

**Early Heart Attack Prediction Using Machine Learning Technique**

**BY**

**MD Faizul Islam**  
**161-15-7455**

This Report Presented in Partial Fulfillment of the Requirements for the  
Degree of Bachelor of Science in Computer Science and Engineering

Supervised By

**Dr. Syed Akhter Hossain**

Professor and Head  
Department of CSE  
Faculty of Science & Information Technology  
Daffodil International University



**DAFFODIL INTERNATIONAL UNIVERSITY**

**DHAKA, BANGLADESH**

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## APPROVAL

This Project/internship titled “**Early heart attack prediction using machine learning technique**”, submitted by **MD Faizul Islam, ID No: 161-15-7455** to the Department of Computer Science and Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 8<sup>th</sup> july 2020

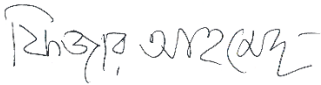
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We hereby declare that this research has been done by us under the supervision of **Dr. Syed Akhter Hossain** Professor and Head, Department of CSE, Daffodil International University. We also declare that neither this research nor any part of this research has been submitted elsewhere for the award of any degree or diploma.

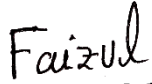
**Supervised by:**



---

**Dr. Syed Akhter Hossain**  
Professor and Head  
Department of CSE  
Daffodil International University

**Submitted by:**



08-07-20

---

**MD Faizul Islam**  
ID: -161-15-7455  
Department of CSE  
Daffodil International University

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## **ABSTRACT**

Heart attack is a disease which has become the leading cause of death worldwide. Particularly in the South Asian countries have a tremendous risk of heart attack at an early age than any other ethnic group. Most often it's challenging for medical practitioners to predict heart attack as it requires experience and knowledge which is a complex task to accomplish. This health industry has enormous amounts of data which is useful for making effective conclusions using their hidden information. Using appropriate results and making effective decisions on data, some superior data mining techniques are used such as Logistic Regression, Decision Tree, K-NN. By using some properties like (age, gender, bp, stress etc) we can be predicted the chances of heart attack.

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# CHAPTER 1

## INTRODUCTION

### 1.1 Introduction

A heart attack is the death of a segment of heart muscle caused by a loss of blood supply. The blood is usually cut off when an artery supplying the heart muscle is blocked by a blood clot. Usually, the heart muscle does not get the necessary amount of oxygen due to a blood clot that blocks the artery supply. The three types of heart attacks are (a) ST segment elevation myocardial infarction (STEMI) (b) non-ST segment elevation myocardial infarction (NSTEMI) (c) Coronary spasm or unstable angina.

Cardiovascular disease is the number one cause of death globally; more people die annually from cardiovascular diseases than from any other cause. It accounts for nearly one in every three deaths worldwide annually. Accounting for 15.5% of all deaths worldwide cardiovascular disease is the world's leading cause of death.

At present growing concern for Bangladesh is a cardiovascular disease with patients suffering it topping the list of people with non-communicable diseases. According to the National Health Bulletin, the top cause of hospital admission, morbidity, and mortality in the country is also cardiovascular disease. “Cardiovascular disease became the leading cause of death among the non-communicable diseases in Bangladesh,” said the World Health Organization in its latest Non-Communicable Diseases Country Profiles 2018.

According to (WHO) [7], deaths caused by cardiovascular disease increased manifold in Bangladesh over recent years. Cardiovascular identification could be a sophisticated and necessary task that must be done accurately and expeditiously. Supported a doctor's expertise & information the identification is usually created. This results in unwanted results & excessive medical prices of treatments provided to patients. Therefore, a computerized medical diagnosis system would be extremely

propitious.

But using the data mining technique we can explore the hidden patterns in the medical domain. These patterns can be utilized for clinical diagnosis. An online-based prediction system can make these diagnoses easy and affordable especially for the financially insecure people.

This paper intends to research the various prognostic descriptive data processing techniques introduced in recent years to predict the possibilities of upset.

## **1.2 Motivation**

In case of Heart attack, when heart attack occur, sometimes can't understand which heart attack is occurred. Is this heart attack or other diseases? For this reasons people have to go to hospital and do many testing for this disease which is very time consuming and wasting money. In this situation patient cannot get proper treatment in early which is bad for this patient's condition. Many of the time doctor almost done getting result but sometimes result become wrong for doing early. That's why many patients do not get right treatment and can't understand which will be the next treatment. So many people suffer more and more. Our system helps to give a good result for this situation and get early result that heart attack has or not.

## **1.3 The rationale of the study**

Presently a-days, Heart attack is considered as one of the most serious diseases. It considered as a most alluring sickness for getting to be identified with the heart. In the wake of seeking and breaking down we picked heart attack as our exploration point. For turning into an expansive number of dead on the heart attack, the exploration subject has been chosen. At long last, the paper has been chipping away at this to give a superior proposal that encourages us to diminish the dead number for our advanced age people groups.

The purpose of data mining is to find effect full data from large databases. The purpose of data mining is to find effect full data from big databases. Data mining technique are used for profitable and experimental sector. It is a procedure of determining, research and design big number of data in order to identify anonymous patterns or links which add a clear and appropriate conclusion to the data examiner. Data determining, data purification, data conversion, pattern seeking.

#### **1.4 Research questions**

- a) Does it show the accurate value to predict heart attack in early prediction?
- b) Does it classify heart attack diseases by machine learning algorithm?

Already, several harmful diseases have been detected for a human being. Although each disease has a solution for prevention it's not possible for everyone due to only for unconsciousness. Everyone wants to lead a happy life in where a disease is the only obstacle. Any kind of disease prevention is possible if that in remain primary stage. For that reason, we built a prediction system that helps to identify the disease stage and provides us the result that he or she has heart attack or not. All of the diseases, heart attack disease is considered one of the leading diseases. Many peoples are died due to this disease. Heart attack disease is the biggest killer of both men and women in the world. In our Bangladesh there are no well-known system for heart attack. Finally, we selected it as our research topic in Bangladesh people for our pleasure and also try to make a good system for prediction heart attack diseases.

#### **1.5 Expected Output**

In our heart attack prediction is a system that helps to generate an expected result based on the given dataset. In this system, we used 70% of the training to get more accurate predictions. How accurate is it, it depends entirely on the training dataset? After completing all the needed procedure of the proposed system, our system has been ready for preparing out on the given dataset. We have applied various strategies to achieve our desired results. We got 97% accuracy from the K-Nearest Neighbors (KNN) among all that we have used.

## **1.6 Layout of the Report**

- Chapter 1 have demonstrated an introduction to the project with its motivation, research questions and expected outcome.
- Chapter 2 will have “Background” demonstrates introduction, related works, research summary and challenges.
- Chapter 3 will have Research Methodology.
- Chapter 4 will have Experimental Results and Discussion.
- Chapter 5 will have Summary and Conclusion.

## **CHAPTER 2**

### **Background Study**

#### **2.1 Introduction**

In this section, we will discuss related works, research summary and challenges about this research. In related works section, we will discuss other research paper and their works, their methods and accuracy which are related to our work. In research summary section we will give the summary of our related works. In challenges section, we will discuss how we increased the accuracy level.

#### **2.2 Cardiovascular Disease**

In this section, we will discuss some description of cardiovascular disease.

##### **2.2.1 Definition**

Cardiovascular disease generally refers to conditions that involve narrowed or blocked blood vessels that can lead to a heart attack, chest pain (angina) or stroke [29]. Other heart conditions, such as those that affect your heart's muscle, valves or rhythm, also are considered forms of heart disease [29].

##### **2.2.2 Causes and Risk Factors**

While the disease can confer with entirely completely different heart or vessel problems, the term is sometimes accustomed mean hurt to your heart or blood vessels by induration of the arteries, a buildup of fatty plaques in your tracks. Plaque increase thickens and stiffens artery walls, which could inhibit blood run through your arteries to your organs and tissues. Cardiovascular disease is to boot the foremost common reason for disorder. It's caused by correctable problems, like associate unhealthy diet, being overweight lack of exercise and smoking.

There are various risk factors for the disorder. Some you will be ready to predict, others you can't. Some preservation can control this disease if we take this early stage.

Ones that can't be controlled include:

- Gender (males square measure at larger risk)
- Age
- A family history
- Being post-menopausal

Still, creating some changes in your modus vivendi will scale back your probability of getting cardiopathy. manageable risk factors include

- Smoking
  - High LDL, or "bad" cholesterol, and low high-density lipoprotein, or "good" cholesterol
  - Uncontrolled cardiovascular disease (high blood pressure)
  - Physical inactivity
  - Obesity
  - Uncontrolled polygenic disorder
  - Uncontrolled stress and anger
- 
- Uncontrolled stress and anger

The following figure 2.2.2 shows plaque on blood vessel

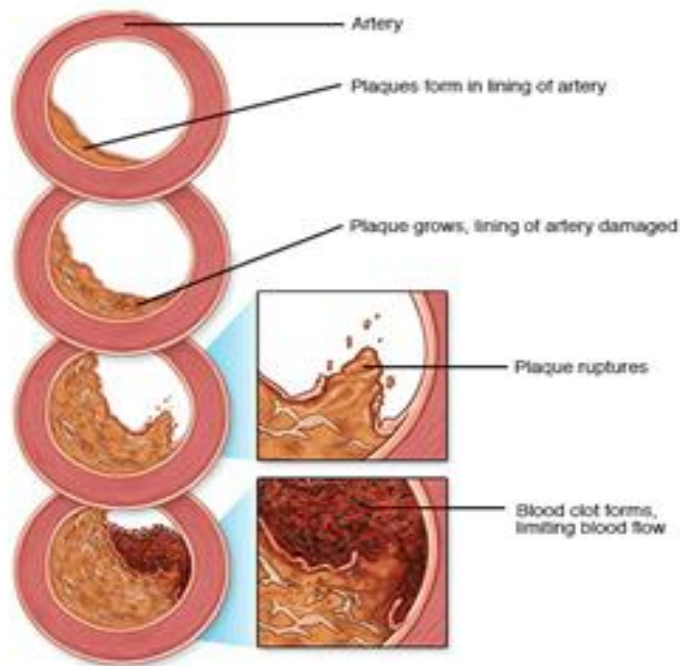


Figure 2.2.2: Plaque on blood vessel

## 2.2 Related Work

**Vikas Chaurasia & Saurabh Pal** used ID3, CART & DT algorithm for diagnosis of patient with heart disease. They got best accuracy for CART algorithm and the accuracy rate was 83.49% [1]. **Asha Rajkumar & Mrs. G.Sophia Reena** used Naive Bayes, Decision List, KNN algorithm for diagnosis of patient with heart disease and they got best accuracy rate for Naive Bayes algorithm which was 52.33% [2]. **Jyoti Soni, Ujma Ansari, Dipesh Sharma & Sunita Soni** proposed the use of Naive Bayes, Decision Tree and KNN algorithm for which they got the best accuracy rate for KNN of 89% [3]. **Kittipol Wisaeng** used only the KNN algorithm in his research and he achieved the highest SE, SP and AC



values of 0.80, 0.80 & 81.90% respectively [4]. **I Ketut Agung Enriko, Mohammad Suryanegara & Dedang Gunawan** used KNN, Naive Bayes and simple CART algorithm in their research and they got best result for KNN with the accuracy rate of 81.85% [5].

### 2.3 Research Summary

In this table 2.1, we have shown the research paper summary in a simple tabular form.

Table 2.1: Research paper summary

SL No	Author	Methodology	Outcome
1	Vikas Chaurasia & Saurabh Pal [1]	ID3, CART & DT method	Best accuracy 83.49% for CART
2	Asha Rajkumar & Mrs. G.Sophia Reena [2]	Naive Bayes, Decision List and KNN method	Best accuracy 52.33% for Naive Bayes
3	Jyoti Soni, Ujma Ansari, Dipesh Sharma & Sunita Soni [3]	Naive Bayes, Decision Tree and KNN method	Best accuracy 89% for KNN
4	Kittipol Wisaeng [4]	KNN method	Highest SE, SP and AC values of 0.80, 0.80 & 81.90% respectively
5	I Ketut Agung Enriko, Mohammad Suryanegara & Dedang Gunawan [5]	KNN, Naive Bayes and simple CART method	Best accuracy 81.85% for KNN

Heart attack is a disease that attacks the heart. Without a doubt, the heart is a very important part of every human being. Therefore, if we want to lead a healthy life, we have to be cautious. If we can predict this disease at an early stage, we can easily prevent it. Otherwise

we must suffer for this disease for our future life. After making the decision based on the current situation, we wanted to establish a system that provides better performance due to disease and understand the situation of affected patients. Finally, we touch our expected goal for God's blessing, which we have thought to implement.

## **2.4 Scope of the problem**

In our research we used many algorithms. But when searching for a better accuracy rate we faced many problems with algorithms. When we were trying to find best accuracy this time few algorithm provide good accuracy but they had some drawbacks and they are time consuming. So we were trying to find out which one give best result in short time. None of the renowned algorithm gave us the actual result we were hoping for. So we find out a good algorithm that matches our expectations and also time efficient.

Some of the example of problems while searching for a best algorithm,

- Some algorithm was showing same accuracy although we are inputting different types of data
- Having problem with data implementation some of the algorithm etc.

## **2.5 Challenges**

Data collection is one of the big challenges for getting predicting accuracy. Without data, the prediction is not possible and it can't predict. After that, another challenge is preprocessing. After doing preprocessing our data set has no null value and helps us to get a good prediction. Next, Feature scaling helps to take all feature values into the same scale with respect to value. Therefore, different algorithm has been applied to the proposed architecture. Finally, the implementation process has been established to get accurate predicted value. There were several challenges rising according to the working procedure. We tried to increase and got a better result for this model by using machine learning algorithm of K-Nearest Neighbors.

Here are few more challenges for us,

- Choosing the perfect algorithm
- Finding study shareholder
- Dealing with the data
- Input data in excel file
- Implementation the dataset on algorithms

## CHAPTER 3

### RESEARCH METHODOLOGY

#### 3.1 Introduction

In our system, we tried to collect data from different medical hospital in our country (Bangladesh). We also tried a unique way and made accurate prediction in our research. We used 14 features and 100 data from Medical hospital's patient dataset. After that, we got some missing value which we resolved. To get the proper prediction, we've already completed the feature scaling process. Datasets are used for training and testing purposes and here are some of them included algorithm Logistic Regression (LR), Classification and Regression Trees (CART), k-Nearest Neighbor (KNN), support vector machines (SVM). The appropriate algorithm scenario has been given based on the working procedure.

#### 3.2 Data Collection Procedure

However, a few hospital-based heart attack studies have been carried out involving three hospitals: National Heart Foundation of Bangladesh, Ibrahim Cardiac Hospital & Saaol Heart Centre. The study was conducted about 100 heart attack patients and 100 normal patient data (have no heart attack) in National Heart Foundation of Bangladesh, Ibrahim Cardiac Hospital & Saaol Heart Centre between 2017 to 2018. We also tried to make our work a unique research. We also search many research paper and get many research paper in heart attack. But our work is for classification of heart attack in early prediction which is unique. In Bangladesh, nobody had done research for classification of heart attack. That's why we collected heart attack dataset and tried to make a good system for our people. Here are some details of dataset collection Table3.1-

Table3.1: Dataset details

SL No	Name of the Medical	No. of data
1	National Heart Foundation of Bangladesh	120
2	Ibrahim Cardiac Hospital	50
3	Saaol Heart Centre	30

Dataset of features reference value are shown in table 3.2 –

Table3.2: Dataset of feature range

Feature	Reference value	Feature	Reference value
BP	<120/80	ST depression	1.3-1.5
Cholesterol	<200mg/dL	Slope of ST	
FBS	<120	Number of vessels fluro	
ECG	120-200ms	Thallium	< .5
HR	170bpm	AGE	>40
Exercise Angina	True	GENDER	Maximum male
Heart Disease	Absence		

In this dataset table 3.2, we try to show 13 dataset features reference value. In table 3.2, we want to show our dataset information where features are Blood Pressure(BP), Cholesterol, Fasting Blood Sugar(FBS), Electrocardiogram(ECG), Heart Rate(HR), Exercise Angina, Heart Disease, ST Depression, Slope of ST, Number of vessels Fluro, Thallium, Age, Gender.

### 3.3 Statistical Analysis

In our system dataset, we have 100 datasets for heart attack patient and 100 datasets non-heart attack patient. Here, we selected 70% dataset to train and 30% dataset to test. In this system we try to find out accuracy from the dataset and use KNN method to predict heart attack diseases. In this figure 3.2 we are shown that dataset flowchart and how we use the dataset for proposed model.

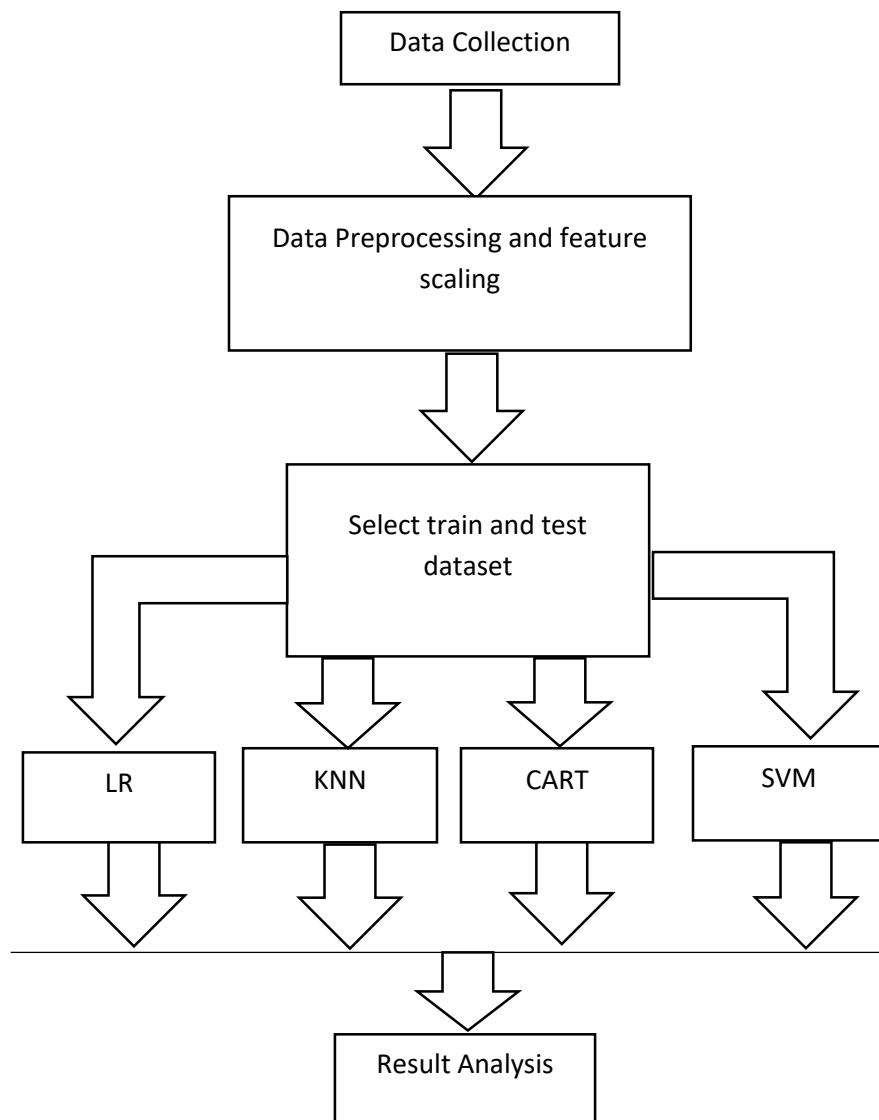


Figure 3.2: Architecture of our proposed model.

In this figure, we have shown that how we do our research in shortly details. In this figure 3.2 we can know how to go ahead for our target step by step.

### **3.4 Research Subject and Instrumentation**

As of late, the fame of machine learning calculations is rising exponentially. Machine Learning Algorithms give PCs the capacity to gain from information with the assistance of measurable methodologies. A machine can discover the interior information example and deliver a choice or prescient learning as a result without the assistance of express coding is considered as the most premium part. In this way, a similar calculation can be connected to datasets of various areas without having a change of its interior structures. There are distinctive kinds of machine learning calculations, however we have utilized some of them to our framework. The algorithm details are given below:

#### **3.4.1 Logistic Regression**

Logistic Regression, falls under Supervised Machine Learning. It takes care of the issues of Classification (to settle on forecasts or take choices dependent on past information). It is utilized to anticipate twofold results for a given arrangement of free factors. The reliant variable's result is discrete. Logistic backslide is another system procured by machine picking up from the field of insights. It is the go-to technique for matched portrayal issues. Calculated backslide uses a condition as the depiction, especially like straight backslide.

Information regards (x) are joined straightly using loads or coefficient regards (implied as the Greek capital letter Beta) to of section a yield regard (y). A key differentiates from direct backslide is that the yield regard being exhibited is a combined quality (0 or 1) rather than a numeric regard.

Coming up next is a model key backslide condition: $y = e^{(b_0 + b_1 * x)} / (1 + e^{(b_0 + b_1 * x)})$   
..... (1)

From equation 1, here  $y$  was the predict yield,  $b_0$  is the inclination or capture term and  $b_1$  was the coefficient for the single data esteem ( $x$ ). Every segment in your information has a related  $b$  coefficient (a consistent genuine esteem) that must be gained from your preparation information.

### 3.4.2 Decision tree (CART)

Decision trees are a vital kind of calculation for prescient demonstrating machine learning. The traditional decision tree calculations have been around for quite a long time and present-day varieties like arbitrary timberland are among the most ground-breaking procedures available. the humble decision tree calculation known by its more current name CART which represents Classification and Regression Trees. Decision tree technique is utilized as the most integral asset for taking in the machine since it gets compelling outcomes as quickly as time permits. Choice tree has diverse kinds of calculations: Cart, ID3, C 4.5, CHH and H48. Among them J48 is utilized and it is exceptionally mainstream algorithm. J48 utilizes pruning technique for building a tree. This calculation keeps on being a recursive procedure until the point that the normal outcomes are found. It gives great exactness and adaptability. This formula is made available from the following equations.

$$E = \sum_{i=1}^K P_i \log_2 P_i \dots \dots \dots (2)$$

From equation 2,

$K$  defines the number of classes of target attributes,

$P_i$  defines the number of occurrences of class,

$i$  is divided by the total number of instances.

Generally, this count is implied as "decision trees", yet on a couple of stages like R they are suggested by the more present-day term CART.



### 3.4.3 Support Vector Machine (SVM)

A Support Vector Machine (SVM) is a discriminative classifier officially described by a detaching hyperplane. Toward the day's end, given checked planning data (oversaw taking in), the computation yields a perfect hyperplane which organizes new points of reference. In two-dimensional space this hyperplane is a line apportioning a plane in two areas where in each class lay in either side the numeric data factors (x) in your data (the segments) shape a n-dimensional space. For example, in case you had two data factors, this would outline a two-dimensional space.

A hyperplane is a line that parts the information variable space. In SVM, a hyperplane is chosen to best separate the focuses in the info variable space by their class, either class 0 or class 1. In two-measurements you can envision this as a line and we should expect that the majority of our info focuses can be totally isolated by this line. For instance:

$$B_0 + (B_1 * X_1) + (B_2 * X_2) = 0 \dots\dots\dots (3)$$

From equation 3, here the coefficients (B1 and B2) that decide the incline of the line and the capture (B0) are found by the learning calculation, and X1 and X2 are the two info factors.

### 3.4.4 K-nearest neighbor (KNN)

KNN falls in the oversight adjusting gathering of computations. Casually, this implies we are given a marked dataset consisting of preparing perceptions (x, y) and might want to catch the connection among x and y. All the more formally, we will likely take in a capacity  $h: X \rightarrow Y$  with the goal that given a concealed perception x,  $h(x)$  can unquestionably foresee the relating yield y. The KNN classifier is likewise a non-parametric and occasion-based learning calculation. Non-parametric means it makes no unequivocal presumptions about the utilitarian type of h, staying away from the risks of mismodeling the basic dispersion of the information. For instance, assume our information is exceptionally non-Gaussian however the learning model we pick accept a Gaussian shape. All things considered, our calculation would make to a great degree poor forecast. Case based learning implies that

our calculation doesn't expressly take in a model. Rather, it retains the preparation occurrences which are thusly utilized as "learning" for the forecast stage. Solidly, this implies just when an inquiry to our database is made (i.e. when we request that it foresee a name given an information), will the calculation utilize the preparation occasions to release an answer.

In the arrangement setting, the K-closest neighbor calculation basically comes down to shaping a larger part vote between the K most comparative occurrences to a given "concealed" perception. Similitude is characterized by a separation metric between two information focuses. A noticeable choice is the Euclidean partition given by

$$d(x,x')=\sqrt{(x_1-x'_1)^2+(x_2-x'_2)^2+\dots+(x_n-x'_n)^2}\dots\dots\dots(4)$$

From equation 4, here given a positive entire number K, a subtle recognition x and a resemblance metric d, KNN classifier plays out the going with two phases:

It goes through the entire dataset registering d among x and each preparation perception. We'll call the K focuses in the preparation information that are nearest to x the set. Note that K is normally odd to counteract tie circumstances.

It essentially ascertains the separation of another information point to all other preparing information focuses. The separation can be of any kind e.g. Euclidean or Manhattan and so on. It at that point chooses the K-closest information focuses, where K can be any number.

Presently, there are likely pondering how to pick the variable K and what its effects are on this classifier. Everything considered, as most AI computations, the K in KNN is a hyper parameter that you, as a maker, must pick with the ultimate objective to get the best fit for the instructive file. Normally, it can consider K controlling the condition of as far as possible we talked about previously.

Exactly when K is close to nothing, we are constraining the zone of a given figure and driving our classifier to be "all the more outwardly impeded" to the general transport. A little motivator for K gives the most versatile fit, which will have low tendency yet high change. Graphically, our decision point of confinement will be progressively barbed.

Then again, a higher K midpoint more voters in each estimate and thus is more grounded to exemptions. Greater estimations of K will have smoother decision limits which suggests cut down change yet extended inclination.

The amount of gathering, K, must be settled before hand. Its downside is that it doesn't yield a comparative result with each run, since the ensuing packs depend upon the fundamental unpredictable assignments. We never know the certifiable bundle, using comparable data, assuming that it is inputted in an other solicitation it may convey various gathering if the amount of data is not many. As far we realize that datasets are especially orchestrated the KNN show building. Since KNN is a non-parametric computation, we won't obtain parameters for the model. The KNN () work reestablishes a vector containing component of portrayals of test set.

### **Selection of Algorithm:**

We use different algorithm to get highest accuracy from our dataset. In this figure, we are show which algorithm are given best accuracy among another algorithm.

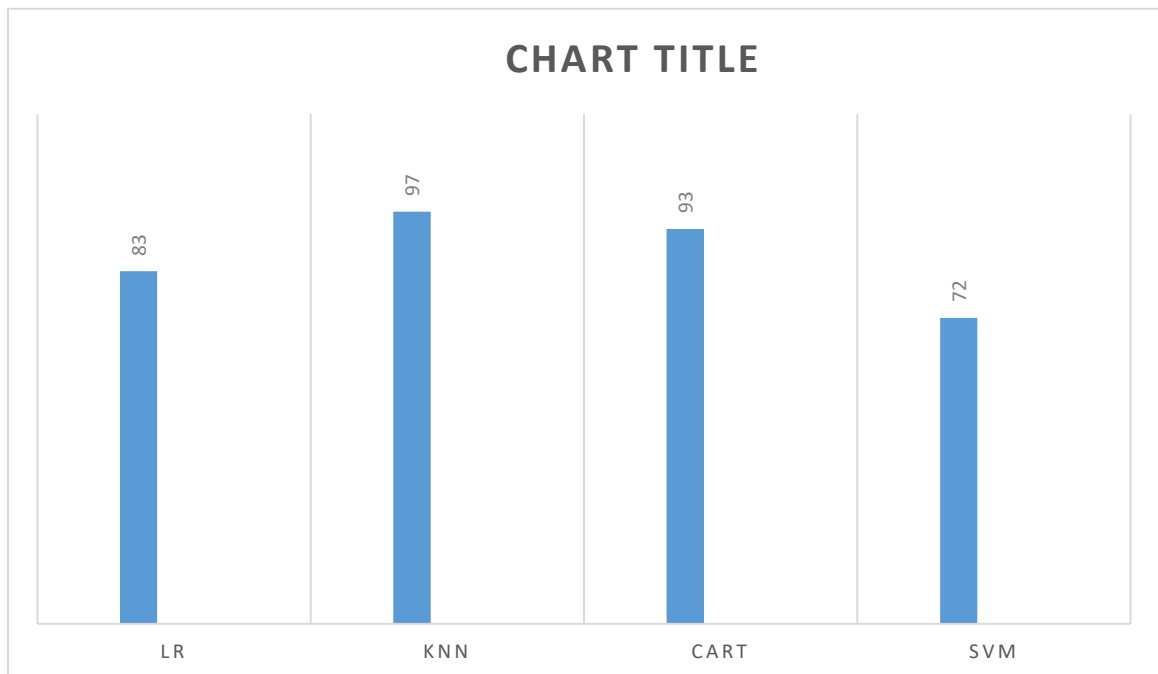


Figure 4.3: Applied algorithms of our proposed method

In figure 4.2, we have 4 models Logistic Regression, k-nearest classifier, Decision Tree Classifier, SVM and exactness estimations for each. We have to contrast the models with one another and select the most exact KNN. The little estimation of K will prompt an expansive fluctuation in expectations. On the other hand, setting K to an extensive esteem may prompt a substantial model inclination. Consequently, K ought to be set to an esteem sufficiently huge to limit the likelihood of misclassification and little enough (regarding the quantity of cases in the model example) so the K closest indicates are nearer the inquiry point. KNN is a decent decision when effortlessness and precision are the dominating issues. KNN can be prevalent, if the life expectancy of an information stream is less or where new sets of information arrives quickly and the preparation set is continue evolving. Despite the fact that KNN gives good outcomes, it is excessively costly as far as time and memory.

### **3.6 Proposed Algorithm**

In our proposed method we use K-nearest neighbors' algorithm. In our algorithm we try to build a model which predict brain stroke disease. Our proposed technique means to improve the execution of KNN classifier for illness forecast. Implementation is considered as a fundamental sector for making any system. Weka is an environment that consist of python and all deep learning packages. Various types of library Function has been used for implementation. In our method -

Step1. Firstly we select our datasets which contain heart attack and normal dataset.

Step2. Classification of dataset into patient with heart attack and normal.

Step3: Input the dataset.

Step4: Apply machine learning algorithm in python.

Step5: Find out highest accuracy from dataset from different machine learning algorithm.

Step6: Get highest accuracy using KNN.

Step7: Measure the performance of the model.

KNN takes the heart attack dataset and classify whether a person is having heart attack or not.

The above algorithm is applied on pre-processed dataset and performance is measured.

We have to realize that the model we made is any great. Afterward, we will utilize factual strategies to evaluate the exactness of the models that we make on concealed information. We additionally need a more solid gauge of the exactness of the best

model on inconspicuous information by assessing it on genuine concealed information. That is, we will keep down a few information that the calculations won't get the opportunity to see and we will utilize this information to get a second and free thought of how precise the best model may really be. We will part the stacked dataset into two, 70% of which we will use to prepare our models and 30% that we will keep down as an approval dataset. We will use 10-fold cross validation to estimate accuracy. This will split our dataset into 10 parts, train on 9 and test on 1 and repeat for all combinations of train-test splits.

Cross-approval is a resampling method used to assess machine learning models on a restricted information test.

The method has a solitary parameter considered  $k$  that alludes to the quantity of gatherings that a given information test is to be part into. In that capacity, the technique is frequently called  $k$ -crease cross-approval. At the point when a particular incentive for  $k$  is picked, it might be utilized instead of  $k$  in the reference to the model, for example,  $k=10$  getting to be 10-overlay cross-approval.

Cross-approval is essentially utilized in connected machine figuring out how to evaluate the aptitude of a machine learning model on concealed information. That is, to utilize a restricted example with the end goal to gauge how the model is relied upon to perform as a rule when used to make forecasts on information not utilized amid the preparation of the model [19].

## Chapter 4

### Experimental Results and Discussion

#### 4.1 Introduction

In this chapter, we will discuss the results of the conducted experiment. We will compare and explore different classifier performance and accuracy. Here some data from online and some data from real people about their knowledge of heart attack and their experience of the problem. From the data set, we find out some statistical data using different formulas and draw some charts on the basis of the data percentage. To measure the accuracy rate of the proposed system in our data set we tested 4 algorithms. We will show the result in a graph and also in tables.

#### 4.2 Experimental Results

To quantify the exhibition of our proposed framework we use dataset for 12 highlights to test the exactness. Our dataset contains 200 information which is coronary episode and ordinary and furthermore get the exactness 97%. We utilize genuine dataset that is the reason we locate the high precision from our dataset. We likewise applied Cross Validation Technique and divided our last dataset into 10 equivalent subsamples to get the higher exactness. We additionally use perplexity network to ascertain exactness, review, F-measure, Support, True Positive Rate, True Negative Rate and precision of the model. The confusion matrix is a table to describe the performance of a classification model on a set of test data. Confusion matrix can define four terms:

True Positive (TP): we predicted result as no brain stroke which are actually no-brain stroke.

True Negative (TN): we predicted result as brain stroke which are actually brain stroke.

False Positive (FP): we predicted No-brain stroke, but these are not actually no brain stroke.

False Negative (FN): we predicted brain stroke, but these are actually no-brain stroke.

Precision: precision is the piece of related instances among the retrieved instances. high precision means that an algorithm returned substantially more relevant results than irrelevant ones.

$$precision = \frac{tp}{tp + fp}$$

Recall: Recall is the piece of relevant instances that have been retrieved over the total amount of relevant instances. High recall means that an algorithm returned most of the relevant result.

$$Recall = \frac{tp}{tp + fn}$$

F-measure: f-score is a measure of test's accuracy by considering both precision and recall. it is a harmonic average of precision and recall.

$$F - score = \frac{2 * precision * recall}{precision + recall}$$

Accuracy: accuracy refers to the familiarity of the measured value to a known value.

$$accuracy = \frac{tp + tn}{tp + tn + fp + fn}$$

True Positive Rate: False positive rate are refers that our proposed method predict the brain stroke is no brain stroke when it's actually brain stroke. Calculate the false positive rate by the given equation:

$$Truepositiverate = \frac{TP}{TN+FP}$$

Specificity: Specificity refers that our proposed method predicts the brain stroke is a brain stroke when it's actually brain stroke [18]. Calculate the specificity of the given equation:

$$specificity = \frac{TN}{TN+FP}$$

We know the confusion matrix and this can help in ascertaining further developed arrangement measurements, for example, precision, recall, specificity and sensitivity of our classifier. We also know the confusion matrix as follow as table 4.1 are shown that-

Table 4.1: Confusion matrix

	No-Event	Event
No-Event	True negative 31	False positive 1
Event	False negative 1	True positive 27

Here this table 4.1 we see that true negative and positive and false negative and positive in confusion matrix.

Here the details of confusion matrix are shown in table 4.2 and confusion matrix is showed by y-validation and prediction value.

Table 4.2: Measure accuracy

	Precision	Recall or sensitivity	F1-score	Support
no	.97	.97	.97	32
yes	.96	.96	.96	28
avg/total	.97	.97	.97	60

In this table 4.2 we can see that confusion matrix are described such as accuracy, precision, recall, fi-score, support for our dataset.

We also get high Accuracy 97% for our research using KNN algorithm. In this figure 4.1 we get accuracy curve for our dataset and we get 97% accuracy for our dataset.



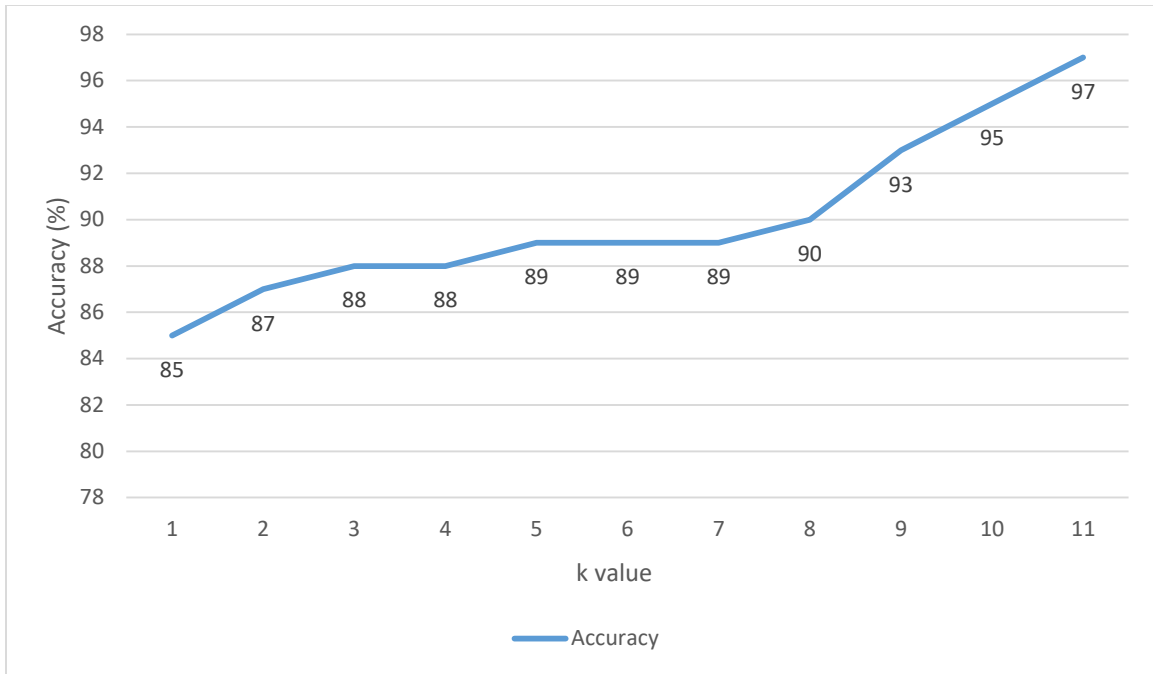


Figure 4.1: Accuracy curve

Here accuracy of our dataset is shown for  $k=11$  and we also try to our best to make a good accuracy using machine learning algorithm.

In most clear terms, given a game plan of data centers from repeated estimations of a comparative sum, the set can be said to be careful if the characteristics are close to each other, while the set can be said to be exact if their ordinary is close to the real estimation of the sum being assessed. In the essential, increasingly common definition over, the two thoughts are free of each other, so a particular course of action of data can be said to be either precise, or careful, or both, or not either.

### 4.3 Descriptive Analysis

Descriptive analysis is a significant first process for conducting statistical analyses. It's helps us to distribute our data and helps us to detect outliers and typos. In our statistical analysis we are doing a tree about how we find out our result. It shows how our research work step by step. First we are collecting data then data preprocessing and Feature scaling then select train and test data set. We are test our data set using KNN, LR, CART, SVM and then we got out expected outcome from KNN and we are discussed about it.

## **CHAPTER 5**

### **Conclusion and Future works**

#### **5.1 Summary of the Study**

In this paper for the prediction we have described KNN Classifier algorithm to the collected dataset. From a 70% train set and 30% test set we evaluated the estimation and enhance the total prediction rate from other used algorithms.

#### **5.2 Conclusion**

The words “heart attack” can be alarming. But thanks to improvements in medical treatments and procedures, people who survive their first cardiac incident can go on to lead full and productive lives. Still, it’s important to understand what triggered your heart attack and what you can expect going forward. The best way to move ahead in your recovery is to make sure your doctor answers your most pressing questions and provides you with clear, detailed instructions before leaving the hospital.

In this paper, we have described KNN algorithms. We have evaluated enhancements through the incorporation of physiological pattern designs as highlights in our algorithms. Episode heart attack can be precisely anticipated utilizing self-detailed data concentrated on well-being practices. Hazard evaluation can be performed with populace well-being overviews to help populace well-being arranging or outside of clinical settings to help quiet engaged avoidance.

#### **5.3 Recommendations**

#### **5.4 Implication for Further Study**

The collection of data we want to increase in the future. And the accuracy of the percentage wants to lower for unknown people. We want to implement an algorithm

for prediction of this imbalance if any people are suffering from this problem or not. Another is that we will try to give the exact solution for recovering this problem and can be undertaken on numerous other diseases using similar techniques and more data on other clinical health problems should be accumulated for similar studies. Further studies in this field require for achieving clinical accuracy and reliability.

Bangladesh's medical system can gather more clinical data in a structured and organized way where each patient's medical data can be acquired which can be later used in many different studies for other diseases and also consolidate with the existing system for automated classification and detection of those diseases.

The study shows that an automated system can be implemented for predicting the chances of cardiovascular disease. With more efficient algorithms and training data, this can be a real-life implementation for clinical prediction in Bangladesh.

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