



# SMART HEALTHCARE SYSTEM

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**Abstract: -**

Living an imbalanced and stressful life has an impact on heart function, resulting in a variety of heart-related disorders and anomalies. It is difficult for patients to determine which doctor is present there for treatment when they arrive for a medical checkup. To solve this problem smart healthcare system project is developed. This paper provides a look at how Machine Learning techniques were utilized to create a smart healthcare system. Gradient boosting and Haar -Cascade classifier was some of the Machine Learning algorithms used in the research.

**Key Words— Heart Abnormality predictor, Attendance system, Patient, Gradient Boosting, Haar-cascade classifier.**

## ***I. INTRODUCTION***

In today's time due to an imbalanced lifestyle people of all age group are facing various health issues and the most common is heart-related disease like chest pain, cholesterol, imbalance value of resting blood sugar which is kept on increasing. Nowadays due to fast moving life and lack of time people have started avoiding their lifestyle habits which directly affects their health. Since people are engaged in their busy schedules and they do not have enough time for a medical checkup this project will help to save patient's time. Due to fast-growing lifestyle, there is a development done in every sector and similarly medical firm is developing by providing the best medical treatments through highly qualified doctors. Among these doctors, a specialized doctor is required for the treatment of a particular body organ. This project will support identifying the presence of the specialized doctor in the medical firm required for treating the patients. Basically, this project smart healthcare system is designed to contribute better healthcare services to patients.

## ***II. OBJECTIVES***

The smart healthcare system contributes to providing better medical treatment, it consists of mainly two features where the first feature is heart abnormality predictor and the second is attendance system using facial recognition. The purpose that will be achieve during this project:

1. The aim of the research for the heart abnormality predictor is to predict the abnormality in heart condition on basis of values of 13 parameters. By predicting the heart condition of the patient we will come to know that whether the patient requires the treatment or not.

2.The goal of Attendance system is to mark the attendance of the medical staff members using facial recognition. As the attendance of the medical staff member will be marked it will be easy to identify which doctor is available for treatment if patient requires the treatment.

## ***III. LITERATURE REVIEW***

This paper [1] describes a way for integrating a student's attendance system with face recognition technology using Personal Identification Numbers (PINs). PCA is a component analysis algorithm. The system will keep track of everything. The attendance in a classroom context automatically, and it will give the professors with the necessary resources. By keeping a student information database, you can readily access the information of your pupils. Keep track of when you clock in and out.

This research [2] presents a safe and secure solution for automating the attendance system by incorporating face recognition technology and detecting faces with Haar-cascade classifiers. By employing a sufficient and accurate training dataset, pre-processing techniques, and Haar-cascade classifiers,

the proposed system in this paper addresses all errors that arise in developing face recognition systems, such as information retrieval time, image properties such as size, quality, and intensity settings, and face orientations.

The goal of this study [3] is to use machine learning algorithms to forecast a patient's heart disease stage level. In order to choose the best features in the data, they employed the gradient boosting approach in conjunction with Recursive Feature Elimination (RFE).

Support Vector Machine (SVM), K-nearest neighbors (KNN), Logistic Regression (LR), Nave Bayes (NB), Random Forest (RF), and Gradient Boosting ensemble approach are some of the common models developed utilising supervised machine learning classification algorithms on scaled data. Standard performance criteria such as accuracy, recall, and F1-score are also used to evaluate these methods.

A gradient boosting tree (GBT) [4] based classifier or gradient boosting classifier model is used in this paper to accurately predict HD. Based on numerous performance criteria, the experimental values proved that the GBT classifier was superior.

#### IV. OVERALL DESCRIPTION

##### 1) Product perspective:

The general public is the target audience for this project or concept. This is beneficial to people of any age and, when taken correctly, can be utilized to predict heart abnormality. This will be achieved with the help of my college faculty. The main purpose of this project is to easily identify the presence of doctor in the medical firm for treating patient if the patient's heart is predicted to be in abnormal condition.

##### 2) Product function:

1. Users will provide the required information for prediction and registration.
2. The data will then be passed through the ML model in the following order:
  - 2.1 Gradient boosting classifier is utilized to predict heart abnormality.
  - 2.2. The Haar-Cascade Classifier is utilized to capture images for marking attendance.
3. Based on the input data values in predictor form, the predictor will predict the heart abnormality.
4. Users can register themselves by providing Name, ID and images for registration.
5. To take attendance user's image will be captured and verified with dataset
6. If image is verified with dataset then attendance will be marked.

##### 3) Operating Environment:

- The Windows 10 operating system is being used throughout development.
- The system would be implemented using Python programming.
- Visual studio: Microsoft Visual Studio is an integrated development environment (IDE) from Microsoft. It is used to

develop computer programs, as well as websites, web apps, web services and mobile apps.

- Kaggle: This web-based application will be used to explore and build models from datasets.

##### 4) Design and implementation constraints:

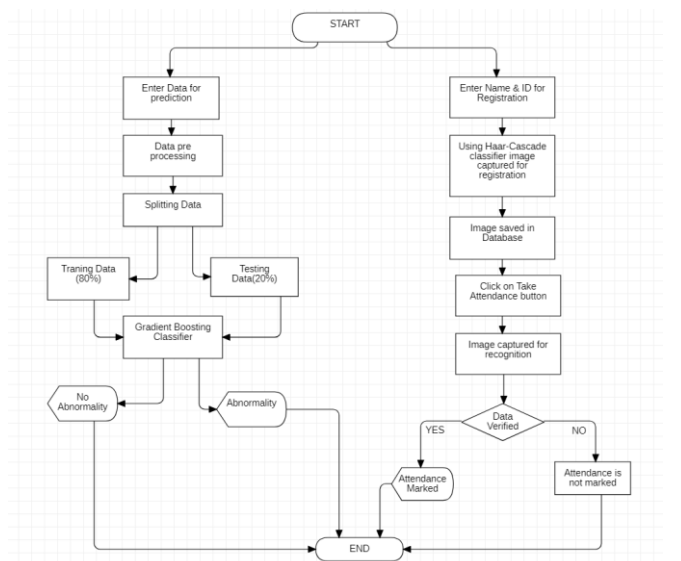
We created the system so that every time a user accesses the attendance system and clicks the attendance button, his or her images are collected for recognition and attendance is recorded; but, if the user is using the attendance system for the first time, he or she must first register. The heart abnormality prediction form is created by combining 13 parameters that, when combined, predict the heart abnormality. The following are some of the functions that this system is capable of:

- Input data
- Store data
- Capture images
- Heart abnormality prediction model

### V. PROPOSED SYSTEM

#### 1.PROCESS

fig.1. flow chart of smart healthcare system



The interface of this project Smart Healthcare System is very user-friendly, which can be easily accessible by the user for any age group. This project consists of two features Heart abnormality predictor and Attendance system. For using the heart abnormality predictor first the user needs to enter the values of the 13 different parameters including personal details required for the prediction in the heart abnormality prediction form. Once the user enters the required details for prediction and clicks on the result button on the prediction form, then it will predict whether the patient has heart abnormality or not. This prediction is based on the values provided in the parameters using gradient boosting algorithm.

The second feature of the project is the Attendance system which will mark the attendance of the medical staff members with the help of facial recognition. So for taking the attendance if the user is already registered, by clicking on the take attendance button user's image will be captured and the attendance for that particular user will be marked, but if the user is not registered then he/she needs to register themselves. To register user needs to enter Name, ID and provide images for registration by clicking on the take image button. Once the images are clicked, then using save profile button for saving the profile. As the user will click on the save profile button a password window will open and the user needs to enter the password for saving his/her profile.

## 2. METHODOLOGY

This project smart healthcare system predicts heart abnormality and marks attendance by identifying face. The first task is to determine the problem statement. The main feature of the project is machine learning which is created by using gradient boosting classifier and Haar-cascade classifier. Where the heart abnormality is predicted using gradient boosting classifier which is helpful in easily predicting heart abnormality as all the necessary parameters are used for prediction, and the attendance is marked with the help of Haar- cascade classifier which makes it easy to identify that which medical staff is present there for the treatment.

We've also created a user interface for interacting with the system. The system will operate in a Machine Learning context, processing data and providing Prediction and marking attendance as a result.

Firstly, in Attendance system if the user is not registered then he/she needs to register themselves for which their Name, ID and images will be required, and if user is already registered then his/her registered will be marked by capturing images and then verifying it with database. In Heart Abnormality predictor it predicts the abnormality when the values of the required parameters are entered in the form.

## 3. DATA SETS AND MODEL DESCRIPTION

### 3.1 Datasets:

The Heart abnormality predictor dataset is made with reference from Kaggle, which consists of 13 different attributes for 303 patients. these attributes include personal details of the patient and parameters on which basis the prediction is done. These attributes are: age, sex, chest pain, trestbps, cholesterol, fasting blood sugar, restecg, thalach, exang, oldpeak, slope, ca, thalassemia, and last column is target which shows whether the prediction is accurate or not.

The Face attendance system dataset needs the Name, ID, and image of the medical staff to mark the attendance, and this required data is stored when the user will register for the first time in the attendance system.

### 3.2 Algorithms used:

For object detection, Haar cascades are one of many techniques now in use. One thing to keep in mind with Haar cascades is that lowering the false negative rate is critical,

therefore set hyper parameters accordingly when training your model.

Working of haar cascade: -

Haar cascade algorithm can be explained in 4 steps: -

#### 3.2.1 Calculating the haar features:

Collecting haar feature is the very first of the algorithm. Essential calculations are performed on the adjacent rectangular regions of an image at the specific locations. Once the Haar features are collected further calculations begin, in the calculation pixel's intensities are summed in each region and the difference between the sums are also calculated. It is difficult to determine these features for a large or very large image. To solve this problem integral images are introduced, as integral images reduces the number of operations.

#### 3.2.2 Creation of Integral Images:

Integral pictures essentially boost up the calculation of these Haar characteristics. It creates sub-rectangles and array references for each of those sub-rectangles instead of computing at every pixel. Following that, the Haar features are computed. It's vital to remember that while doing object detection, practically all of the Haar characteristics are meaningless because the only features that matter are those of the object. For choosing the finest characteristics from hundreds of thousands of Haar features to represent an object Adaboost enters the picture.

#### 3.2.3 Adaboost Training:

Adaboost basically selects the most useful features and trains the classifiers to use them. It creates a "strong classifier" by combining "weak classifiers" that the algorithm may use to detect items. Moving a window over the input image and computing Haar features for each portion of the image produces weak learners. This difference is compared to a learned threshold for distinguishing between non-objects and objects. Because these are "poor classifiers," creating a strong classifier requires a huge number of Haar features.

#### 3.2.4 Cascading Classifier:

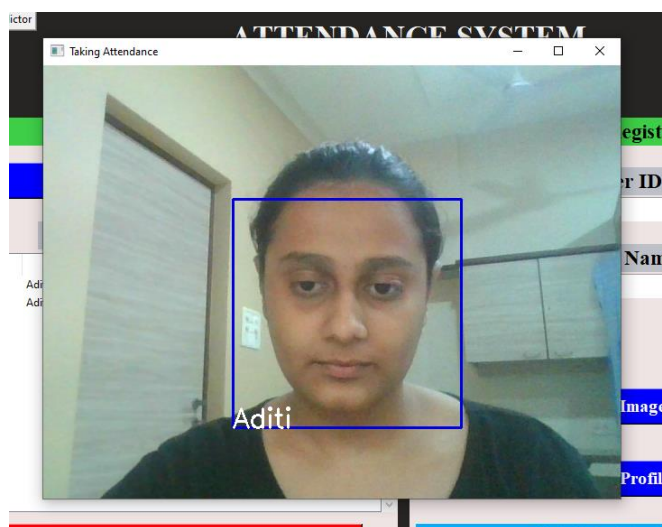
The final step is of combing these weak learners into a strong learner by using cascading classifiers. The cascade classifier consists of a sequence of stages, each of which contains a group of weak learners. Weak learners are taught via boosting, which produces a highly accurate classifier based on the average prediction of all weak learners.

The classifier then selects whether to mark an object as found (positive) or to move on to the next region based on this prediction (negative). Because the bulk of the windows do not contain anything of interest, stages are designed to reject negative samples as quickly as feasible. Because classifying an object as a non-object can severely hamper your object identification method, it's critical to maximise a low false negative rate. The "positives" from the weak learners are represented by the red boxes.

Gradient boosting is a machine learning method for regression and classification that builds a prediction process using a set of weak estimation methods, the most common of which is a decision tree. It combines multiple lesser models into a powerful, huge model with excellent predictability. This type of model is common due to its ability to efficiently classify

datasets. Decision trees are commonly used to build models for gradient boosting classifiers. Gradient Boosting involves optimizing a loss function, teaching a weak learner to generate accurate predictions, and adapting weak learners to an optimization technique to reduce the loss function. The loss function should be one-of-a-kind and tailored to the task at hand. Gradient Boosting Regards Decision Trees as a poor learner. They can be used to insert successive model outputs and correct residuals in forecasts since regression trees generate real values as distributed outcomes and their outputs can be summed together. Trees are presented one at a time in an additive model, with previous trees in the framework remaining intact. The gradient descent method can help minimize the probabilities when adding trees.

## VI. RESULTS ANALYSIS



### Accuracy acquired:

Face is captured and identified while taking attendance with help of Haar-Cascade Classifier.

Heart Abnormality Predictor

Heart Abnormality Prediction Test

Age	Sex		
<input type="text"/>	-- Select an Option --		
Chest Pain Type	Resting Blood Pressure in mm Hg	Serum Cholesterol in mg/dl	Fasting Blood Sugar > 120 mg/dl
-- Select an Option --	<input type="text"/>	<input type="text"/>	-- Select an Option --
Resting ECG Results	Maximum Heart Rate	ST Depression Induced	Exercise Induced Angina
-- Select an Option --	<input type="text"/>	<input type="text"/>	-- Select an Option --
Slope of the Peak Exercise ST Segment	Number of Vessels Colored by Fluoroscopy	Thalassemia	
-- Select an Option --	-- Select an Option --	-- Select an Option --	
<input type="button" value="Result"/>			
The patient is likely to have heart abnormality!			

### Accuracy acquired:

Result of heart abnormality is predicted on basis of the values provided in the required parameters of prediction form.

## VII. CONCLUSION

As further there will be an increase in the number of patients having heart abnormalities across the world, this project will contribute to providing better healthcare services to patients. The project smart healthcare system is life and time saving for

patients as if it detects heart abnormality and the patient requires to be treated by the doctor then with the help of face attendance system it can be easily identified which doctor is available there in the medical firm for the treatment of the patient.

## VIII. FUTURE SCOPE

Further in the future, in this project just like we created a heart abnormality predictor, we can add web pages for multiple diseases prediction which can be beneficial to patients suffering from different diseases.

As there will be an increase in disease prediction as new and different diseases will be added in the project, we can add features like department and qualification of medical staff in Face attendance reader, Which will help in easily identifying the doctors present in the medical firm for treating the patient with a particular disease.

## IX. REFERENCES

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