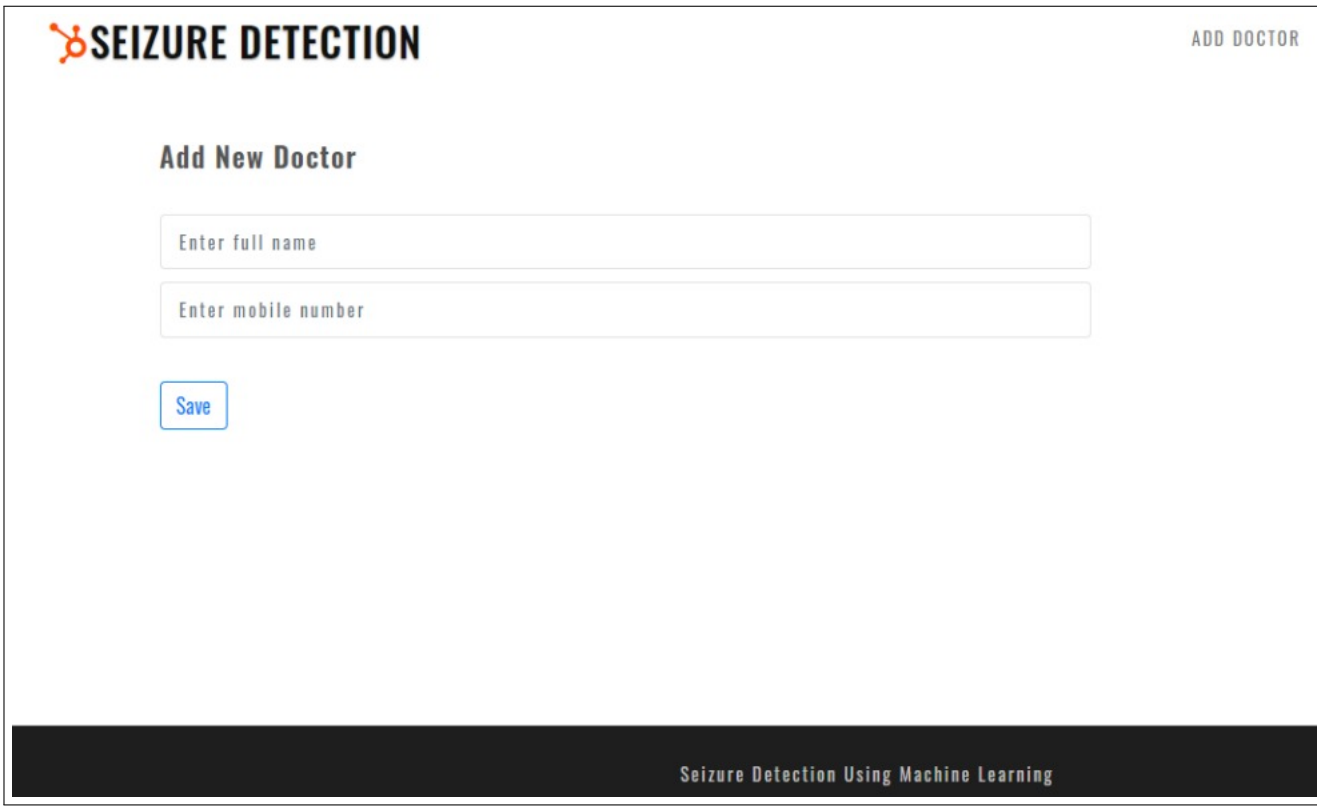

Figure 5.10: Doctor Registration Page

In Registration page Admin can able to register new Doctor.In that Doctor name, mobile no have to fill up.

5.4.4 Patient Registration Form

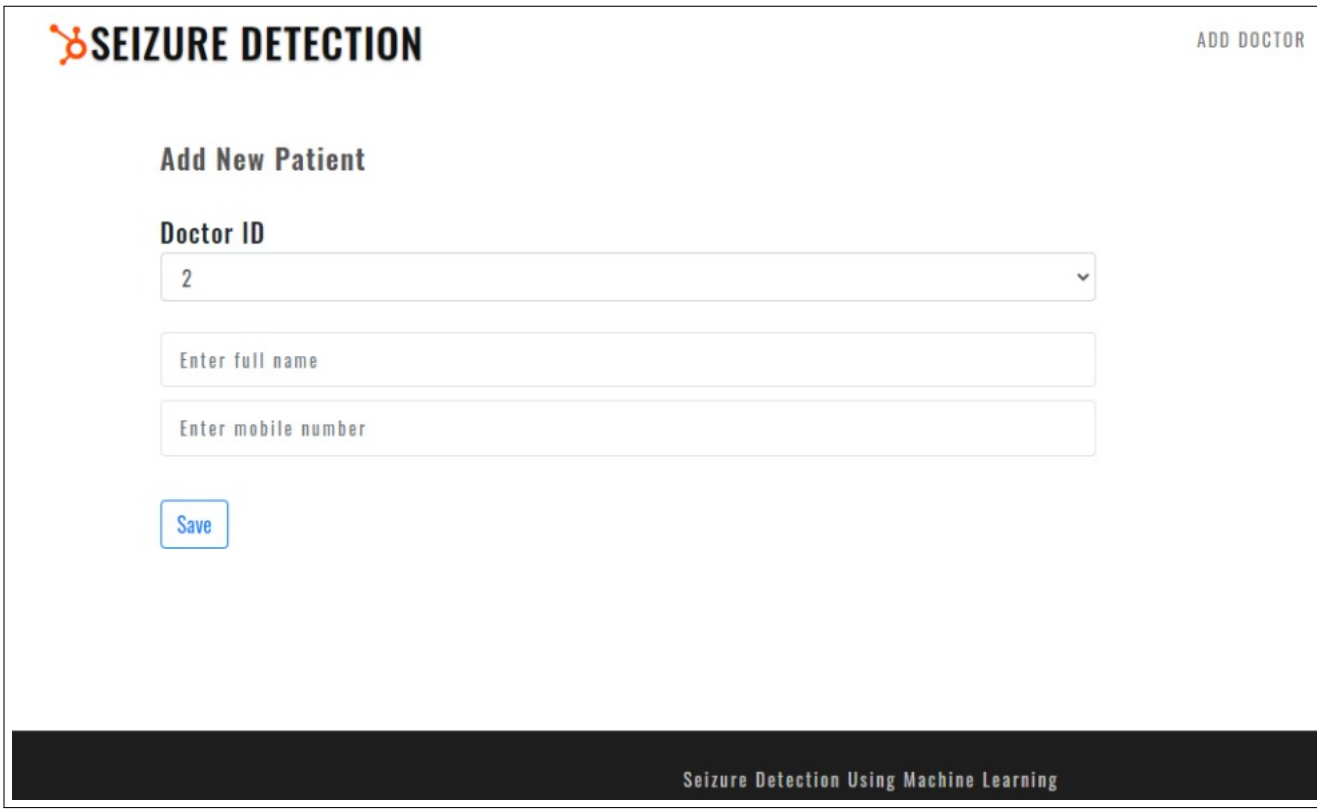

Figure 5.11: Patient Registration Page

In this form Patient name, mobile no and doctor id assigned to that perticular patient have to fill up.

5.4.5 Dataset Uploading Page

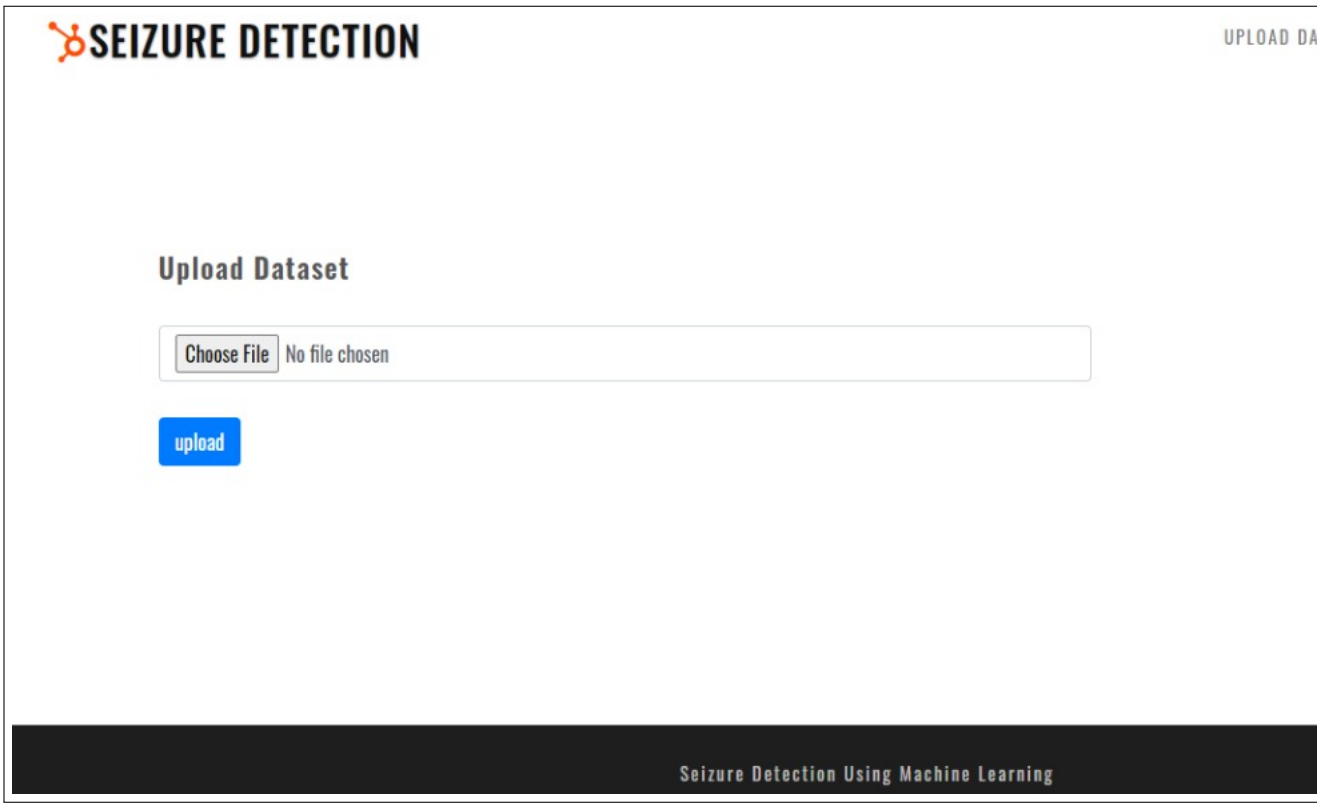

Figure 5.12: Dataset Uploading Page

Here we have to choose dataset which is in the form of csv file.

5.4.6 View Dataset Page

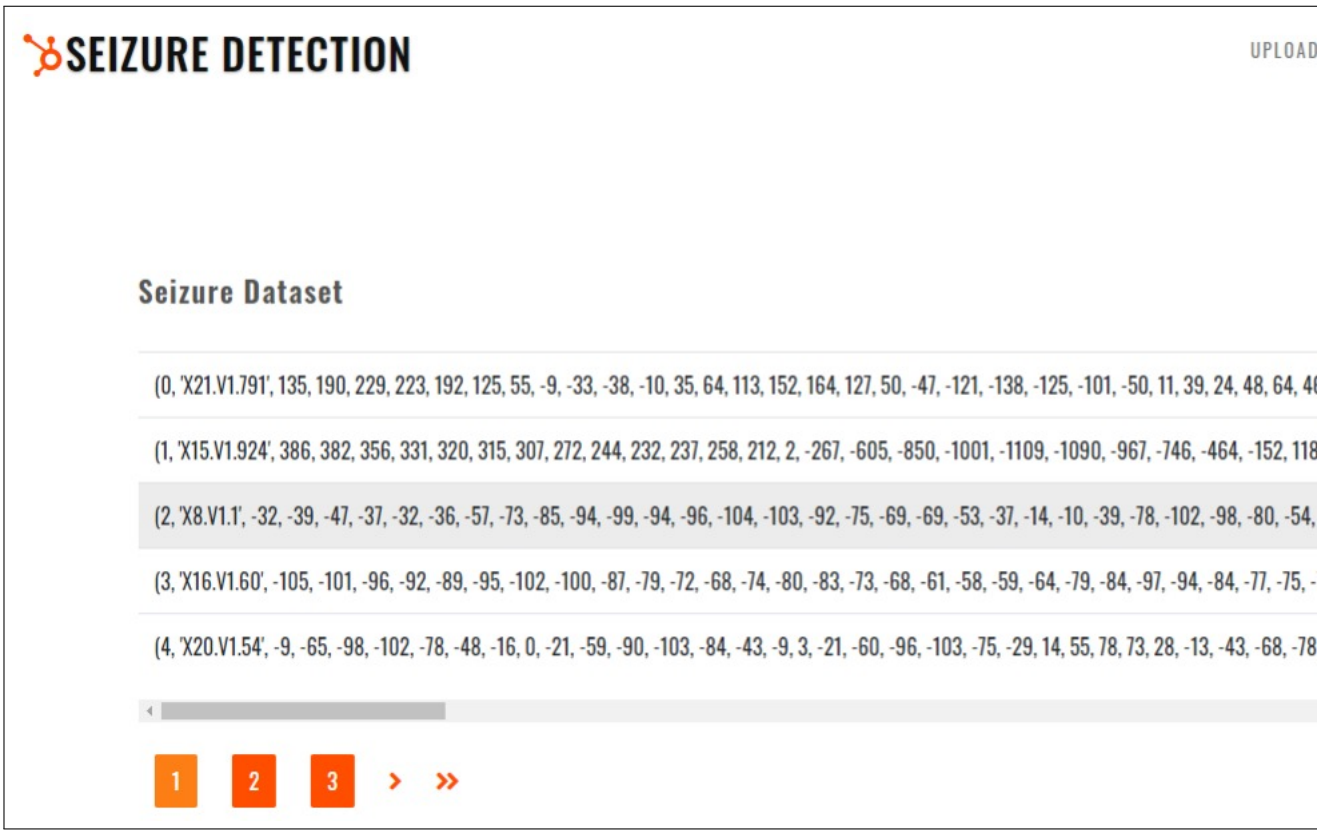

Figure 5.13: View Dataset Page

Here we can see the values of dataset which we already uploaded.

5.4.7 Result of Perticular Patient

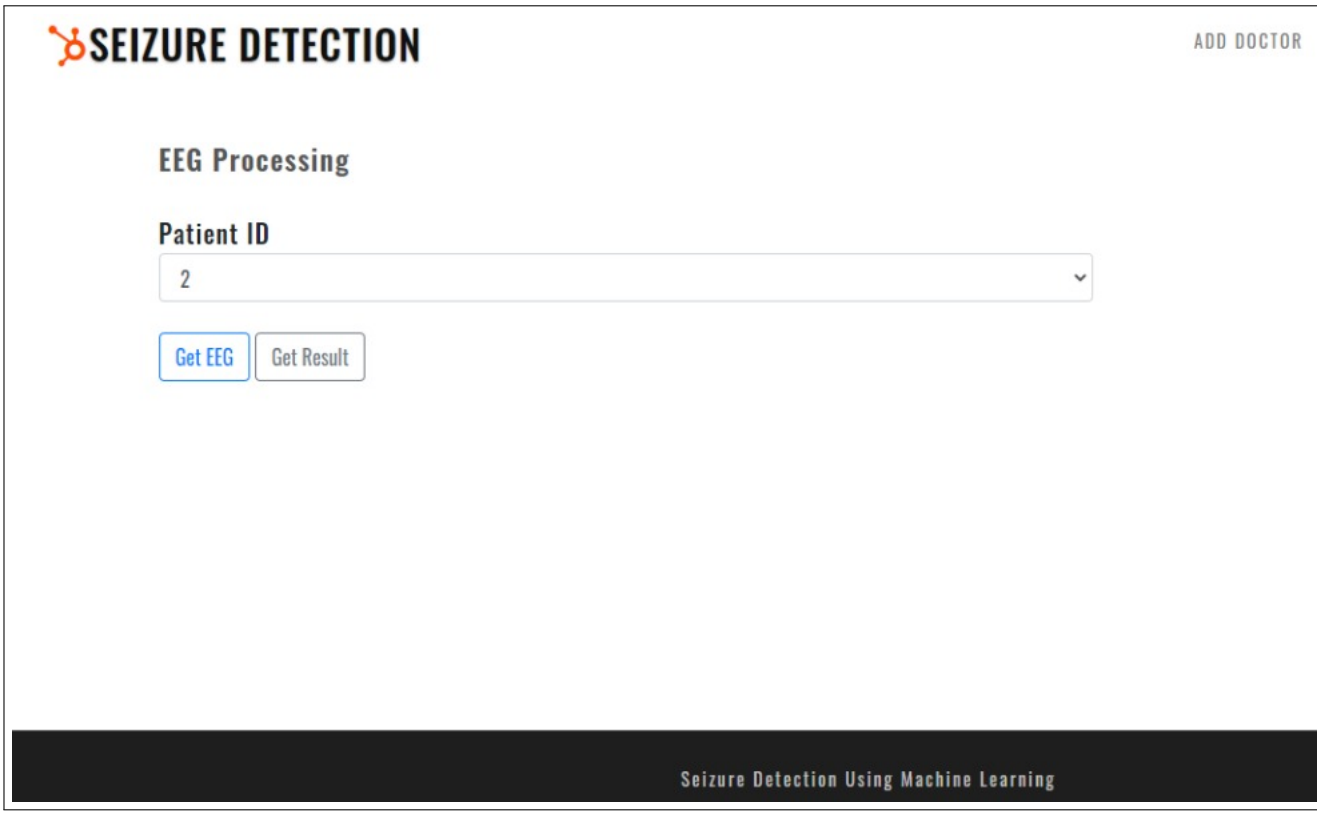

Figure 5.14: Result

Here we can check the EEG signals of perticular patient as well as we get the result after selecting id of that patient.

Chapter 6

PROJECT PLANNING

6.1 Project Estimates

Agile Development Methodology:

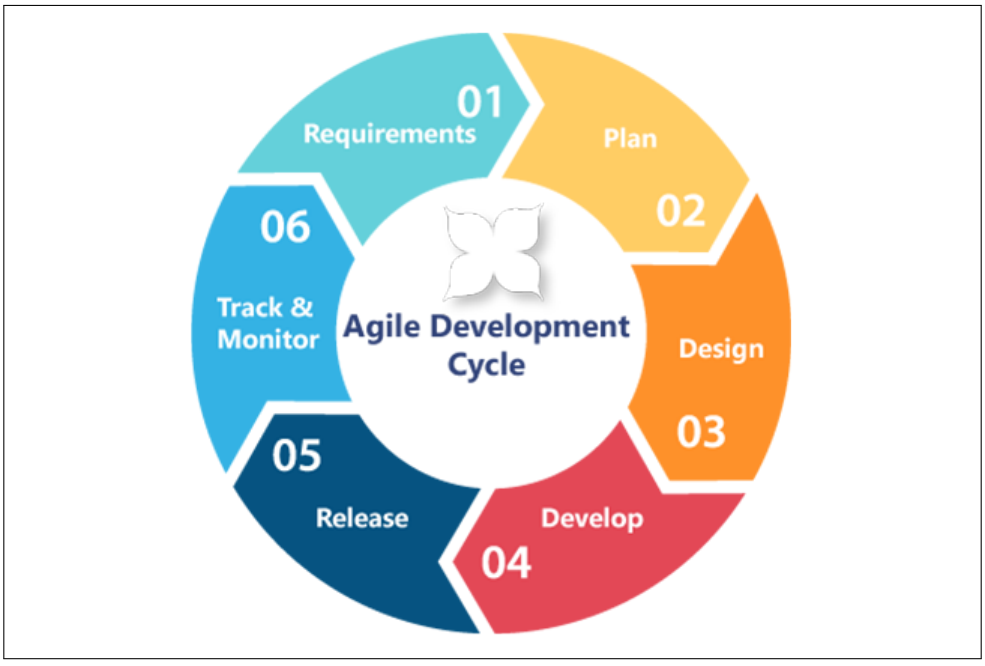

Figure 6.1: Agile Model

Agile Modeling (AM) is methodology for modeling and documenting software systems based on best practices.it is a collection of values and principles,that can be applied on an (agile) software development project.This methodology is more flexible than traditional modeling methods,making it a better fit in a fast changing environment.It is part of the agile software development toolkit .Agile modeling is supplement to other agile development methodologies such as Scrum,extreme programming(XP),and Relational Unified Process(RUP).It is explicitly included as part of the disciplined agile delivery(DAD) framework.

Scope of Project

Epilepsy seizure detection software that doctor can use to detect epilepsy seizure at early stage. In that software patient's data can be stored. It will be used for detection. With the help of various parameters of patient's data, software can detect epilepsy seizure. After detection of epilepsy seizure Results will be send to relatives of patient's through the message.It will be helpful for relatives to take care of patients or for proper tretment of patients at right time.

6.2 Risk Management

Our project support only NP-complete category problem. There are variety of user who are using our system for the searching the approximated price of the real estate properties. Every user provides personal data consistent with his convenience, his/her request are send to the server. This method is depends upon user sort enclosed therefore this project is below NP-complete category.In our project we have a tendency to use different algorithms i.e. construction of structured DNN Algorithm,And construction of structured knowledge graph which are NP-Complete because it depends on user's parameters.

6.2.1 Risk Identification

"Risk are future unsure events with a chance of prevalence and a possible for loss" Risk identification and management area unit the most issues in each computer code project. Effective analysis of computer code risks can facilitate to effective designing and assignments of work.

6.2.1.1 Categories of Risk

Risks are known, classified and managed before actual execution of program. These risks are classified in several classes.
Scheduled Risk:

Project schedule get slip once project tasks and schedule unharness risks don't seem to be self-addressed properly. Schedule risks primarily impact on project and at last on economy and should result in project failure. Schedules typically slip because of following reasons:

1. Wrong time estimation
2. Resources are not tracked properly.
3. Failure to identify complex functionalities and time required to develop those functionalities.
4. Unexpected project scope expansions.
5. Facilities are not available on time.
6. Sometime facilities are available but a inadequate
7. Development tools are not in work as expected.

End-User:

1. A delay in one task causes cascading delays in dependent task
2. End user is not solicited.
3. Communication time large required.

Budget Risk:

1. Wrong budget estimation.
2. Project scope expansion.

Operational Risks:
Risks of loss due to improper process implementation, failed system or some external events risks.

1. Database connectivity failure
2. users authentication and building of access tree failed.
3. Communication failure
4. No resource planning
5. Insufficient Network Bandwidth
6. Unavailability/Conguration failure of the Access Point.

Technical risks:
Technical risks generally leads to failure of functionality and performance. Causes of technical risks are:

1. Continuous changing requirements and environment
2. Product is complex to implement.
3. Server failure
4. Security breakdown
5. Scalability of network
6. Difficult project modules integration.

6.2.2 Risk Analysis

ID	Risk Description	Probability	Impact		
			Schedule	Quality	Overall
1	Continuous Stream of Required changes	Low	High	High	High
2	None of us known how to use technology	Low	Low	Low	Low
3	Real time performance	Low	Low	High	High
4	Incorrect key generation	Low	Low	Low	Low
5	Module Integration	High	High	High	High
6	System Failure like database Connectivity	Low	Low	High	High

Figure 6.2: Risk Analysis

6.3 Plan of Project

1	**ANALYSIS PHASE**
1.1	Study of Existing System
1.2	Study on Research Papers and Discussion
1.3.1	Problem Definition
1.3.2	Scope
1.3.3	Feasibility
1.4	Defining the Problem
1.5	Fixing The Scope of the Project
1.6	Feasibility Analysis
1.7	Requirement Analysis
1.8	Project Estimation
2	**DESIGN PHASE**
2.1	Designing GUI
2.2	Developing Algorithms of various modules
2.3	Developing UML Diagrams of the System
3	**CODING**
3.1	Coding Algorithm
3.2	Coding Module
4	**TESTING**
4.1	Unit Testing
4.2	Integration Testing
4.3	System Testing
5	**DEPLOYMENT**
6	**DOCUMENTATION**

Figure 6.3: Plan of Project

6.3.1 Analysis Phase

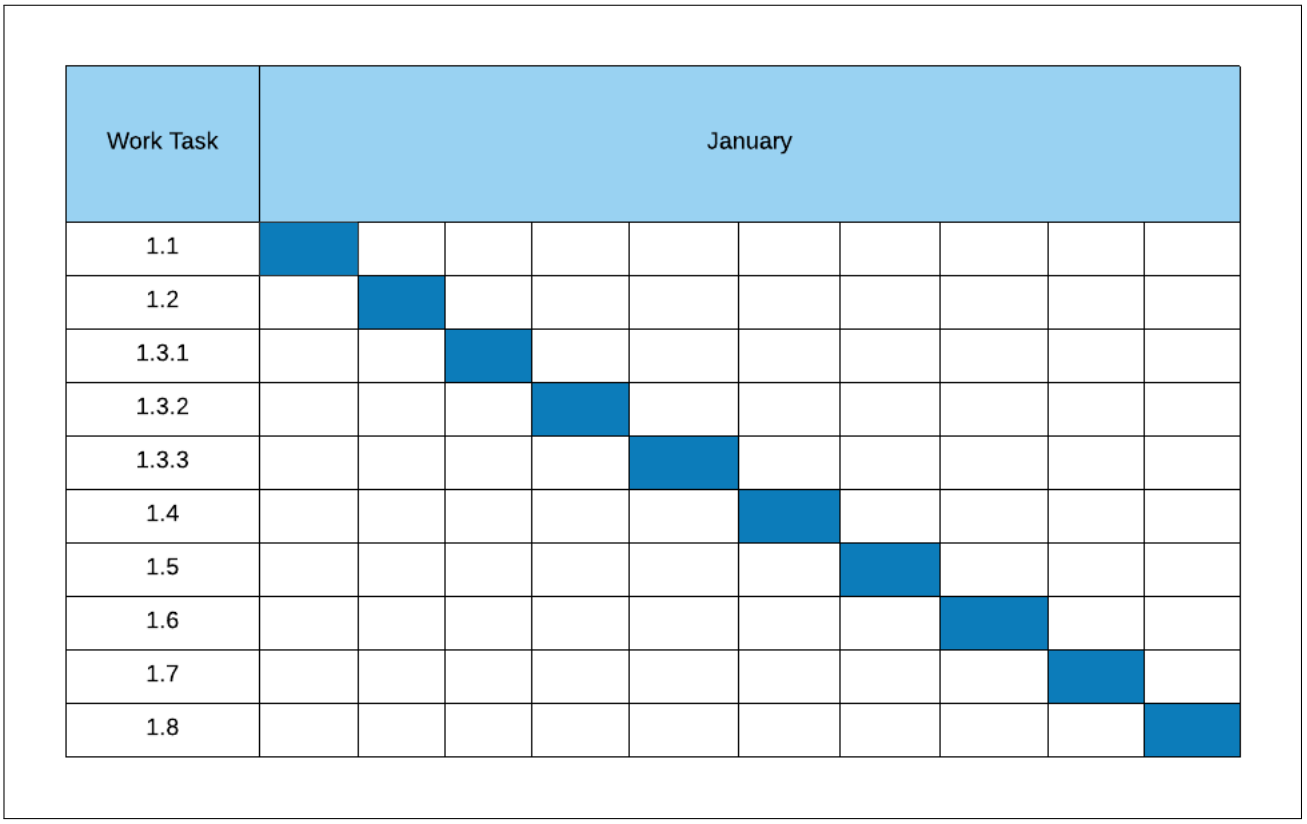

Figure 6.4: Planner1

6.3.2 Design Phase

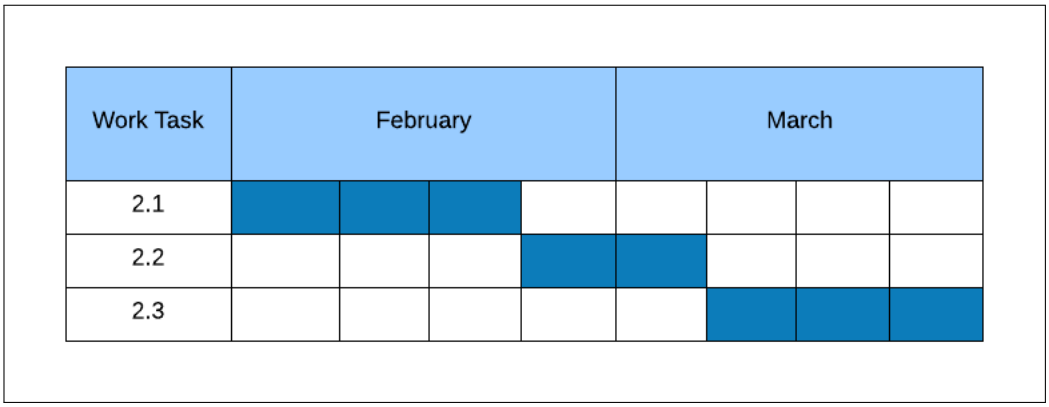

Figure 6.5: Planner2

6.3.3 Coding,Deployment and Documentation Phase

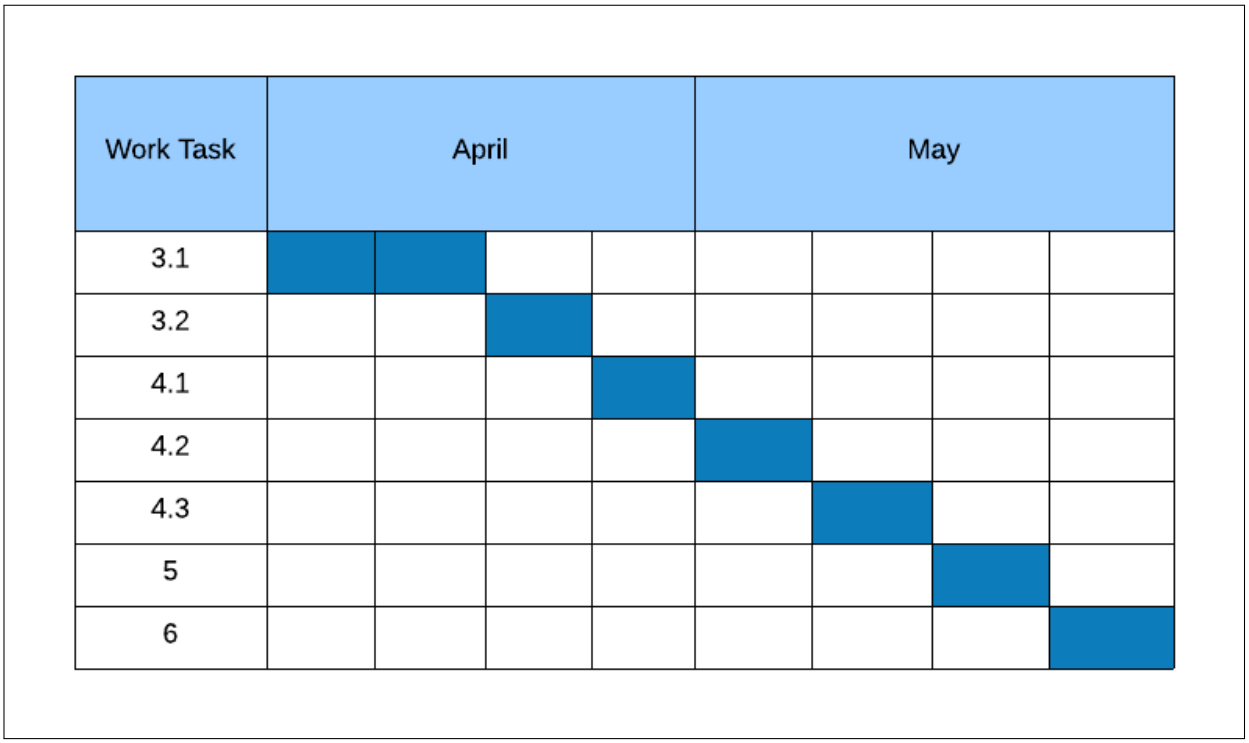

Figure 6.6: Planner3

Gantt Chart:

A project time chart may included entire time required to project Gantt chart is a visual view of tasks scheduled over time. Gantt charts are used for planning projects of all sizes and they are a useful way of showing what work is scheduled to be done on a specific day. They also help you view the start and end dates of a project in one simple view.

It gives the information of our project time management.It gives the time required and schedule of our project .Gantt charts convey this information visually. They outline all of the tasks involved in a project, and their order, shown against a timescale. This gives you an instant overview of a project, its associated tasks, and when these need to be finished.

A Gantt Chart is a table that illustrates the course of a project and all the elements involved. This visual was first developed by Karol Adamiecki in 1896, then Henry Gantt devised his own version which illustrates a project schedule in the 1910s. Gantt Charts are a useful tool when you want to see the entire landscape of either one or multiple projects. It helps you view which tasks are dependent on one another and which milestones are coming up.

Figure 6.7: Gantt Chart

6.4 COCOMO Model

Cocomo (Constructive Cost Model) is a regression model based on LOC, i.e number of Lines of Code. It is a procedural cost estimate model for software projects and often used as a process of reliably predicting the various parameters associated with making a project such as size, effort, cost, time and quality. It was proposed by Barry Boehm in 1970 and is based on the study of 63 projects, which make it one of the best-documented models.
The key parameters which define the quality of any software products, which are also an outcome of the Cocomo are primarily Effort Schedule:

- **Effort:** Amount of labor that will be required to complete a task. It is measured in person-months units.
- **Schedule:** Simply means the amount of time required for the completion of the job, which is, of course, proportional to the effort put. It is measured in the units of time such as weeks, months.

The necessory steps in this model are:

1.Get an initial estimate of the development effort from evaluation of thusants of delivered lines of source code (KDLOC).

2.Determine a set of 15 multiplying factors from various attributes of the project.

3.Calculate the effort estimate by multiplying the initial estimate with all the multiplying factors. i.e multiply the values in step1 and step2.
The initial estimate (Nominal estimate) is determined by an equation of the form used in the static single variable models.using KDLOC as the measure of the size.To determine the initial effort Ei in person-months the equation used is of the the type is shown belo
Ei=a*(KDLOC)b

6.4.1 Basic COCOMO Model

The basic COCOMO Model provides an accurate size of project parameters. The following expression gives the basic COCOMO esimation model.
Effort=a1*(KLOC)a2 PM
Tdev=b1*(efforts)b2 Months where,

- **KLOC:**is the estimated size of the software product indicate in Kilo Lines of Code.a1,a2,b1,b2 are constant for each group of software product.

- **Tdev:** is the estimated time to develop the software,expressed in months.efforts is the total effort required to develop the software product,expressed in person months (PMs).

  #### 6.2.1.1 Efforts and Time Estimates of this project

  Effort=3.0*(4)*1.12=13.44PM
  Tdev=2.5*(13.44)*0.35=11.76PM

  Productivity(KLOC/Efforts)=4/13.44=0.297.6KLOC/PM

Chapter 7

RESULTS

7.1 Why SVM Is Better Than ID3

Table 7.1 : SVM Vs ID3

Sr.No.	SVM	ID3
1	SVM uses kernel trick to solve non-linear problems	ID3 Construct tree based on Entropy,Information Gain of Nodes.
2	SVM is better for Numerical data.	ID3 are better for categorical data.
3	Less Colinearity.	More colinearity than SVM.
4	More Accurate Results	Less Accurate Results.
5	More Time Required	Less Time Required.

7.2 Visualizing Results

7.2.1 View Dataset:

Figure 7.1: Input to System

7.2.2 Detection of Epilepsy Seizure

Seizure is not Detected

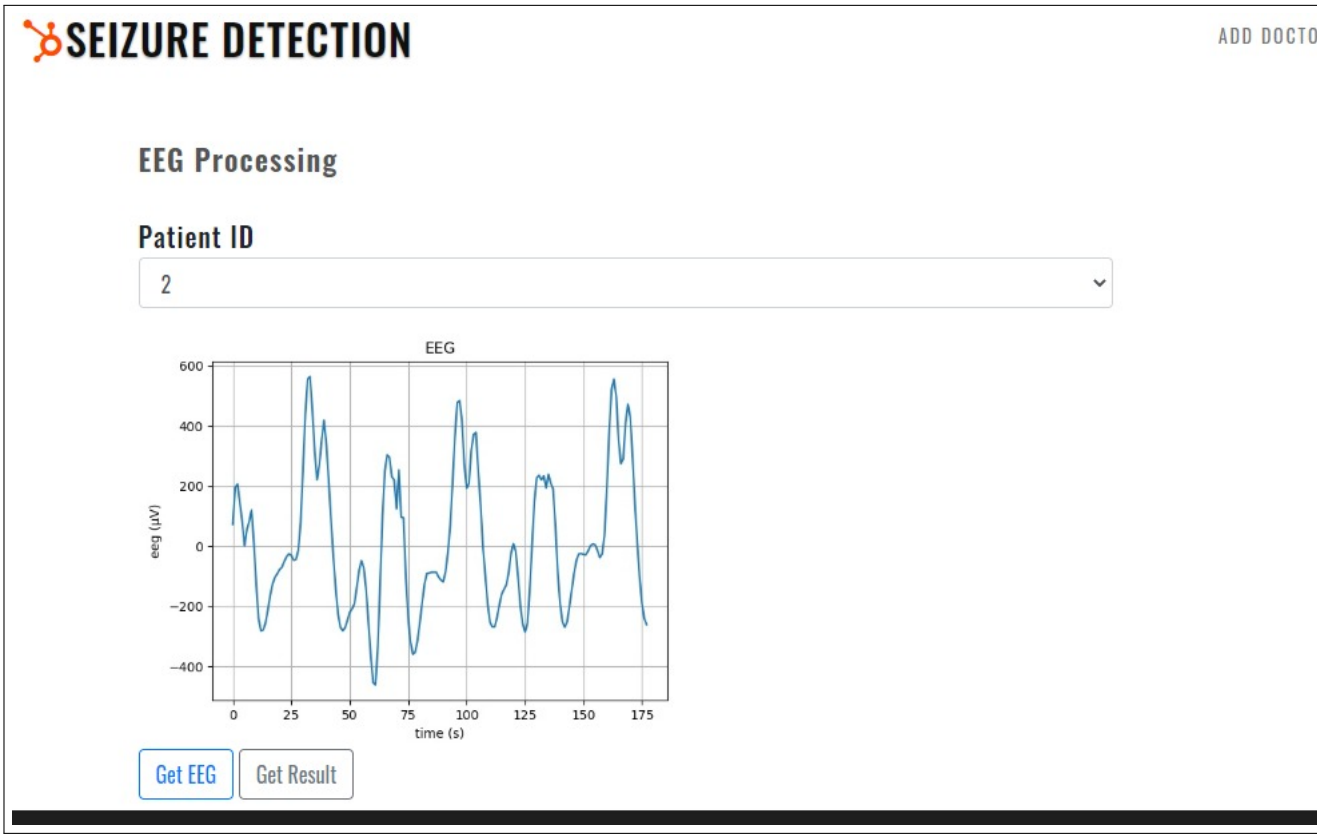

Figure 7.2: Case I

Here we can see that Seizure is not detected as the EEG signals are normal values which we can see on this graph .

The brain activity of an epileptic patient has four major stages:

Table 7.1 : Brain Activity Stages

Sr.No.	Stage	Characteristics
1	preictal stage	the time before the seizure.
2	ictal stage	the actual seizure.
3	postictal stage	the period after the seizure, lasting usually between 5 and 60 minutes.
4	interictal stage	characterised by normal brain activity, is the time between seizures (postictal to preictal stage).

Seizure is Detected

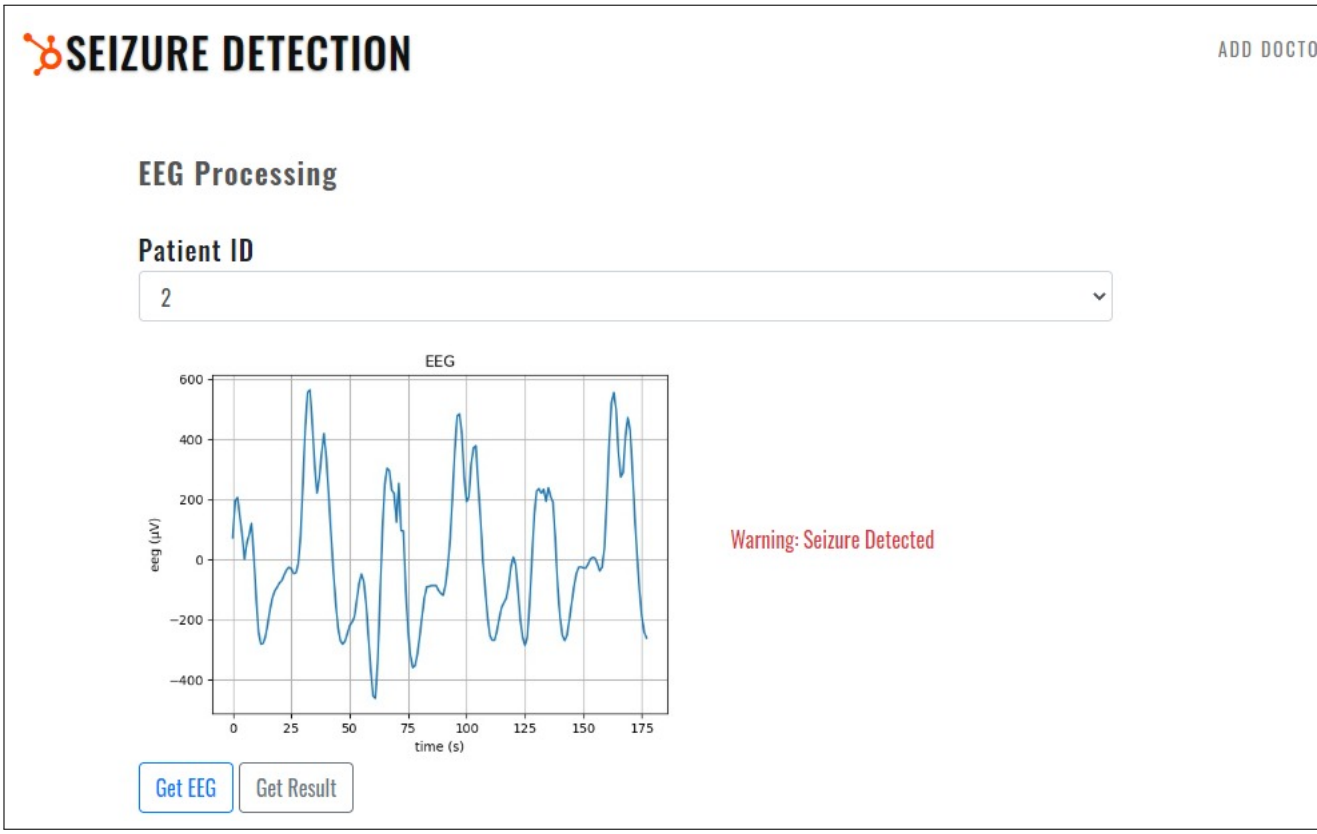

Figure 7.3: Case II

Here we can see that Seizure is detected as the EEG signals are not normal values which we can see on this graph .hence it will generate warning message .also message will send to that patient mobile no.

Chapter 8

CONCLUSION AND FUTURE SCOPE

We have implemented an epilepsy seizure detection software, which predict seizure at earlier stage. This system take input which are the signals or parameters of patients,and then Predict whether Epilepsy is detected or not.This system has used Support vector machine alogorithm for classification. We used Support vector machine and ID3 algorithms for classification. We compare them and determined which algorithm gives better result.

As we know that support vector machine required more time for computation but it gave better results. it is more accurate than other algorithms. hence our system gave better or accurate results. After detection of epilepsy alert signal in the form of message is send to relatives of patient from doctor.then they are able to take care of that patient and make treatment for that patient at early stage.

For Future Research, we will study all parameters of brain activity in normal and abnormal patients so that we will get comparative results. In future we can include in that various alert system connected with this web application.As well as EEG Data of patient can be monitored through this application .

Chapter 9

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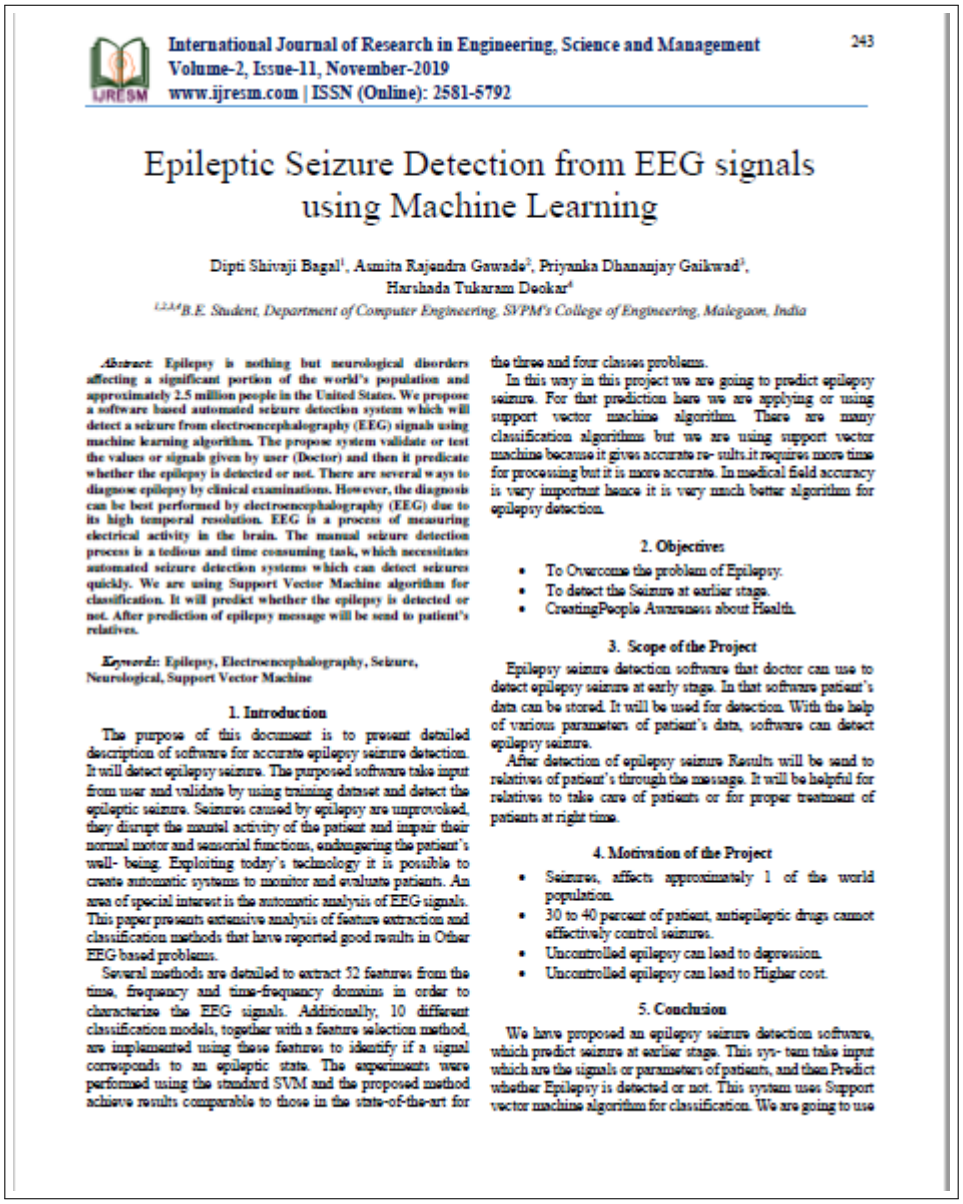

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Epileptic Seizure Detection from EEG signals using Machine Learning

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Abstract **Epilepsy is nothing but neurological disorders affecting a significant portion of the world's population and approximately 2.5 million people in the United States. We propose a software based automated seizure detection system which will detect a seizure from electroencephalography (EEG) signals using machine learning algorithm. The propose system validate or test the values or signals given by user (Doctor) and then it predicate whether the epilepsy is detected or not. There are several ways to diagnose epilepsy by clinical examinations. However, the diagnosis can be best performed by electroencephalography (EEG) due to its high temporal resolution. EEG is a process of measuring electrical activity in the brain. The manual seizure detection process is a tedious and time consuming task, which necessitates automated seizure detection systems which can detect seizures quickly. We are using Support Vector Machine algorithm for classification. It will predict whether the epilepsy is detected or not. After prediction of epilepsy message will be send to patient's relatives.**

Keywords: **Epilepsy, Electroencephalography, Seizure, Neurological, Support Vector Machine**

1. Introduction

The purpose of this document is to present detailed description of software for accurate epilepsy seizure detection. It will detect epilepsy seizure. The purposed software take input from user and validate by using training dataset and detect the epileptic seizure. Seizures caused by epilepsy are unprovoked, they disrupt the mental activity of the patient and impair their normal motor and sensorial functions, endangering the patient's well- being. Exploiting today's technology it is possible to create automatic systems to monitor and evaluate patients. An area of special interest is the automatic analysis of EEG signals. This paper presents extensive analysis of feature extraction and classification methods that have reported good results in Other EEG based problems.

Several methods are detailed to extract 52 features from the time, frequency and time-frequency domains in order to characterize the EEG signals. Additionally, 10 different classification models, together with a feature selection method, are implemented using these features to identify if a signal corresponds to an epileptic state. The experiments were performed using the standard SVM and the proposed method achieve results comparable to those in the state-of-the-art for the three and four classes problems.

In this way in this project we are going to predict epilepsy seizure. For that prediction here we are applying or using support vector machine algorithm. There are many classification algorithms but we are using support vector machine because it gives accurate re- sults.it requires more time for processing but it is more accurate. In medical field accuracy is very important hence it is very much better algorithm for epilepsy detection.

2. Objectives

- To Overcome the problem of Epilepsy.
- To detect the Seizure at earlier stage.
- CreatingPeople Awareness about Health.

3. Scope of the Project

Epilepsy seizure detection software that doctor can use to detect epilepsy seizure at early stage. In that software patient's data can be stored. It will be used for detection. With the help of various parameters of patient's data, software can detect epilepsy seizure.

After detection of epilepsy seizure Results will be send to relatives of patient's through the message. It will be helpful for relatives to take care of patients or for proper treatment of patients at right time.

4. Motivation of the Project

- Seizures, affects approximately 1 of the world population.
- 30 to 40 percent of patient, antiepileptic drugs cannot effectively control seizures.
- Uncontrolled epilepsy can lead to depression.
- Uncontrolled epilepsy can lead to Higher cost.

5. Conclusion

We have proposed an epilepsy seizure detection software, which predict seizure at earlier stage. This sys- tem take input which are the signals or parameters of patients, and then Predict whether Epilepsy is detected or not. This system uses Support vector machine algorithm for classification. We are going to use

Figure 9.1: Paper Publication

link:http://avishkar.unipune.ac.in/Innovator/ViewResult.aspx

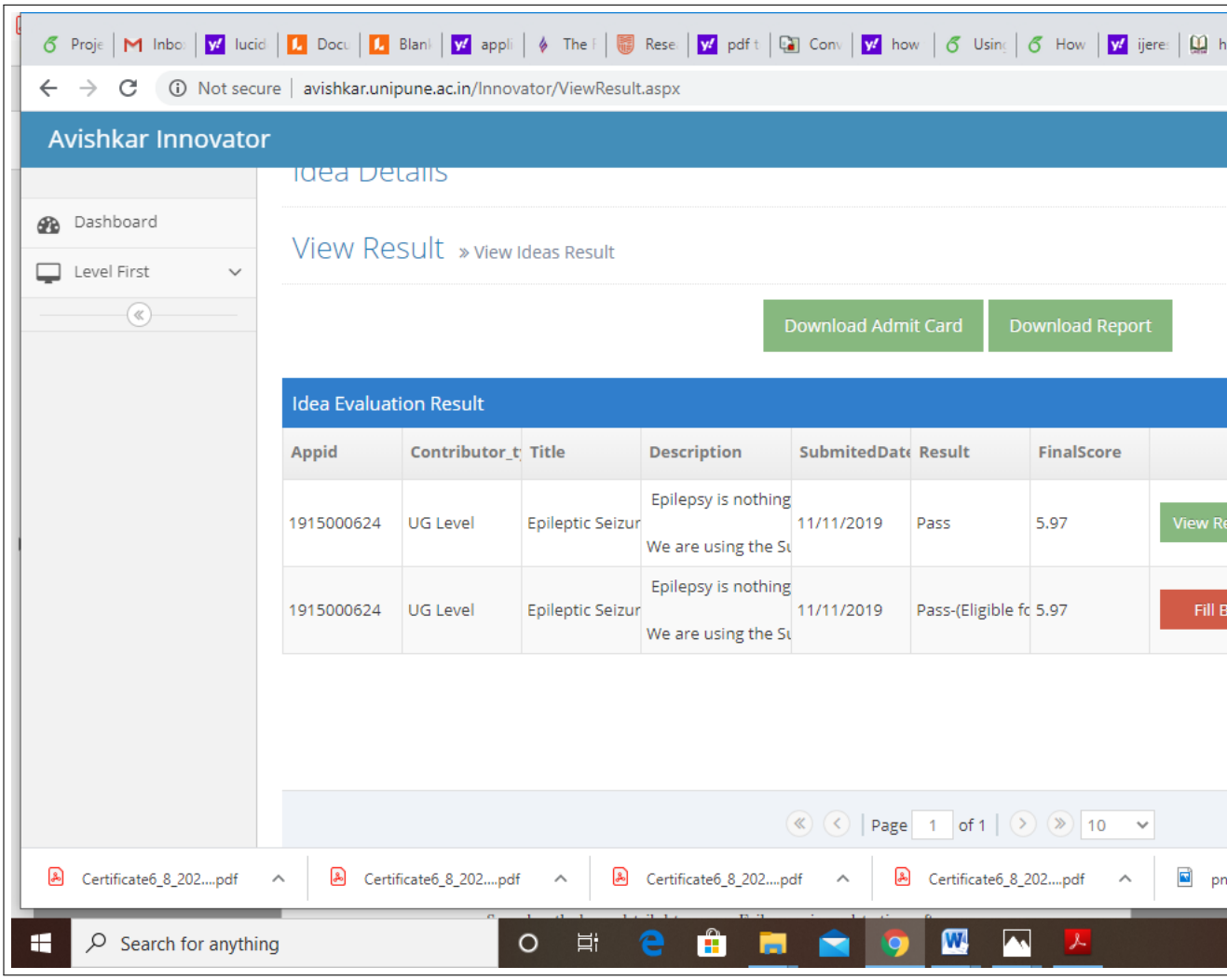

Figure 9.2: Paper Presentation

Annexure A
PLAGIARISM REPORT

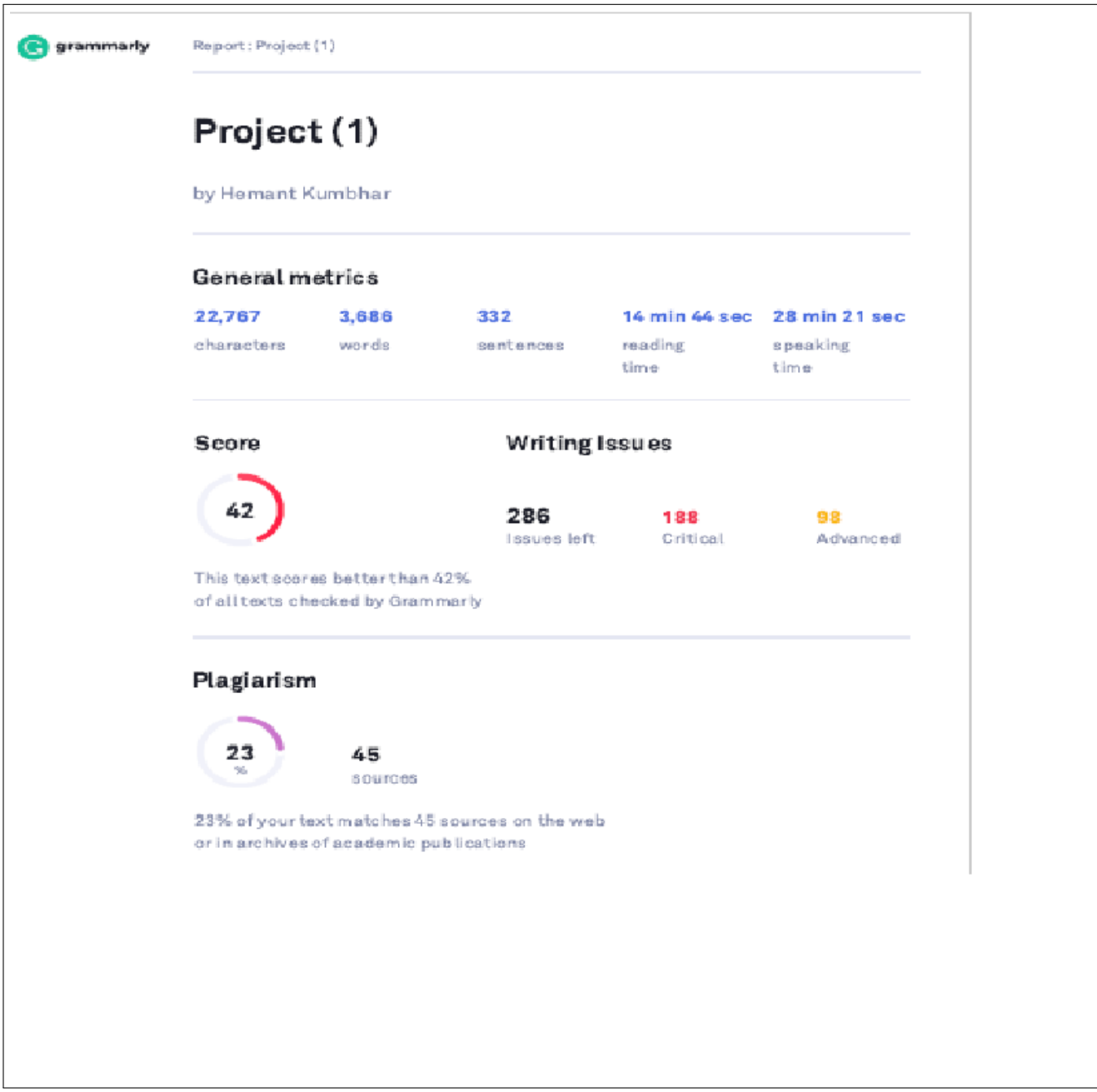

Figure 9.3: Plagiarism Report

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AVISHKAR 2019

DISTRICT LEVEL RESEARCH COMPETITION

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AVISHKAR 2019

DISTRICT LEVEL RESEARCH COMPETITION

Certificate of Participation

This is to certify that Shri./smt. ***Gawade Asmita Rajendra*** of ***SHIVNAGAR VIDYA PRASARAK MANDAL COLLEGE OF ENGINEERING*** has participated at the **"Avishkar – 2019"** District Level Research Competition at ***UG Level*** in the ***Medicine and Pharmacy*** Category, held at ***Dr. D. Y. Patil Arts, Commerece & Science College Akurdi Pune*** in ***January 2020.***

Mr. M. V. Rasve
Deputy Registrar