VISUALIZING AND PREDICTING HEART DISEASES WITH AN INTERACTIVE DASH BOARD

Project Report

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1.INTRODUCTION

Several disorders that affect the human heart are referred to as heart disease. The terms "heart disease" and "cardiovascular disease" are frequently used interchangeably. Heart disease is a general phrase that covers a wide range of heart-related medical conditions. The irregular health state that directly affects the heart and all of its components is characterized by these medical conditions. A heart attack, stroke, or chest pain can all be caused by illnesses that are generally made possible by restricted or obstructed blood arteries due to heart disease. Heart diseases are also characterized by other illnesses that affect the muscle, valves, or rhythm of the heart. Heart disease comes in many different forms .Heart failure (HF) and Coronary Artery Disease are the two most comparable forms (CAD).Heart failure (HF) is mostly brought on by a blockage or narrowing of the coronary arteries. Blood for the heart is also delivered through coronary arteries. Data mining is a complicated process that uses intricate algorithms to extract implicit, previously undiscovered possibly useful information known as knowledge from medical data. Data Mining accomplish the job, which centres on gathering a sizable amount of data, managing them, and creating reports on the data by taking out the knowledgeable information .

1.1.Project overview

Sudden cardiac arrest is the abrupt loss of heart function, breathing and consciousness. The condition usually results from a problem with your heart's electrical system, which disrupts your heart's pumping action and stops blood flow to your body. Sudden cardiac arrest isn't the same as a heart attack, when blood flow to a part of the heart is blocked. However, a heart attack can sometimes trigger an electrical disturbance that leads to sudden cardiac arrest. If not treated immediately, sudden cardiac arrest can lead to death. Survival is possible with fast, appropriate medical care. Cardiopulmonary resuscitation (CPR), using a defibrillator or even just giving compressions to the chest can improve the chances of survival until emergency workers arrive.

1.2.purpose

An erratic heartbeat is known as a cardiac arrhythmia. When the electrical signals that coordinate the heart's beats don't function properly, heart rhythm disorders might result. The heart beats too quickly, too slow, or irregularly as a result of the poor signalling. Heart arrhythmias, which may be completely safe, sometimes feel like your heart is speeding or fluttering. However, some heart rhythms can result in uncomfortable, and occasionally even lifethreatening, symptoms. However, occasionally having a fast or sluggish heart rate is natural.

For instance, the heart rate may rise during physical activity or fall during sleep. The management of fast, slow, or irregular heartbeats may involve drugs, catheter procedures, implanted devices, or surgery. A heart-healthy lifestyle can aid in avoiding heart damage that may result in specific cardiac arrhythmias.

2. Literature Survey

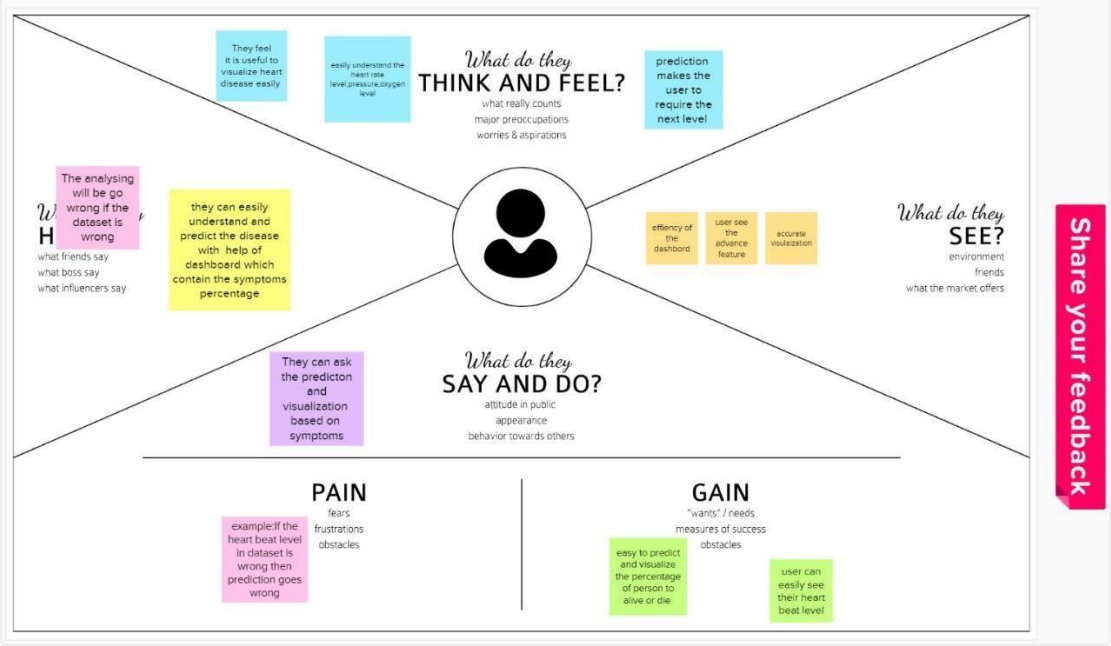
Bo Jin, Chao Che, and colleagues (2018) suggested a neural networkbased model for "Predicting the Risk of Heart Failure With EHR Sequential Data Modeling." This study conducted an attempt to foretell congestive heart disease using electronic health record (EHR) data from realworld datasets connected to the condition. To represent the diagnostic events and predicted coronary failure events using the fundamental tenets of an extended memory network model, we typically use one-hot encryption and word vectors. By examining the outcomes, we often highlight how crucial it is to respect the sequential character of clinical records.

"Heart Disease Prediction via Evolutionary Rule Learning," by Aakash Chauhan et al. (2018). In addition to assisting in directly extracting information (data) from electronic records, this study eliminates the manual task. We used frequent pattern growth association mining on the patient dataset to produce strong association rules. This will facilitate (assist) in reducing the number of services and demonstrate how the vast majority of regulations contribute to the most accurate prognosis of cardiovascular illness.

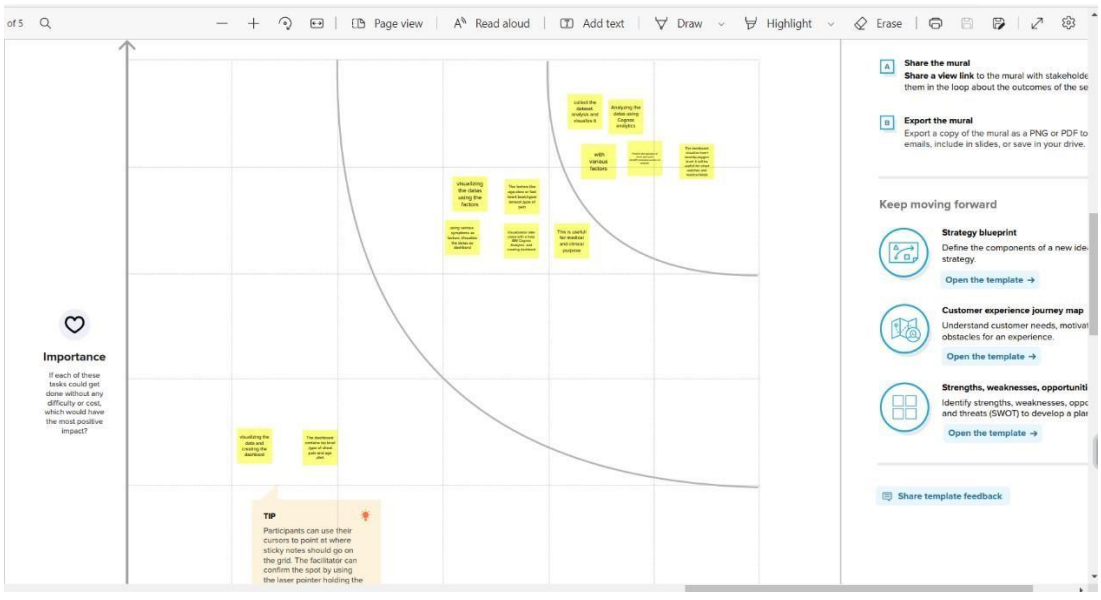
For the prediction of cardiovascular disease, two types of experiments are employed. In the first form, merely a random forest model is created, while in the second experiment, a random forest model based on the suggested Random Search Algorithm is created. In comparison to the traditional random forest model, this methodology is effective and simpler. It produces 3.3% greater accuracy when compared to traditional random forests. The suggested learning approach can aid medical professionals in better heart failure identification. Senthilkumar Mohan, Chandrasegar Thirumalai, et al "Effective .'s Heart Disease Prediction Using Hybrid Machine Learning Techniques" (2019) was an effective technique utilizing hybrid machine learning methodology. The hybrid method combines the random forest and linear approaches. For prediction, the dataset and attribute subsets were gathered. The pre-processed cardiovascular disease knowledge (data) set was used to choose a subset of specific attributes. Hybrid approaches were used to diagnose cardiovascular illness after prep-processing. The 2019 paper "Prediction and Diagnosis of Heart Disease Patients Using Data Mining Technique" was written by Mamatha Alex P and Shaicy P Shaji. The Artificial Neural Network, KNN, Random Forest, and Support Vector Machine

techniques are used in this article. Artificial Neural Networks have superior accuracy when compared to the previously described categorization algorithms in data mining to predict heart disease.

2.1 EMPATHY MAP



2.2 IDEATION PHASE



3. PROPOSED SOLUTION

S.No.	Parameter	Description
1.	Problem Statement	To leading cause of death in the world is heart disease. To check whether the person have the heart disease or not by analyzing the symptoms and reduce the death rate of heart disease.
2.	Proposed Solution	We are going to predict the heart disease using the dataset which contains features like symptoms,age, Max Hr , Types of Chest pain etc.. These are useful to create an effective Dashboard. The Dashboard which have visual view of predicting the heart diseases like symptoms of heart disease. It is easy for the doctors to predict the accurate heart disease.
3.	Novelty/Uniqueness	The treatment made easy for the doctor's Based on the patient's heart disease condition. Prediction will reduce the death rate.
4.	Social Impact/Customer Satisfaction	By Predicting the heart disease accurately, the treatment made easy and fast for the doctors and it is useful for hospital to maintain the patient's condition .Visualizing the disease is easy for doctors and it also used for some app.
5.	Business Model	It is used in smart watches and mobile phones as app. It is used as a dashboard for hospital usage.
6.	Scalability	Easy to maintain and visualize the heart disease.

4.REQUIREMENT ANALYSIS:

4.1Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	User can Register through the dashboard
FR-2	User Confirmation	Confirmation via Email
FR-3	Input Data	After login, the user can give the data
FR-4	Visualizing Data	User can visualize the heart disease through Dashboard.
FR-5	Generating Report	User can view the result.

4.2 Non-functional Requirements:

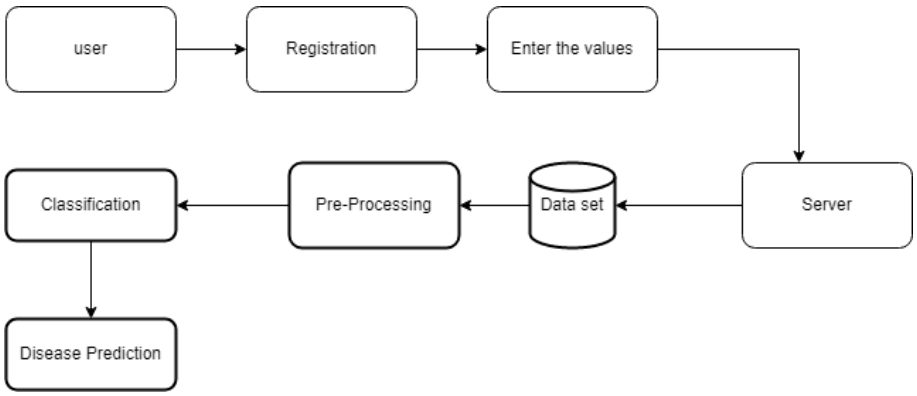
Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	The application is user friendly and interactive to the user.
NFR-2	**Security**	The system should keep the data update and it should able to back up the data.
NFR-3	**Reliability**	The application is highly reliable to the user.
NFR-4	**Performance**	Deals with the measure of the System's response time under different condition.

NFR-5	**Availability**	The application will be available to the users.
NFR-6	**Scalability**	Access the workload under which the system will still meet the performance requirements.

5.PROJECT DESIGN:

5.1 DATAFLOW DIAGRAM



6.CODING & SOLUTIONING (Explain the features added in the project along with code)

6.1.Feature 1

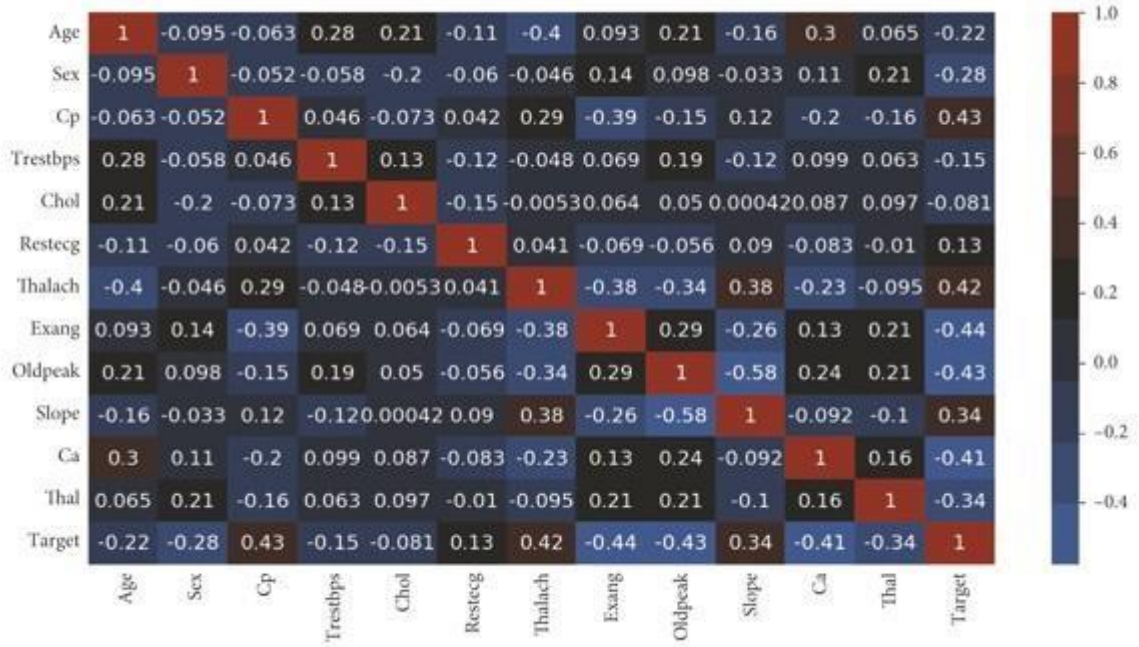
The health care industries collect huge amounts of data that contain some hidden information, which is useful for making effective decisions. For providing appropriate results and making effective decisions on data, some advanced data mining techniques are used. In this study, an effective heart disease prediction system (EHDPS) is developed using neural network for predicting the risk level of heart disease. The system uses 15 medical parameters such as age, sex, blood pressure, cholesterol, and obesity for prediction. The EHDPS predicts the

likelihood of patients getting heart disease. It enables significant knowledge, eg, relationships between medical factors related to heart disease and patterns, to be established. We have employed the multilayer perceptron neural network with backpropagation as the training algorithm. The obtained results have illustrated that the designed diagnostic system can effectively predict the risk level of heart diseases.

6.2.Feature 2

For selecting the features and only choosing the important feature, the Lasso algorithm is used which is a part of embedded methods while performing feature selection. It shows better predictive accuracy than filter methods. It renders good feature subsets for the used algorithm. And then for selecting the selected features, select from the model which is a part of feature selection in the scikit-learn library.

6.3.DatabaseSchema(ifApplicable)



7.ADVANTAGES & DISADVANTAGES

ADVANTAGES

- Effective in high dimensional spaces.
- Still effective in cases where the number of dimensions is greater than the number of samples.

- Uses a subset of training points in the decision function (called support vectors), so it is also memory efficient.
- Versatile: different kernel functions can be specified for the decision function. Common kernels are provided, but it is also possible to specify custm kernels.

DISADVANTAGES

If the number of features is much greater than the number of samples, avoid over-fitting in choosing Kernel functions and regularization term is crucial. SVMs do not directly provide probability estimates, these are calculated using an expensive five-fold cross-validation.

8.CONCLUSION

A cardiovascular disease detection model has been developed using three ML classification modelling techniques. This project predicts people with cardiovascular disease by extracting the patient medical history that leads to a fatal heart disease from a dataset that includes patients' medical history such as chest pain, sugar level, blood pressure, etc. This Heart Disease detection system assists a patient based on his/her clinical information of them been diagnosed with a previous heart disease. The algorithms used in building the given model are Logistic regression, Random Forest Classifier and KNN [22]. The accuracy of our model is 87.5%. Use of more training data ensures the higher chances of the model to accurately predict whether the given person has a heart disease or not [9]. By using these, computer aided techniques we can predict the patient fast and better and the cost can be reduced very much. There are a number of medical databases that we can work on as these Machine learning techniques are better and they can predict better than a human being which helps the patient as well as the doctors. Therefore, in conclusion this project helps us predict the patients who are diagnosed with heart diseases by cleaning the dataset and applying logistic regression and KNN to get an accuracy of an average of 87.5% on our model which is better than the previous models having an accuracy of 85%. Also, it is concluded that accuracy of KNN is highest between the three algorithms that we have used i.e. 88.52%. 'Figure 6' shows 44% of people that are listed in the dataset are suffering from Heart Disease.

9.FUTURE SCOPE

Heart diseases are a major killer in India and throughout the world, application of promising technology like machine learning to the initial prediction of heart diseases will have a profound impact on society. The early prognosis of heart disease can aid in making decisions on lifestyle changes in high-risk patients and

in turn reduce the complications, which can be a great milestone in the field of medicine. The number of people facing heart diseases is on a raise each year. This prompts for its early diagnosis and treatment. The utilization of suitable technology support in this regard can prove to be highly beneficial to the medical fraternity and patients. In this paper, the seven different machine learning algorithms used to measure the performance are SVM, Decision Tree, Random Forest, Naïve Bayes, Logistic Regression, Adaptive Boosting, and Extreme Gradient Boosting applied on the dataset. The expected attributes leading to heart disease in patients are available in the dataset which contains 76 features and 14 important features that are useful to evaluate the system are selected among them. If all the features taken into the consideration then the efficiency of the system the author gets is less. To increase efficiency, attribute selection is done. In this n features have to be selected for evaluating the model which gives more accuracy. The correlation of some features in the dataset is almost equal and so they are removed. If all the attributes present in the dataset are taken into account then the efficiency decreases considerably. All the seven machine learning methods accuracies are compared based on which one prediction model is generated. Hence, the aim is to use various evaluation metrics like confusion matrix, accuracy, precision, recall, and f1-score which predicts the disease efficiently. Comparing all seven the extreme gradient boosting classifier gives the highest accuracy of 81%.

10.APPENDIX HTML

- HTML stands for Hyper Text Markup Language
- HTML is the standard markup language for creating Web pages
- HTML describes the structure of a Web page
- HTML consists of a series of elements
- HTML elements tell the browser how to display the content
- HTML elements label pieces of content such as "this is a heading", "this is a paragraph", "this is a link", etc.

CSS

Cascading **S**tyle **S**heets, fondly referred to as **CSS**, is a simply designed language intended to simplify the process of making web pages presentable. CSS allows you to apply styles to web pages. More importantly, CSS enables you to do this independent of the HTML that makes up each web page. It describes how a webpage should look: it prescribes colors, fonts, spacing, and much more. In short, you can make your website look however you want. CSS lets developers and designers define how it behaves, including how elements are positioned in

the browser.While html uses tags, css uses rulesets. CSS is easy to learn and understand, but it provides powerful control over the presentation of an HTML document.

JavaScript is a lightweight, cross-platform, and interpreted compiled programming language which is also known as the scripting language for webpages. It is wellknown for the development of web pages, many non-browser environments also use it. JavaScript can be used for **Client-side** developments as well as **Server-side** developments. Javascript is both imperative and declarative type of language. JavaScript contains a standard library of objects, like **Array**, **Date**, and **Math**, and a core set of language elements like **operators**, **control structures**, and **statements**.

10.1 SOURCE CODE:

```
<!DOCTYPE html>
<html lang="en">

<head>
  <meta charset="utf-8">
  <meta content="width=device-width, initial-scale=1.0" name="viewport">

  <title>Heart Disease Visualizing</title>
  <meta content="" name="description">
  <meta content="" name="keywords">

  <!-- Favicons -->
  <link href="assets/img/favicon.png" rel="icon">
  <link href="assets/img/apple-touch-icon.png" rel="apple-touch-icon">

  <!-- Google Fonts -->
  <link
href="https://fonts.googleapis.com/css?family=Open+Sans:300,300i,400,400i,600,600i,700,7
00i|Roboto:300,300i,400,400i,500,500i,600,600i,700,700i|Poppins:300,300i,400,400i,500,50
0i,600,600i,700,700i" rel="stylesheet">

  <!-- Vendor CSS Files -->
  <link href="assets/vendor/fontawesome-free/css/all.min.css" rel="stylesheet">
  <link href="assets/vendor/animate.css/animate.min.css" rel="stylesheet">
  <link href="assets/vendor/aos/aos.css" rel="stylesheet">
  <link href="assets/vendor/bootstrap/css/bootstrap.min.css" rel="stylesheet">
  <link href="assets/vendor/bootstrap-icons/bootstrap-icons.css" rel="stylesheet">
```

```
  <link href="assets/vendor/boxicons/css/boxicons.min.css" rel="stylesheet">
  <link href="assets/vendor/glightbox/css/glightbox.min.css" rel="stylesheet">
<link href="assets/vendor/swiper/swiper-bundle.min.css" rel="stylesheet">
  <link
href="https://us1.ca.analytics.ibm.com/bi/?perspective=story&pathRef=.my_folders%2Fproj
ect%2Ffirst%2Bstory&action=view&sceneId=model000001847bc76dda_00000000&sceneT
ime=15000">

  <!-- Template Main CSS File -->
  <link href="assets/css/style.css" rel="stylesheet">

  <!-- =======================================================
* Template Name: Medicio - v4.9.1
* Template URL: https://bootstrapmade.com/medicio-free-bootstrap-theme/
* Author: BootstrapMade.com
* License: https://bootstrapmade.com/license/
  ======================================================= --> </head>

<body>

  <!-- ======= Top Bar ======= -->
  <div id="topbar" class="d-flex align-items-center fixed-top">
    <div class="container d-flex align-items-center justify-content-center justify-content-
mdbetween">

      <h2>VISUALIZING AND PREDICTING HEART DISEASE USING
DASHBOARD</h2>
    </div>
  </div>

  <!-- ======= Header ======= -->
  <header id="header" class="fixed-top">
    <div class="container d-flex align-items-center">


      <!-- Uncomment below if you prefer to use an image logo -->
      <!-- <h1 class="logo me-auto"><a href="index.html">Medicio</a></h1> -->

      <nav id="navbar" class="navbar order-last order-lg-0">
<ul>
        <li><a class="nav-link scrollto " href="#hero">Home</a></li>
        <li><a class="nav-link scrollto" href="#about">Dashboard</a></li>
        <li><a class="nav-link scrollto" href="#services">Story</a></li>
        <li><a class="nav-link scrollto" href="#departments">Report</a></li>

      </ul>
```

```
  </div>
 </header><!-- End Header -->

 <!-- ======= Hero Section ======= -->
 <section id="hero">
  <div id="heroCarousel" data-bs-interval="5000" class="carousel slide carousel-fade"
databs-ride="carousel">

    <ol class="carousel-indicators" id="hero-carousel-indicators"></ol>

    <div class="carousel-inner" role="listbox">

      <!-- Slide 1 -->
      <div class="carousel-item active" style="background-image:
url(assets/img/slide/slide1.jpg)">
        <div class="container">
          <h2>Heart Disease</h2>
          <p>Heart disease is one of the biggest causes of morbidity and mortality among the
population of the world.The term “heart disease” is often used interchangeably with the term
“cardiovascular disease”. 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.
Other heart conditions, such as those that affect your heart’s muscle,
valves or rhythm, also are considered forms of heart disease.</p>

        </div>
      </div>




    </div>

    <a class="carousel-control-prev" href="#heroCarousel" role="button" data-
bsslide="prev">
      <span class="carousel-control-prev-icon bi bi-chevron-left" aria-hidden="true"></span>
</a>

    <a class="carousel-control-next" href="#heroCarousel" role="button" data-
bsslide="next">
      <span class="carousel-control-next-icon bi bi-chevron-right" ariahidden="true"></span>
    </a>

  </div>
```

```
  </section><!-- End Hero -->

  <main id="main">

    <!-- ======= Featured Services Section ======= -->
    <section id="featured-services" class="featured-services">
      <div class="container" data-aos="fade-up">

        <div class="row">
          <div class="col-md-6 col-lg-3 d-flex align-items-stretch mb-5 mb-lg-0">
            <div class="icon-box" data-aos="fade-up" data-aos-delay="100">
              <div class="icon"><i class="fas fa-heartbeat"></i></div>
              <h4 class="title"><a href="">MAX HR</a></h4>
              <p class="description"> The increase in cardiovascular risk, associated with the
acceleration of heart rate,
                was comparable to the increase in risk observed with high blood pressure</p>
</div>
          </div>

          <div class="col-md-6 col-lg-3 d-flex align-items-stretch mb-5 mb-lg-0">
            <div class="icon-box" data-aos="fade-up" data-aos-delay="200">
              <div class="icon"><i class="fas fa-pills"></i></div>
              <h4 class="title"><a href="">Blood Pressure</a></h4>
              <p class="description">High blood pressure that occurs with other conditions, such
as obesity, high cholesterol or diabetes, increases your risk even more.</p>
            </div>
          </div>

          <div class="col-md-6 col-lg-3 d-flex align-items-stretch mb-5 mb-lg-0">
            <div class="icon-box" data-aos="fade-up" data-aos-delay="300">
              <div class="icon"><i class="fas fa-thermometer"></i></div>
              <h4 class="title"><a href="">Fasting Blood Sugar</a></h4>
<p class="description">Not producing enough of a hormone
                secreted by your pancreas (insulin) or not responding to insulin properly causes
your body’s blood sugar levels to rise,
                increasing your risk of a heart attack</p>
            </div>
          </div>



        </div>

      </div>
    </section><!-- End Featured Services Section -->
```

```
 <!-- ======= Cta Section =======
  <section id="cta" class="cta">
   <div class="container" data-aos="zoom-in">

    <div class="text-center">
     <h3>In an emergency? Need help now?</h3>
     <p> Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum.</p>
     <a class="cta-btn scrollto" href="#appointment">Make an Make an Appointment</a>
    </div>

   </div>
  </section> End Cta Section -->

  <!-- ======= About Us Section ======= -->
  <section id="about" class="about">
   <div class="container" data-aos="fade-up">

    <div class="section-title">
     <h2>Dashboard</h2>
     <iframe
src="https://us1.ca.analytics.ibm.com/bi/?perspective=dashboard&amp;pathRef=.my_folders%2Fproject%2FDashboard&amp;closeWindowOnLastView=true&amp;ui_appbar=false&amp;ui_navbar=false&amp;shareMode=embedded&amp;action=view&amp;mode=dashboard&amp;subView=model000001847b33752b_00000000" width="1000" height="900"
      frameborder="0" gesture="media" allow="encrypted-media" allowfullscreen=""></iframe>
    </div>

    <div class="row">
     <div class="col-lg-6" data-aos="fade-right">
      <iframe
src="https://us1.ca.analytics.ibm.com/bi/?perspective=dashboard&amp;pathRef=.my_folders%2FDashboard1&amp;closeWindowOnLastView=true&amp;ui_appbar=false&amp;ui_navbar=false&amp;shareMode=embedded&amp;action=view&amp;mode=dashboard&amp;subView=model000001849a7d2101_00000000"
       width="600" height="500" frameborder="0" gesture="media" allow="encryptedmedia" allowfullscreen=""></iframe>
     </div>
     <div class="col-lg-6 pt-4 pt-lg-0 content" data-aos="fade-left">
      <h3></h3>
      <p style="padding:30px">
       The average Value of FBS over 120 is 20.
```

Not producing enough of a hormone secreted by your pancreas (insulin) or not responding to insulin properly causes your body's blood sugar levels to rise, increasing your risk of a heart attack.
</p>

</section><!-- End About Us Section -->

<!-- ======= Services Section ======= -->
<section id="services" class="services services">

<h2>Story</h2>
<iframe
src="https://us1.ca.analytics.ibm.com/bi/?perspective=story&pathRef=.my_folders%2Fproject%2Ffirst%2Bstory&closeWindowOnLastView=true&ui_appbar=false&ui_navbar=false&shareMode=embedded&action=view&sceneId=model000001847bc76dda_00000000&sceneTime=15000" width="1000" height="700" frameborder="0" gesture="media"
allow="encrypted-media" allowfullscreen=""></iframe>

</section><!-- End Services Section -->

<!-- ======= Pricing Section ======= -->

<section id="contact" class="contact">

<h2>Report</h2>

<iframe

```
src="https://us1.ca.analytics.ibm.com/bi/?pathRef=.my_folders%2FData%2Bmodule%2FNew%2Breport&amp;closeWindowOnLastView=true&amp;ui_appbar=false&amp;ui_navbar=false&amp;shareMode=embedded&amp;action=run&amp;format=HTML&amp;prompt=false" width="1000" height="800" frameborder="0" gesture="media" allow="encrypted-media" allowfullscreen=""></iframe>
      </div>



      </div>
    </section><!-- End Contact Section -->

  </main><!-- End #main -->



  <div id="preloader"></div>
  <a href="#" class="back-to-top d-flex align-items-center justify-content-center"><i class="bi bi-arrow-up-short"></i></a>

  <!-- Vendor JS Files -->
  <script src="assets/vendor/purecounter/purecounter_vanilla.js"></script>
  <script src="assets/vendor/aos/aos.js"></script>
  <script src="assets/vendor/bootstrap/js/bootstrap.bundle.min.js"></script>
  <script src="assets/vendor/glightbox/js/glightbox.min.js"></script>
  <script src="assets/vendor/swiper/swiper-bundle.min.js"></script>
  <script src="assets/vendor/php-email-form/validate.js"></script>

  <!-- Template Main JS File -->
  <script src="assets/js/main.js"></script>

</body>

</html>
```

OUTPUT:

DEMOLINK:

https://drive.google.com/file/d/1nmQkfVMHAIx4b89FcLbJQWEH4RmkMjj_/view

REFERENCE:

[1] Bo Jin ,Chao Che, Zhen Liu, Shulong Zhang, Xiaomeng Yin, And Xiaopeng Wei, "Predicting the Risk of Heart Failure With EHR Sequential Data Modeling" ,IEEE Access 2018.

[2] Aakash Chauhan , Aditya Jain , Purushottam Sharma , Vikas Deep, "Heart Disease Prediction using Evolutionary Rule Learning", "Computational "International Intelligence Technology" (CICT 2018). and Conference on Communication

[3] Ashir Javeed, Shijie Zhou, Liao Yongjian, Iqbal Qasim, Adeeb Noor, Redhwan Nour4, Samad Wali And Abdul Basit , "An Intelligent Learning System based on Random Search Algorithm and Optimized Random Forest Model for Improved Heart Disease Detection" , IEEE Access 2017.