A PROJECT REPORT

On

PREDICTION OF STONES IN KIDNEYS

USING MACHINE LEARNING

Submitted in partial fulfilment for the award of the degree of

Bachelor of Technology

in

Computer Science and Engineering

Submitted by

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Accredited by NAAC with an "A+" Grade

ISO 9001:2015 Certified

SCHOOL OF ENGINEERING AND TECHNOLOGY

SRI PADMAVATI MAHILA VISVAVIDYALAYAM

(Women's University)

Tirupati, April – 2023

Department of Computer Science and Engineering

DECLARATION BY THE CANDIDATE

We hereby declare that the project report entitled **"PREDICTION OF STONES IN KIDNEYS USING MACHINE LEARNING**" submitted by us to the Department of Computer Science and Engineering, School of Engineering and Technology, Sri Padmavati Mahila Visvavidyalayam, Tirupati in partial fulfilment of the requirements for the award of the degree of **Bachelor of Technology in Computer Science and Engineering** is a record of bonafide work carried out by us under the supervision of **Ms. V.J VIJAYA GEETHA**, **Assistant Professor**.We further declare that the work reported in this project has not been submitted and will not be submitted, either in part or in full, for the award of any other degree or diploma of this university or any other institute or university.

Place: Signature of the Candidate

Date:

S. SHAMEERA
P. SUBHASHINI
A. UJWALA
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Department of Computer Science and Engineering

BONAFIDE CERTIFICATE

This is to certify that the project report entitled **"PREDICTION OF STONES IN KIDNEYS USING MACHINE LEARNING"** submitted by **S.SHAMEERA(1971091),P.SUBHASHINI(1971104), A.UJWALA (1971116)** and **T.YAMINI(1971127)** to the School of Engineering and Technology, Sri Padmavati Mahila Visvavidyalayam, Tirupati in partial fulfilment of the requirement for the award of the degree of **B. Tech** in **Computer Science and Engineering** is a record of bonafide work carried out by them under my guidance. The work fulfils the requirements as per the regulations of this University and in my opinion meets the necessary standards for submission. The contents of this report have not been submitted and will not be submitted either in part or in full, for the award of any other degree or diploma and the same is certified.

Guide:

Mrs. V. J Vijaya Geetha	**Prof. V Saritha**
Assistant Professor	**Head of the Department**
Department of CSE	**Department of CSE**

Internal Examiner **External Examiner**

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With Gratitude

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ABSTRACT

Stones in kidneys is the major problem facing by many people nowadays. Most of the people are affected heavily due to delay in the detection of stones in the kidneys. This project proposes a method where ML technique such as Decision Tree and Random Forest Algorithms to identify the presence of kidney stones based on the dataset received from patients and also uses Convolutional Neural Network algorithm. The process proposed is divided into multiple steps that will speed-up timely medical assistance for the patients. Dataset contains attributes collected from the urine test for characterization and identification of kidney stones.

Keywords: Decision tree, Random forest (Machine Learning Algorithms)

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CHAPTER 1

1. INTRODUCTION

1.1 General Introduction

The collection of salts and certain minerals in urine, primarily calcium and acid, is known as kidney stones. It's caused due to lack of water intake. "Kidney stones are hard, non-organic deposits that form inside kidneys when the excrement is concentrated and contains more transparent-making ingredients than the fluid in urine.Uric acid, calcium, and oxalate are among these elements.Urinary calculus develops when the bodies are dehydrated but have a lot of waste. In private, diabetes elevated vital signs, and obesity may raise the risk of nephrolith.

The majority of crystals are formed by a combination of features passed down from parents to offspring and indirect determinants. Extreme calcium excretion, corpulence, some meals, few medicines, calcium supplements, hyperparathyroidism, taste sensitivity, and not drinking enough fluids while drinking alcohol are all risk factors.

When minerals in excretion aggregate to excessive levels, stones form in the kindney.

1.2 PROBLEM STATEMENT

To build a machine learning model that can detect the presence of kidney stones based On the dataset provided. The model is intended to be used as a reference tool for the doctors or clinic centers to help prompt decisions on the clinical analysis of the patients to get results weather its positive or negative.

CHAPTER 2

2. LITERATURE SURVEY

2.1 Survey of the Existing Models

AUTHOR	PUBLICATION YEAR	PREDICTION OF DISEASE	TOOL	TECHNIQUES	ACCURACY
Grosse Hokamp	2019	Kidney Stone	MATLAB	ANN	86%
Boukenze, B	2017	Chronic Kidney Disease	WEKA	SVM ANN Bayes Network	62.5% 62.5% 57.5%
Polat,H	2017	Chronic Kidney Disease	WEKA	SVM	98.5%
Panwong P	2016	Chronic Kidney Disease	WEKA	KNN ANN RF	86.32% 83.24% 86.60%
Kaladhar	2012	Kidney Stone	WEKA	Naive Bayes Random Forest	0.99% 0.98%
Koushal Kumar	2012	Kidney Stone	WEKA	ANN	0.8459%

1. **TITLE:**

   A study on effective kidney stone prediction using Artificial Neural Network (ANN) Technique.

   AUTHOR:

   GROSSE HOKAMP

   METHODOLOGY:

   The prototype artificial neural network (ANN) model was developed using data from patients with renal stone, in order to predict stone-free status and to help in planning treatment with Extracorporeal Shock Wave Lithotripsy (ESWL) for kidney stones. Successful results were obtained to predict the stone-free rate, with the help of the ANN model designed by using a series of data collected from real patients in whom ESWL was implemented to help in planning treatment for kidney stones.

2. **TITLE:**

   A study on chronic kidney disease prediction using Bayes Network Technique.

   AUTHOR:

   Boukenze, B

   METHODOLOGY:

   The collected data was analyzed with Weka software, and various data mining models were used to prepare a predictive model. Various data mining algorithms such as the Bayesian model, different types of Decision Trees, Artificial Neural Networks, and Rule-based classifiers were used in these models. We also proposed

four models based on ensemble learning to improve the accuracy of each learning algorithm.

3. TITLE:

A study on chronic kidney disease prediction using Support Vector Machine (SVM) Technique.

AUTHOR:

Polat, H

METHODOLOGY:

Polat, has presented a work using Machine Learning Technique, namely Support Vector Machine(SVM). This was used to study, classify and compare kidney, liver and heart disease data sets with varying kernels and kernel parameters. Results of Support Vector Machines was compared for different data sets such as kidney disease dataset, liver disease dataset and heart disease dataset. The results with different kernels were tuned with proper parameter selection. Results were better analyzed to establish better learning techniques for predictions. It is concluded that varying results were observed with SVM classification Technique with differnet kernel functions.

4. TITLE:

A study on chronic kidney disease prediction using K- Nearest Neighbour (KNN) Technique.

AUTHOR:

Panwong, P

METHODOLOGY:

The KNN algorithm with three different distance formulas achieved acceptable results in the classification of kidney stones. The Euclidean distance KNN algorithm yielded the best results. The data show the classification accuracy was 98.8%. The performance of the model is usually evaluated based on accuracy, sensitivity, and specificity. We further confirmed the performance of the diagnostic model developed by the KNN using a receiver operating characteristic (ROC) for all classification algorithms.

5. TITLE:

A study on kidney stone prediction using Random Forest Technique.

AUTHOR:

KALADHAR

METHODOLOGY:

Kaladhar, applied machine learning techniques to predict kidney stones by using Random forest, and Naive Bayes machine learning algorithms which becomes useful in automating the treatment of kidney stones diseases.The predictive model for the risk of kidney diseases was formulated using three supervised machine learning algorithms (Decision Tree, Multi-layer perception and Genetic Algorithm) following the identification of relevant features. The predictive model was simulated using the Waikato Environment for Knowledge Analysis (WEKA) environment and the model was validated using historical dataset of kidney stone risk via performance metrics:

accuracy, true positive rate, precision and false positive rate.

6. TITLE;

A study on kidney stone prediction using Artificial Neural Network Technique.

AUTHOR:

KOUSHAL KUMAR

METHODOLOGY:

ANN model designed by using a series of data collected from real patients in whom ESWL was implemented to help in planning treatment for kidney stones.The aim of this study was to develop a prototype artificial neural network (ANN) model from data obtained from real patients. The Alyuda NeuroIntelligence software was used to create an artificial neural network (ANN). While creating the ANN, data were analyzed with regards to training, validity, and test. Data was analyzed according to numerical and categorical data, and also about what percentage of data was training, validity or test related. The second stage involved the transformation of all data to the numerical form for processing. In the third stage, the ANN structure was formed.

2.2 EXISTING METHOD:

Logistic Regression is used to develop a prediction model for the presence of kidney stones.The model was based on patient age, gender, body mass

Index(B.M.I) and clinical symptoms. Logistic Regression models are not Perfect andmay not be able to accurately predict all cases of kidney stones.

CHAPTER 3

3. OVERVIEW OF THE PROPOSED SYSTEM

3.1 Dataset Information

The data set is obtained from kaggle . It contains 7 attributes and 2128 rows .The detailed information about the data set can be given below.

3.2 Attribute Information:

The six physical characteristics of the urine are: (1) specific gravity, the density of the urine relative to water; (2) pH, the negative logarithm of the hydrogen ion; (3) osmolarity (mOsm), a unit used in biology and medicine but not in physical chemistry. Osmolarity is proportional to the concentration of molecules in solution; (4) conductivity (mMho milliMho). One Mho is one reciprocal Ohm. Conductivity is proportional to the concentration of charged ions in solution; (5) urea concentration in millimoles per litre; and (6) calcium concentration (CALC) in millimolesllitre. It may be anticipated that some of these characteristics are highly correlated. Another point worth noting is that the units of measurement vary by several orders of magnitude among the six characteristics.

CALCIUM: Calcium in urine test measures the calcium levels in urine (pee).
Abnormal calcium level may indicate kidney stones or other medical conditions.

UREA: Urea is a waste product resulting from the breakdown of protein in the body. And this test measures the amount of urea in the urine.

PH: A urine ph test measures the level of acid in urine. Monitoring the urine ph may be helpful in preventing the formation of kidney stones.

OSMOLALITY OF URINE: An osmolality test measures the concentration of particles in urine.

CONDUCTIVITY: Urine conductivity has positive relation with osmolality. Human urine is a poor conductor of electricity in particle terms.

GRAVITY: Urine specific gravity is a laboratory test that shows the concentration of all chemical particles in the urine.

TARGET: Diagnosis of Kidneys stones. – Value 0: result is negative (no stones)—Value 1: result is positive(stones present)

ATTRIBUTES	**QUANTILES**				
	MIN	25%	50%	75%	MAX
calcium	0.17	1.45	3.16	6.19	14.3
urea	10	159	260	380	620
ph	4.76	5.53	5.94	6.4	7.94
Osmolarity of urine	187	410	594	803	1236
conductivity	5.1	14	21.4	27	38
Gravity	1	1.01	1.02	1.02	1.04
Target	0	0	0	1	1

3.3 MODULES:

USER	SYSTEM
• Register • Login • Load Kidney dataset • Data Splitting • Select Model • View Accuracy • Input Values • View Output • Logout	• Read Dataset • Training • Generate Model • Generate Results • Generate Report

3.3.1 Modules Description:

1. User:

Register:

First the user should be registered to view the home page.

Login:

After the registration process, the user should login to the page with the user's details.

Load kidney dataset:

To upload the dataset by taking attributes for the prediction of stones in kidneys. **Data Split:**

To split the dataset into 70% for training the data and remaining 30% for testing the data.

Select Model:

To select the Machine Learning Techniques (Decision Tree, Random Forest) for the prediction of stones in kidneys **View Accuracy:**

User view’s the generated accuracy from the model.

Input Values:

The user must provide input values for the certain fields in order to get results.

View Output:

The user is supposed to view the prediction results**.**

2. System:

Read Dataset:

System checks for data whether it is available or not and load the data in csv files.

Training the data:

The data will split into two parts as train and test data before training

with the given algorithms**.**

Model Building:

To create a model that predicts the personality with better accuracy, this module will help the user.

Generate Results:

We train the machine learning algorithm and predict the stone prediction detection.

Generate Report:

The system will create the report based on the generated results.

CHAPTER 4

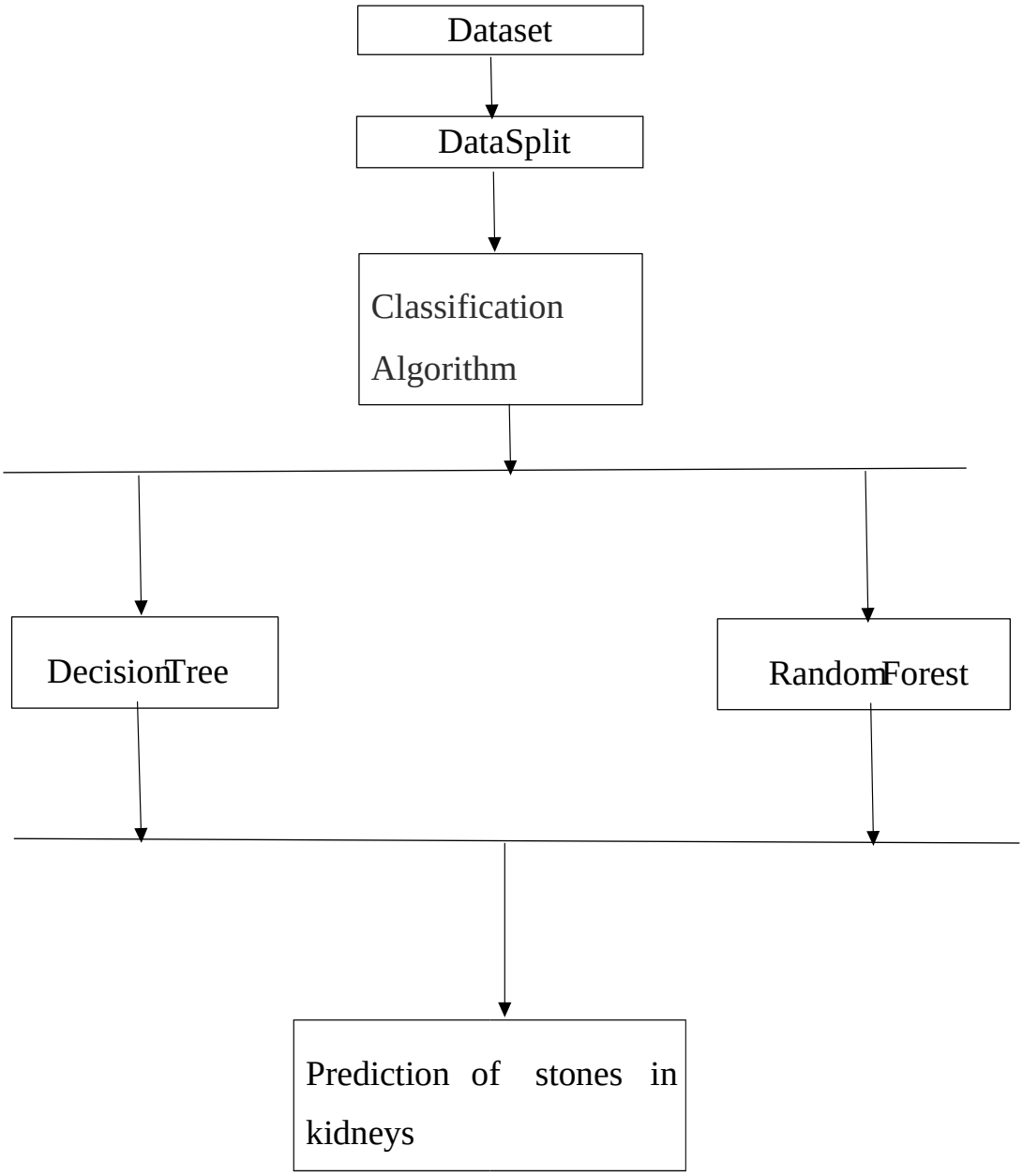
PROPOSED SYSTEM ANALYSIS

4.1 Proposed System:

Many Machine Learning models are there to diagnose the data samples. Among these models, those with better performance were selected as Decision Tree, Random Forest. An integral model was then established to achieve higher performance.

We propose this software that can be considered as a useful system, it helps to reduce the limitations obtained by traditional method. By using the Decision Tree, Random forest algorithms we can be able to generate best results for the patients. The software can be able to give us with very efficient and accurate results. The backend of the software designed by using Python environment. The proposed architecture consists of input of dataset, pre-processing, feature extraction, classification and prediction respectively.

These data is splitted for both testing and training where the 70% of data used for training and 30% data used for testing. The both the evaluation are entirely various from each other. This data is carried for the extraction and classification to predict the kidney stones with accuracy.



ADVANTAGES:

- High accuracy
- Data splitting can be done explicitly

4.2 Algorithms used in proposed system:

The methods include in the project

4.2.1 Decision Tree:

- Decision Tree learns to partition on the basis of the attribute value.
- It partitions the tree in recursively manner call recursive partitioning. • It helps you in decision making.

In a decision tree, for predicting the class of the given dataset, the algorithm starts from the root node of the tree. This algorithm compares the values of root attribute with the record (real dataset) attribute and, based on the comparison, follows the branch and jumps to the next node.

For the next node, the algorithm again compares the attribute value with the other sub-nodes and move further. It continues the process until it reaches the leaf node of the tree. The complete process can be better understood using the below algorithm:

Step-1: Begin the tree with the root node, says S, which contains the complete dataset.

Step-2: Find the best attribute in the dataset using **Attribute Selection Measure (ASM).**

Step-3: Divide the S into subsets that contains possible values for the best attributes.

Step-4: Generate the decision tree node, which contains the best attribute.

Step-5: Recursively make new decision trees using the subsets of the dataset created in step – 3. Continue this process until a stage is reached where you cannot further classify the nodes and called the final node as a leaf node.

Attribute Selection Measures

While implementing a Decision tree, the main issue arises that how to select the best attribute for the root node and for sub-nodes. So, to solve such problems there is a technique which is called as **Attribute selection measure or ASM.** By this measurement, we can easily select the best attribute for the nodes of the tree.

There are two popular techniques for ASM, which are:

- **Information Gain**
- **Gini Index**

- Information gain is the measurement of changes in entropy after the segmentation of a dataset based on an attribute.
- It calculates how much information a feature provides us about a class.
- According to the value of information gain, we split the node and build the decision tree.
- A decision tree algorithm always tries to maximize the value of information gain, and a node/attribute having the highest information gain is split first. It can be calculated using the below formula:

1. Information Gain= Entropy(S)- [(Weighted Avg) *Entropy(each feature)

Entropy: Entropy is a metric to measure the impurity in a given attribute. It specifies randomness in data. Entropy can be calculated as:

Entropy(s)= -P(yes)log2 P(yes)- P(no) log2 P(no)

Where,

S= Total number of samples

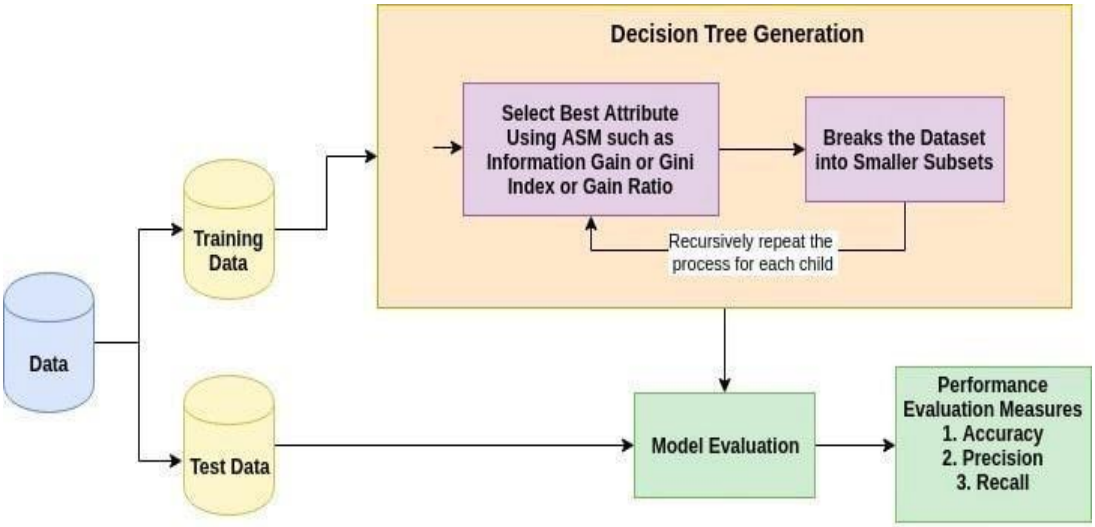
P(yes)= probability of yes

P(no)= probability of no

2.Gain Index:

- Gini index is a measure of impurity or purity used while creating a decision tree in the CART(Classification and Regression Tree) algorithm.
- An attribute with the low Gini index should be preferred as compared to the high Gini index.
- It only creates binary splits, and the CART algorithm uses the Gini index to create binary splits. □ Gini index can be calculated using the below formula:

Gini Index= 1- $\sum_j P_j^2$



4.2.2 Random Forest:

- Random Forest is used for Classification in Machine Learning.
- It is a classifier that contains a number of decision trees on various subsets of the given dataset and takes the prediction from each tree and based on the majority votes of predictions, and it predicts the final output.

As the name suggests, "Random Forest is a classifier that contains a number of decision trees on various subsets of the given dataset and takes the average to improve the predictive accuracy of that dataset." Instead of relying on one decision tree, the random forest takes the prediction from each tree and based on the majority votes of predictions, and it predicts the final output.The greater number of trees in the forest leads to higher accuracy and prevents the problem of overfitting.

Random Forest works in two-phase first is to create the random forest by combining N decision tree, and

second is to make predictions for each tree created in the first phase.

Working:

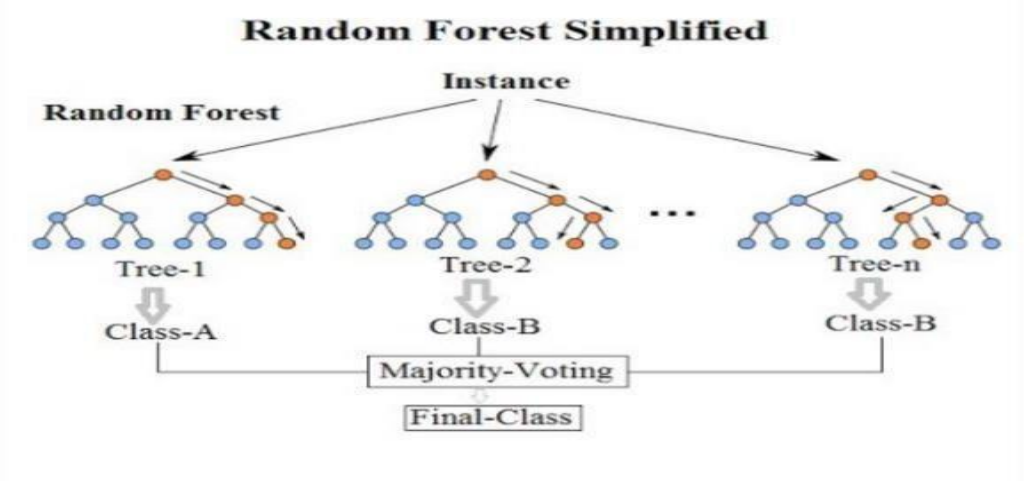
The Working process can be explained in the below steps and diagram Step-1: Select random K data points from the training set.

Step-2: Build the decision trees associated with the selected data points (Subsets).

Step-3: Choose the number N for decision trees that you want to build.

Step-4: Repeat Step 1 & 2.

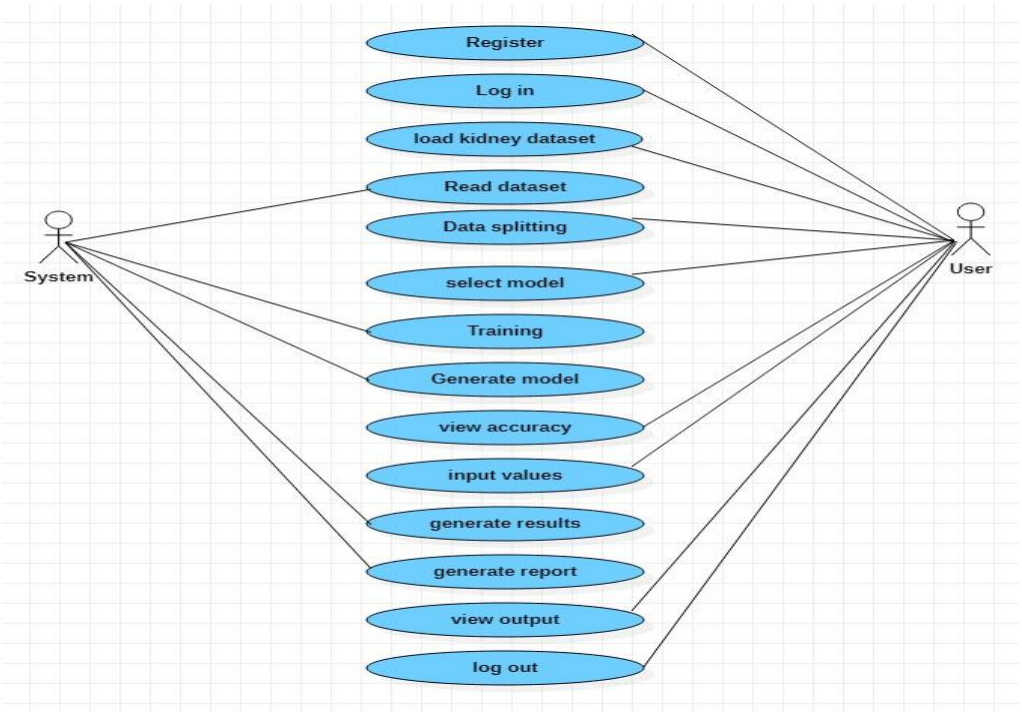
Step-5: For new data points, find the predictions of each decision tree, and assign the new data points to the category that wins the majority votes.



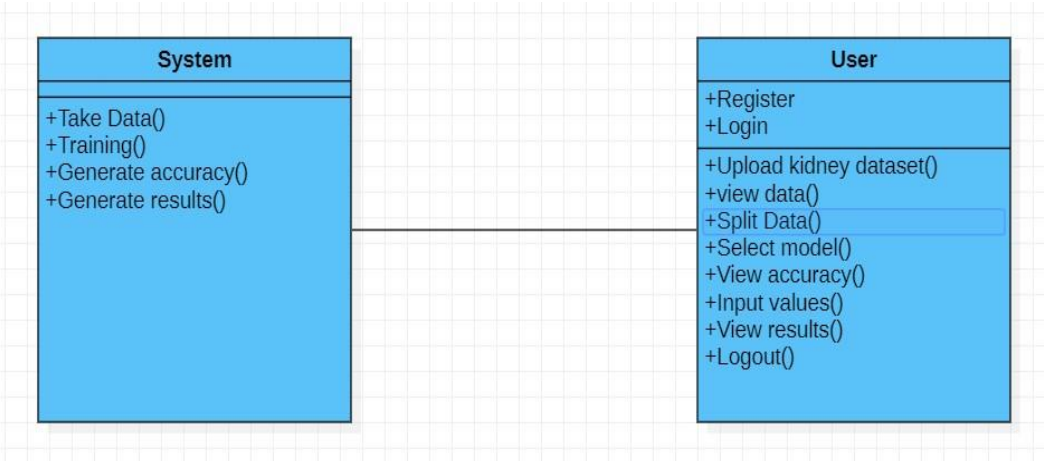
4.3 System Design:

• The Unified Modelling Language (UML) is used for specifying the visualization of software systems. • Now, let's see how the visualization process goes in our project.

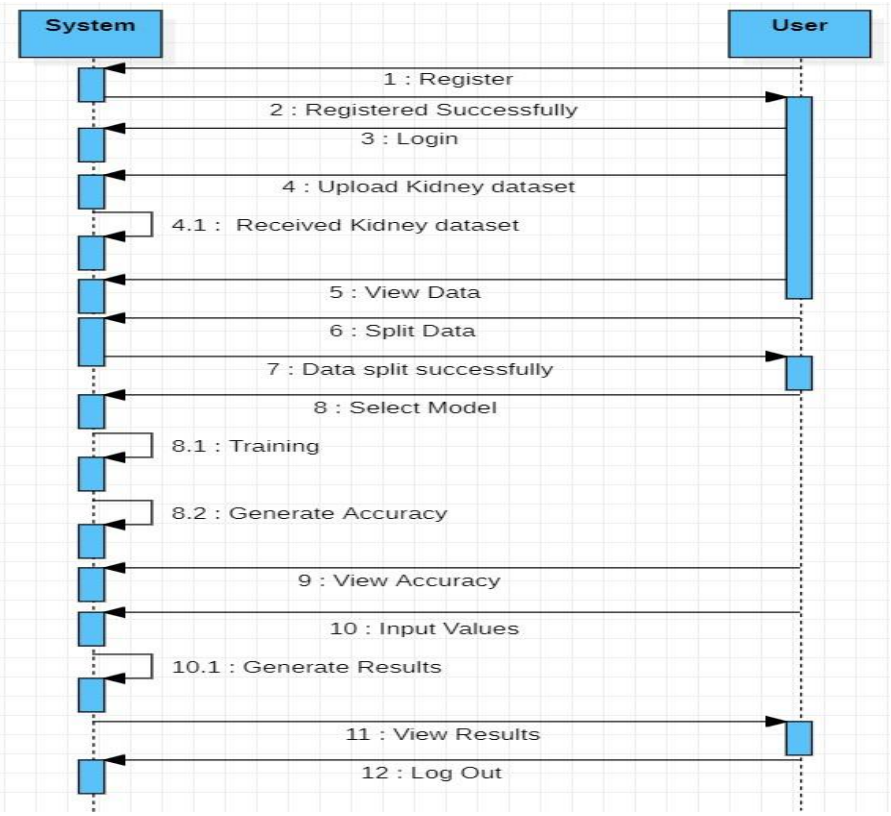
4.3.1 USE CASE:



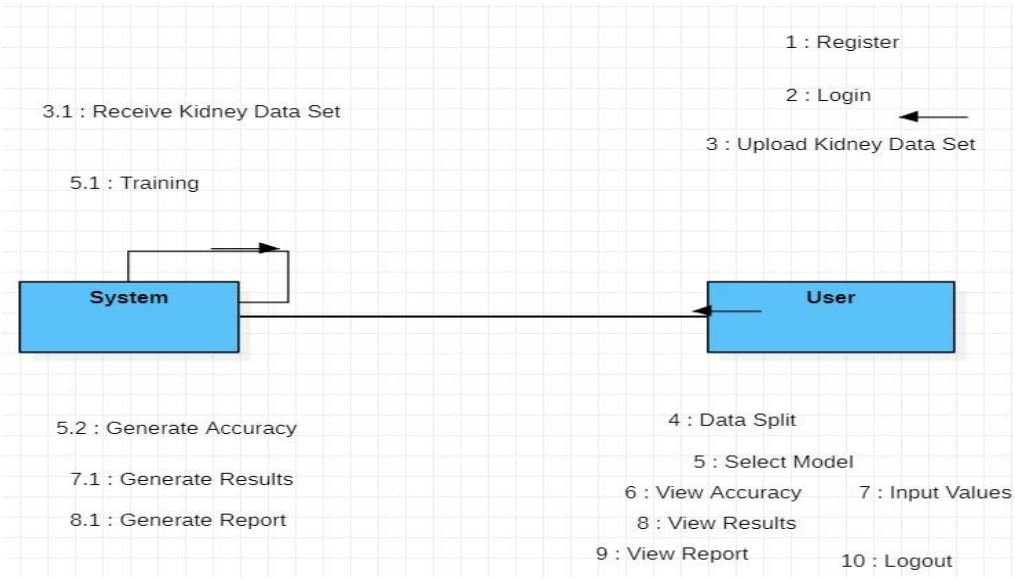
4.3.2 CLASS DIAGRAM:



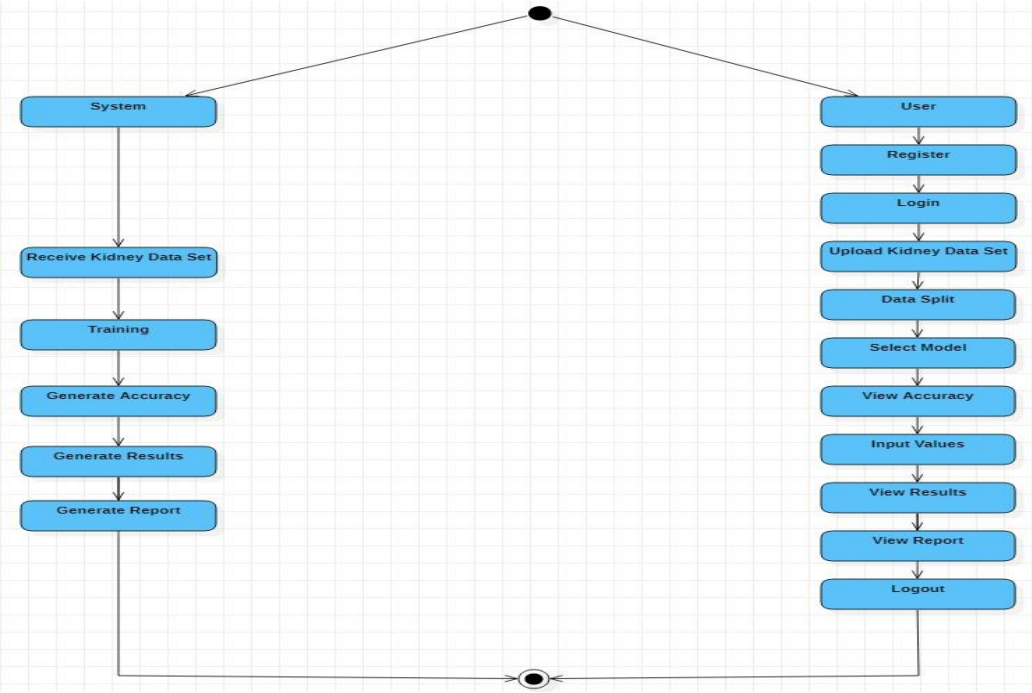
4.3.3 SEQUENCE DIAGRAM:



4.3.4 COLLABORATION DIAGRAM:



4.3.5 ACTIVITY DIAGRAM:



4.4 SYSTEM REQUIREMENTS SPECIFICATION

Functional and non-functional requirements:

Requirement's analysis is very critical process that enables the success of a system or software project to be assessed. Requirements are generally split into two types: Functional and non-functional requirements.

Functional Requirements: These are the requirements that the end user specifically demands as basic facilities that the system should offer. All these functionalities need to be necessarily incorporated into

the system as a part of the contract. These are represented or stated in the form of input to be given to the system, the operation performed and the output expected. They are basically the requirements stated by the user which one can see directly in the final product, unlike the non-functional requirements.

1) System shutdown in case of a cyber-attack
2) A verification email is sent to user whenever he/she register for the first time on some software system.

Non-functional requirements: These are basically the quality constraints that the system must satisfy according to the project contract. The priority or extent to which these factors are implemented varies from one project to other. They are also called non-behavioral requirements.

They basically deal with issues like:

- Portability
- Security
- Maintainability
- Reliability
- Scalability
- Performance
- Reusability
- Flexibility

Examples of non-functional requirements:

1) Emails should be sent with a latency of no greater than 12 hours from such an activity.
2) The processing of each request should be done within 10 seconds
3) The site should load in 3 seconds whenever of simultaneous users are > 10000

4.4.1 HARDWARE REQUIREMENTS:

Hardware:

Operating system : Windows 7 or 7+

RAM : 8 GB

Hard disc or SSD : More than 500 GB

Processor : Intel 3rd generation or high or Ryzen with 8 GB Ram

4.4.2 SOFTWARE REQUIREMENTS:

Software:

Software : Python 3.6 or high version

IDE : PyCharm

Framework : Django

CHAPTER 5

5. RESULTS AND DISCUSSION

5.1 IMPLEMENTATION:

Split:

```
<!DOCTYPE html>
<html lang="en">
   <head>
      <!-- basic -->
      <meta charset="utf-8">
      <meta http-equiv="X-UA-Compatible" content="IE=edge">
      <!-- mobile metas -->
      <meta name="viewport" content="width=device-width, initial-
      scale=1">
      <meta name="viewport" content="initial-scale=1, maximum-
      scale=1"> <!-- site metas -->
      <title>PREDICTION OF STONES IN KIDNEYS USING MACHINE
      LEARNING</title>
      <meta name="keywords" content="">
      <meta name="description" content="">
      <meta name="author" content="">
      <!-- bootstrap css -->
      <link rel="stylesheet"
      href="static/css/bootstrap.min.css"> <!-- style css --
      >
      <link rel="stylesheet" href="static/css/style.css">
      <!-- Responsive-->
      <link rel="stylesheet"
      href="static/css/responsive.css"> <!-- fevicon -->
      <link rel="icon" href="static/images/kidney.jpg"
      type="image/gif" /> <!-- Scrollbar Custom CSS -->
      <link rel="stylesheet"
      href="static/css/jquery.mCustomScrollbar.min.css">
      <!-- Tweaks for older IEs-->
<link rel="stylesheet" href="https://netdna.bootstrapcdn.com/font-
awesome/4.0.3/css/font-awesome.css">
      <!-- owl stylesheets -->
      <link rel="stylesheet" href="static/css/owl.carousel.min.css">
```

```
            <link rel="stylesheet"
            href="static/css/owl.theme.default.min.css">
                                                    <link    rel="stylesheet"
        href="https://cdnjs.cloudflare.com/ajax/libs/fancybox/2.1.5/jquery.f
        ancybox.mi n.css" media="screen">
           </head>
           <!-- body -->
           <body>
             <style>
           body      {                  background-image:
url("static/images/kid2.jpg");   background-repeat:  no-
repeat;

 background-color: #cccccc;    height:
700px;
                 background-position: center;
                 background-repeat: no-repeat;
 background-size: cover;
        }
        </style>
              <!-- header top section start -->
              <div class="header_top">
                <div class="container">
                  <div class="row">
                    <div class="col-sm-
                      5"> </div>
                    </div>
        <div class="contact_right">
                         <div
        class="call_text"style="color:white;"><strong>PREDICTION OF STONES IN
        KIDNEYS USING MACHINE LEARNING</strong></div> </div>
                  </div>
                </div>
              </div>
              <!-- header top section end -->
              <!-- header section start -->
              <nav class="navbar navbar-expand-lg navbar-light bg-light">
                  <button class="navbar-toggler" type="button" data-
                  toggle="collapse"
        data-target="#navbarNavAltMarkup" aria-controls="navbarNavAltMarkup"
        aria- expanded="false" aria-label="Toggle navigation">
                  <span class="navbar-toggler-icon"></span>
                </button>
                <div class="collapse navbar-collapse"
                id="navbarNavAltMarkup">
                  <div class="navbar-nav">
                    <a class="nav-item nav-link" href="/upload">upload</a>
```

```
                    <a class="nav-item nav-link" href="/split">split</a>
                    <a class="nav-item nav-link"
                    href="/modeltrain">modeltrain</a>
                    <a class="nav-item nav-link"
                   href="/prediction">prediction</a> </div>
                  </div>
                </nav>
                <!-- header section end -->
                <div id="about" class="about" style="height: 100vh;">
                  <div class="container">
                      <div class="row">
                          <div class="col-md-12">
                         <div class="about_border">
                             <div class="row">
                                 <div class="col-md-6">
                                         <div class="titlepage
                                         text_align_left">
                                               <center> <h2
        style="color:rgb(255, 255, 255);">split data</h2></center>
                                     </div>
                                         <div
class="about_text">

                                <form action="{% url 'split' %}" method="post"
        enctype="multipart/form-data"><br><br>
                                       {% csrf_token %}
                                    <label><h6 style="color:rgb(255, 255,
        255);font-size:35px;"><b>Enter                                    Split
        Size:</b></h6></label>    
                                     <input type="text" placeholder="Test
        Data      Size"      name="split"      required="required"
   style="width:
        350px;"><br><br><br><br>



                                    <input type="submit" value="submit"
        class="btn btn-info"><br><br><br>
                                                  <div>
                                               {% for message in messages %}

                                      <center><h4 style="color:rgb(255,
        255, 255)">{{message}}</h4></center>
                                                      {% endfor %}
                                        </div>
                                    </form>
                                      </center>
                                </div>
                            </div>
```

```
                        <div class="col-md-6">
                            <div class="about_img">

                            </div>
                        </div>
                    </div>
                </div>
            </div>
        </div>
    </div>

    <!-- Javascript files-->
    <script src="static/js/jquery.min.js"></script>
    <script src="static/js/popper.min.js"></script>
    <script src="static/js/bootstrap.bundle.min.js"></script>
    <script src="static/js/jquery-3.0.0.min.js"></script>
    <script src="static/js/plugin.js"></script>
    <!-- sidebar -->
    <script
    src="static/js/jquery.mCustomScrollbar.concat.min.js"></script>
    <script src="static/js/custom.js"></script>
    <!-- javascript -->
    <script src="static/js/owl.carousel.js"></script>
                                                        <script
src="https:cdnjs.cloudflare.com/ajax/libs/fancybox/2.1.5/jquery.fancybox.mi
                                                    n.j s"></script>
    <script>
      $('#myCarousel').carousel({
            interval: false
        });

        //scroll slides on swipe for touch enabled devices

        $("#myCarousel").on("touchstart", function(event){

            var yClick =
            event.originalEvent.touches[0].pageY;
            $(this).one("touchmove", function(event){

                var yMove =
                event.originalEvent.touches[0].pageY; if(
                Math.floor(yClick - yMove) > 1 ){
                $(".carousel").carousel('next');
                } else if( Math.floor(yClick -
                yMove) < -1 ){
                $(".carousel").carousel('prev');
                }
```

```
            });
            $(".carousel").on("touchend", function(){
                $(this).off("touchmove");
            });
        });
    </script>
    </body>
    </html>
```

Model Train:

```
<!DOCTYPE html>
<html lang="en">
   <head>
      <!-- basic -->
      <meta charset="utf-8">
      <meta http-equiv="X-UA-Compatible" content="IE=edge">
      <!-- mobile metas -->
      <meta name="viewport" content="width=device-width, initial-
      scale=1">
      <meta name="viewport" content="initial-scale=1, maximum-
      scale=1">
      <!-- site metas -->
      <title>PREDICTION OF STONES IN KIDNEYS USING MACHINE
      LEARNING</title>
      <meta name="keywords" content="">
      <meta name="description" content="">
      <meta name="author" content="">
      <!-- bootstrap css -->
      <link rel="stylesheet" href="static/css/bootstrap.min.css">
      <!-- style css -->
      <link rel="stylesheet" href="static/css/style.css">
      <!-- Responsive-->
      <link rel="stylesheet"
      href="static/css/responsive.css"> <!-- fevicon -->
      <link rel="icon" href="static/images/kidney.jpg">
      <!-- Scrollbar Custom CSS -->
      <link rel="stylesheet"
      href="static/css/jquery.mCustomScrollbar.min.css">
      <!-- Tweaks for older IEs-->
<link rel="stylesheet" href="https://netdna.bootstrapcdn.com/font-
awesome/4.0.3/css/font-awesome.css">
      <!-- owl stylesheets -->
      <link rel="stylesheet" href="static/css/owl.carousel.min.css">
```

```
            <link rel="stylesheet"
            href="static/css/owl.theme.default.min.css">
                                                    <link    rel="stylesheet"
        href="https://cdnjs.cloudflare.com/ajax/libs/fancybox/2.1.5/jquery.f
        ancybox.mi n.css" media="screen">
           </head>
           <!-- body -->
           <body>
             <style> body {     background-image:
url("static/images/kid2.jpg");        background-repeat:
no-repeat;
 background-color: #cccccc;

                height: 700px;
 background-position:         center;
background-repeat:         no-repeat;
background-size: cover;
        }
        </style>
              <!-- header top section start -->
              <div class="header_top">
                <div class="container">
                  <div class="row">
                    <div class="col-sm-
                      5"> </div>
                    </div>
                    <div class="contact_right">
                         <div
        class="call_text"style="color:white;"><strong>PREDICTION OF STONES
        IN KIDNEYS USING MACHINE LEARNING</strong></div>
                    </div>
                    </div>
                  </div>
                </div>
              </div>
              <!-- header top section end -->
              <!-- header section start -->
        <nav class="navbar navbar-expand-lg navbar-light bg-light">
                  <button class="navbar-toggler" type="button" data-
                  toggle="collapse"
        data-target="#navbarNavAltMarkup" aria-controls="navbarNavAltMarkup"
        aria- expanded="false" aria-label="Toggle navigation">
                    <span class="navbar-toggler-icon"></span>
                </button>
                <div class="collapse navbar-collapse"
                id="navbarNavAltMarkup">
                  <div class="navbar-nav">
                    <a class="nav-item nav-link" href="/upload">upload</a>
```

```
                    <a class="nav-item nav-link" href="/split">split</a>
                    <a class="nav-item nav-link" href="/model
                    train">modeltrain</a>
                    <a class="nav-item nav-link"
                   href="/prediction">prediction</a> </div>
                  </div>
                </nav>
                <!-- header
section end -->

                                    <div class="col-md-6">

                                <div class="titlepage text_align_left">

                                    <center> <h2 style="color: white;">Model
        Training</h2></center>
                                        </div><br><br><br>
                                        <div class="about_text" >

 method="post">                         <form action="{% url 'modeltrain' %}"

                                               {% csrf_token %}

                                    {% comment %} <center> <label for="algo"
        style="color:black;">Select a Model:</label> {% endcomment %}
                                           <center>
                                        <select id="algo" name="algo">
                                     <option value="0">select model</option>
                                                  <option value="1">Random
        Forest</option>
                                                    <option value="2">Decision
        tree</option>
                                          <option value="3">CNN</option>
       </select>    <br><br><br>


                                        <input type="submit" value="submit"
        class="btn btn-info"><br><br><br>
                                                 <div>

                                                    <center><b style="color:
        white;">{{msg}}</b></center><br><br>
                                           </center>

                                        </form>
                                    </div>
                                </div>
```

```
                        </div>
                    </div>
            <!-- Javascript files-->
            <script src="static/js/jquery.min.js"></script>
            <script src="static/js/popper.min.js"></script>
            <script src="static/js/bootstrap.bundle.min.js"></script>
            <script src="static/js/jquery-3.0.0.min.js"></script>
            <script src="static/js/plugin.js"></script>
            <!-- sidebar -->
            <script
            src="static/js/jquery.mCustomScrollbar.concat.min.js"></script>
            {% comment %} <script src="static/js/custom.js"></script> {%
            endcomment %} <!-- javascript -->
            <script src="static/js/owl.carousel.js"></script>
                                                                    <script
src="https:cdnjs.cloudflare.com/ajax/libs/fancybox/2.1.5/jquery.fancybox.mi
                                                                n.j s"></script>
            <script>
              $('#myCarousel').carousel({
                    interval: false
                });

                //scroll slides on swipe for touch enabled devices

                $("#myCarousel").on("touchstart", function(event){

                    var yClick =
                    event.originalEvent.touches[0].pageY;
                    $(this).one("touchmove", function(event){
                        var yMove =
                        event.originalEvent.touches[0].pageY; if(
                        Math.floor(yClick - yMove) > 1 ){
                       $(".carousel").carousel('next');
                        } else if( Math.floor(yClick -
                        yMove) < -1 ){
                        $(".carousel").carousel('prev');
                        }
                    });
                    $(".carousel").on("touchend", function(){
                        $(this).off("touchmove");
                    });
                });
            </script>
            </body>
            </html>
```

Prediction:

```
<!DOCTYPE html>
<html lang="en">
   <head>
      <!-- basic -->
      <meta charset="utf-8">
      <meta http-equiv="X-UA-Compatible" content="IE=edge">
      <!-- mobile metas -->
      <meta name="viewport" content="width=device-width, initial-
      scale=1">
      <meta name="viewport" content="initial-scale=1, maximum-
      scale=1">
      <!-- site metas -->
      <title>PREDICTION OF STONES IN KIDNEYS USING MACHINE
      LEARNING</title>
      <meta name="keywords" content="">
      <meta name="description" content="">
      <meta name="author" content="">
      <!-- bootstrap css -->
      <link rel="stylesheet"
      href="static/css/bootstrap.min.css"> <!-- style css --
      >
      <link rel="stylesheet" href="static/css/style.css">
      <!-- Responsive-->
      <link rel="stylesheet" href="static/css/responsive.css">
      <!-- fevicon -->
      <link rel="icon" href="static/images/kidney.jpg"
      type="image/gif" /> <!-- Scrollbar Custom CSS -->
      <link rel="stylesheet"
      href="static/css/jquery.mCustomScrollbar.min.css">
      <!-- Tweaks for older IEs-->
<link rel="stylesheet" href="https://netdna.bootstrapcdn.com/font-
awesome/4.0.3/css/font-awesome.css">
      <!-- owl stylesheets -->
      <link rel="stylesheet" href="static/css/owl.carousel.min.css">
      <link rel="stylesheet"
      href="static/css/owl.theme.default.min.css">
                                          <link    rel="stylesheet"
href="https://cdnjs.cloudflare.com/ajax/libs/fancybox/2.1.5/jquery.f
ancybox.mi n.css" media="screen">
   </head>
   <!-- body -->
   <body>
     <s
   tyle
   >
```

```
   body
   {
background-image: url("static/images/kid2.jpg");
          background-repeat: no-
          repeat; background-
          color: #cccccc; height:
          700px; background-
          position: center;
          background-repeat: no-
          repeat; background-size:
          cover;
}
</style>
      <!-- header top section start -->
      <div class="header_top">
        <div class="container">
          <div class="row">
            <div class="col-sm-
              5"> </div>
            </div>
            <div class="contact_right">
                <div
class="call_text"style="color:white;"><strong>PREDICTION OF STONES
IN KIDNEYS USING MACHINE LEARNING</strong></div>
            </div>
              </div>
            </div>
          </div>
        </div>
      </div>
      <!-- header top section end -->
      <!-- header section start -->
      <nav class="navbar navbar-expand-lg navbar-light bg-light">
          <button class="navbar-toggler" type="button" data-
toggle="collapse" data-target="#navbarNavAltMarkup" aria-
controls="navbarNavAltMarkup" aria- expanded="false" aria-
label="Toggle navigation">
          <span class="navbar-toggler-icon"></span>
        </button>
   <div class="collapse navbar-collapse" id="navbarNavAltMarkup">
          <div class="navbar-nav">
            <a class="nav-item nav-link" href="upload">upload</a>
            <a class="nav-item nav-link" href="split">split</a>
            <a class="nav-item nav-link"
            href="modeltrain">modeltrain</a>
            <a class="nav-item nav-link"
            href="prediction">prediction</a>
            <a href="/login" class="nav-item nav-link
          active">logout</a> </div>
```

```
            </div>
          </nav>
          <!-- header section end -->
          <div id="about" class="about" style="height: 100vh;">
            <div class="container">

                    <div class="col-md-12">
                   <div class="about_border">


                                  <div class="col-md-12">
                                  <div class="titlepage text_align_center">
                                  <h2 style="color:white">Prediction</h2>
                                      </div>
                                      <br><br>
                                  </div>
                                  <div class="col-md-12">
method="post">                       <form action="{% url 'prediction' %}"

                                     {% csrf_token %}

      50px;">                        <div class="about_text" style="padding-top:

                                        <style > table, td { padding: 10px;
                                            border: 1px solid rgb(1, 0, 0);
                                            border-collapse: collapse;



                                            }
                                        </style>
                                        <center style="    padding-top: 20px;">
                                                     <table style="margin-left:

    4px;color:red(1, 0, 0);"><b>
                                                 <h1>
                                                     <tr>
                                                            {%for r in
                                                            Inp%} <tr>
                                                        {%for c in r%}
                                                                  <td
      style="color:rgb(0, 0, 0); border-width: 20px; background-color:
      antiquewhite;"><b>{{c}}</b></td>
                                                                    {%endfor%}
                                                       </tr>
                                                            {%endfor%}
                                                     </tr>
                                                      </h1>
                                                         {%for r in pred%}
```

```
                                                    <tr>
                                                   {%for j in r%}
                                                    <td style="color:rgb(0,
        0, 0); background-color: antiquewhite;">{{ j }}</td>
                                                            {%endfor%}
                                                    </tr>

                                                    {%endfor%}


                                                </b> </table>
                                                <br>
                                              <
/center>
                                                                        <center><h2
        style="color:red;">{{msg}}</h2></center>
        <center> <br>
                                      <table>
                                        <tr>
                                     <td><label style="margin-left: 20px;color:
        #FFFFFF;"><b>gravity of urine(0-1)</b></label>
                                                <input type="float" name="f1"
        placeholder="gravity" style="margin-left: 20px;"><br><br></td>
                                   <td> <label style="color: #FFFFFF;"><b>ph of
        urine(4-8)</b></label>
        <input type="float" name="f2" placeholder="ph" ><br><br></td>
                              <td><label style="color: #FFFFFF;"><b>osmolality
        of urine(50-1200)</b></label>
        <input type="float" name="f3" placeholder="osmo" ><br><br></td>
                                                    <td><label style="color:
        #070706;"><b>conductivity of urine(1-33)</b></label>
                                                <input type="flaot" name="f4"
        placeholder="conductivity" ><br><br></td>
                                   <td><label style="color: #070706;"><b>Conc.
        of urea in urine(428-714)</b></label>
                              <input type="float" name="f5" placeholder="urea"
        ><br><br></td>


                                     </tr>
                                     </table>
                                       <br>
                                     <ta
                                     ble
                                      >
                                     <tr>
                                            <td><label style="margin-left:
        20px; color: #FFFFFF;"><b>conc. of calcium in urine(2-7)</b></label>
```

```
                    <input type="float" name="f6" placeholder="calcium"
      style="margin-left: 20px;"><br><br></td>
                            <
                            /
                            t
                            r
                            >
                        </table><br>
      <center><input type="submit" style="margin-left:
                            50px;"><br></center></form> </div>
                        </div>
                    </div>
                </div>
            </div>
        </div>
    </div>
    <!-- Javascript files-->
    <script src="static/js/jquery.min.js"></script>
    <script src="static/js/popper.min.js"></script>
    <script src="static/js/bootstrap.bundle.min.js"></script>
    <script src="static/js/jquery-3.0.0.min.js"></script>
    <script src="static/js/plugin.js"></script>
    <!-- sidebar -->
    <script
    src="static/js/jquery.mCustomScrollbar.concat.min.js"></script>
    <script src="static/js/custom.js"></script>
    <!-- javascript -->
    <script src="static/js/owl.carousel.js"></script>
                                                        <script
src="https:cdnjs.cloudflare.com/ajax/libs/fancybox/2.1.5/jquery.fancybox.mi
                                                    n.j s"></script>

    </body>
    </html>
```

Output:

```
<!DOCTYPE html>
<html lang="en">
   <head>
      <!-- basic -->
      <meta charset="utf-8">
      <meta http-equiv="X-UA-Compatible" content="IE=edge">
      <!-- mobile metas -->
      <meta name="viewport" content="width=device-width, initial-
      scale=1">
```

```
            <meta name="viewport" content="initial-scale=1, maximum-
            scale=1">
            <!-- site metas -->
            <title>PREDICTION OF STONES IN KIDNEYS USING MACHINE
            LEARNING</title>
            <meta name="keywords" content="">
            <meta name="description" content="">
            <meta name="author" content="">
            <!-- bootstrap css -->
            <link rel="stylesheet"
            href="static/css/bootstrap.min.css"> <!-- style css --
            >
            <link rel="stylesheet" href="static/css/style.css">
            <!-- Responsive-->
            <link rel="stylesheet" href="static/css/responsive.css">
            <!-- fevicon -->
            <link rel="icon" href="static/images/kidney.jpg"
            type="image/gif" /> <!-- Scrollbar Custom CSS -->
            <link rel="stylesheet"
            href="static/css/jquery.mCustomScrollbar.min.css">
            <!-- Tweaks for older IEs-->
        <link rel="stylesheet" href="https://netdna.bootstrapcdn.com/font-
        awesome/4.0.3/css/font-awesome.css">
            <!-- owl stylesheets -->
            <link rel="stylesheet" href="static/css/owl.carousel.min.css">
            <link rel="stylesheet"
            href="static/css/owl.theme.default.min.css">
                                                <link    rel="stylesheet"
        href="https://cdnjs.cloudflare.com/ajax/libs/fancybox/2.1.5/jquery.f
        ancybox.mi n.css" media="screen">
           </head>
           <!-- body -->
           <body>
             <style> body {     background-image:
url("static/images/kid2.jpg");        background-repeat:
no-repeat;
 background-color: #cccccc;

                height: 700px;
 background-position:         center;
background-repeat:         no-repeat;
background-size: cover;
        }
        </style>
            <!-- header top section start -->
            <div class="header_top">
              <div class="container">
                <div class="row">
```

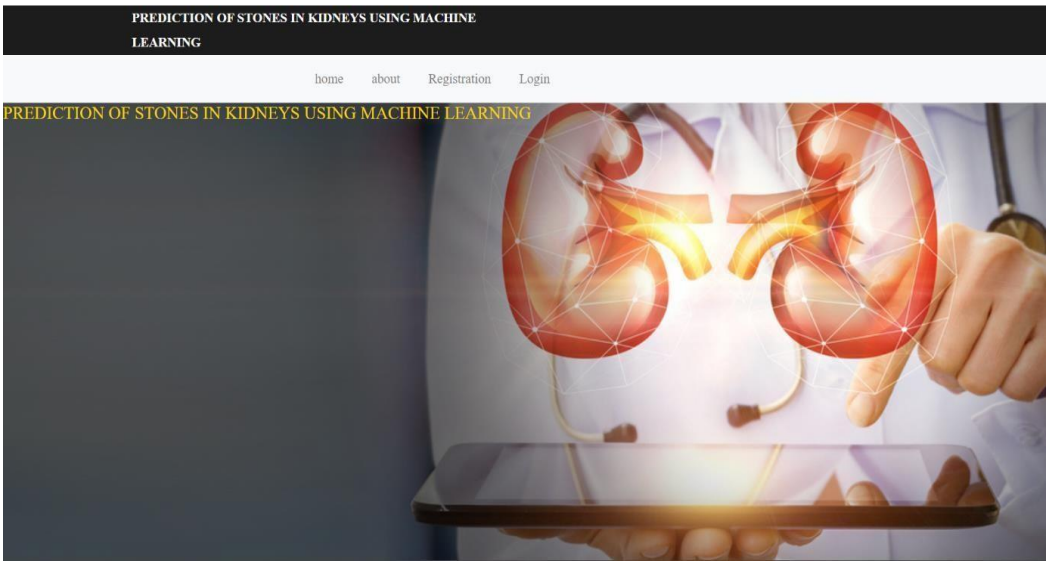
```
            <div
              class="row">
              </div>
            </div>
            <div class="contact_right">
        <div class="call_text"style="color:white;"><strong>PREDICTION
OF STONES IN KIDNEYS USING MACHINE LEARNING</strong></div>
            </div>
              </div>
            </div>
          </div>
        </div>
      </div>
      <!-- header top section end -->
      <!-- header section start -->
      <nav class="navbar navbar-expand-lg navbar-light bg-light">
          <button class="navbar-toggler" type="button" data-
          toggle="collapse"
data-target="#navbarNavAltMarkup" aria-controls="navbarNavAltMarkup"
aria- expanded="false" aria-label="Toggle navigation">
          <span class="navbar-toggler-icon"></span>
        </button>
        <div class="collapse navbar-collapse"
        id="navbarNavAltMarkup">
          <div class="navbar-nav">
            <a class="nav-item nav-link" href="upload">upload</a>
            <a class="nav-item nav-link" href="split">split</a>
            <a class="nav-item nav-link"
            href="modeltrain">modeltrain</a>
            <a class="nav-item nav-link"
            href="prediction">prediction</a>
            <a href="/login" class="nav-item nav-link
          active">logout</a> </div>
        </div>
      </nav>
      <!-- header section end -->
      <div id="about" class="about" style="height:
        100vh;"> <div class="container">

               <div class="row-md-12">
              <div class="about_border">
```

```
                                <div class="row-md-12">
                                    <div class="titlepage text_align_center">
                                       <h2 style="color:white">Prediction</h2>
                                    </div>
                                    <br><br>
                                </div>
                                <div class="row-md-12">
 method="post">                                    <form action="{% url 'prediction' %}"

                                        {% csrf_token %}

                                <div class="about_text" style="padding-top:
        50px; background-color: aliceblue;" >
                                        <style >
                                            table,
                                            td {
                                            padding:
                                            10px;
                                                border: 1px solid
                                                rgb(1, 0, 0); border-
                                                collapse: collapse;
                                        }
                                    </style>
                                        <center style="    padding-top:
20px;">
        <table style="margin-left: 4px;color:red(1, 0, 0);"><b>
                                                <h1
                                                style="color:black;">M
                                                edical
        Report</h1>
                                            <h1>
                                                <tr>
                                                       {%for r in
                                                       Inp%} <tr>
                                                   {%for c in r%}
                                                          <td
        style="color:rgb(0, 0, 0); border-width: 20px; background-color:
        antiquewhite;"><b>{{c}}</b></td>
                                                             {%endfor%}
                                                  </tr>
                                                       {%endfor%}

                                                </tr>
                                                 </h1>
                                                    {%for r in pred%}
                                                <tr>
                                                {%for j in r%}
                                                 <td style="color:rgb(0,
```

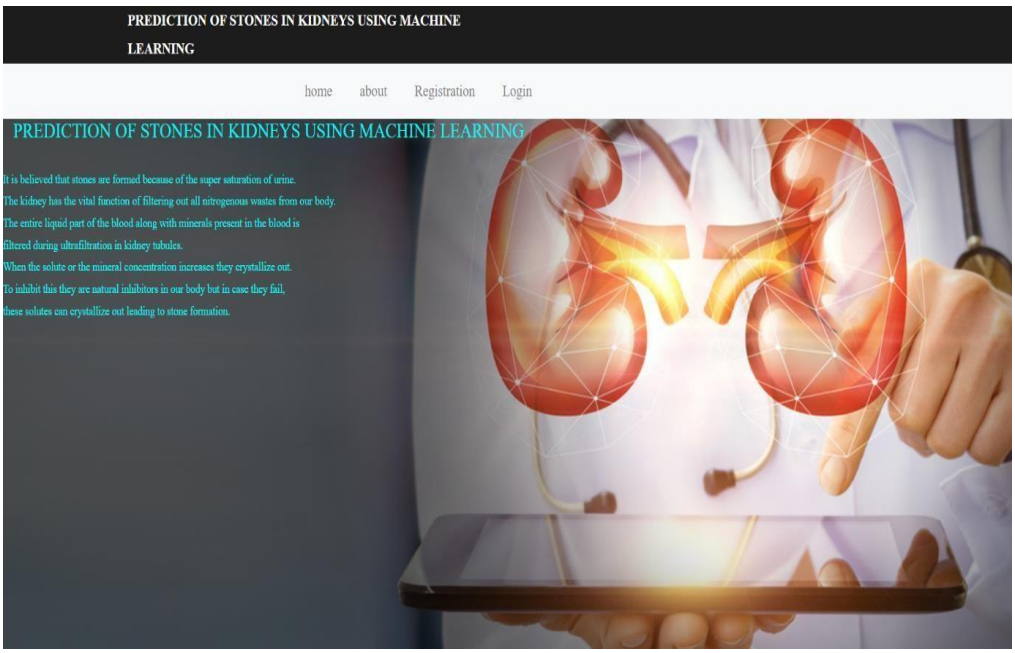
```
        0, 0); background-color: antiquewhite;">{{ j }}</td>
                                                                {%endfor%}
                                                        </tr>

                                                        {%endfor%}


                                                    </b> </table>
                                                    <br>
                                                <
/center>
                                                                        <center><h2
        style="color:red;">{{msg|safe}}</h2></center>
                                        <center>

                                </div>
                                     </div>
                                 </div>
                            </div>
                        </div>
                    </div>
                </div>
            <!-- Javascript files-->
            <script src="static/js/jquery.min.js"></script>
            <script src="static/js/popper.min.js"></script>
            <script src="static/js/bootstrap.bundle.min.js"></script>
            <script src="static/js/jquery-3.0.0.min.js"></script>
            <script src="static/js/plugin.js"></script>
            <!-- sidebar -->
            <script
            src="static/js/jquery.mCustomScrollbar.concat.min.js"></script>
            <script src="static/js/custom.js"></script>
            <!-- javascript -->
            <script src="static/js/owl.carousel.js"></script>
                                                                    <script
 src="https:cdnjs.cloudflare.com/ajax/libs/fancybox/2.1.5/jquery.fancybox.mi
                                                                n.j s"></script>


            </body>
            </html>
```

5.2 RESULTS:

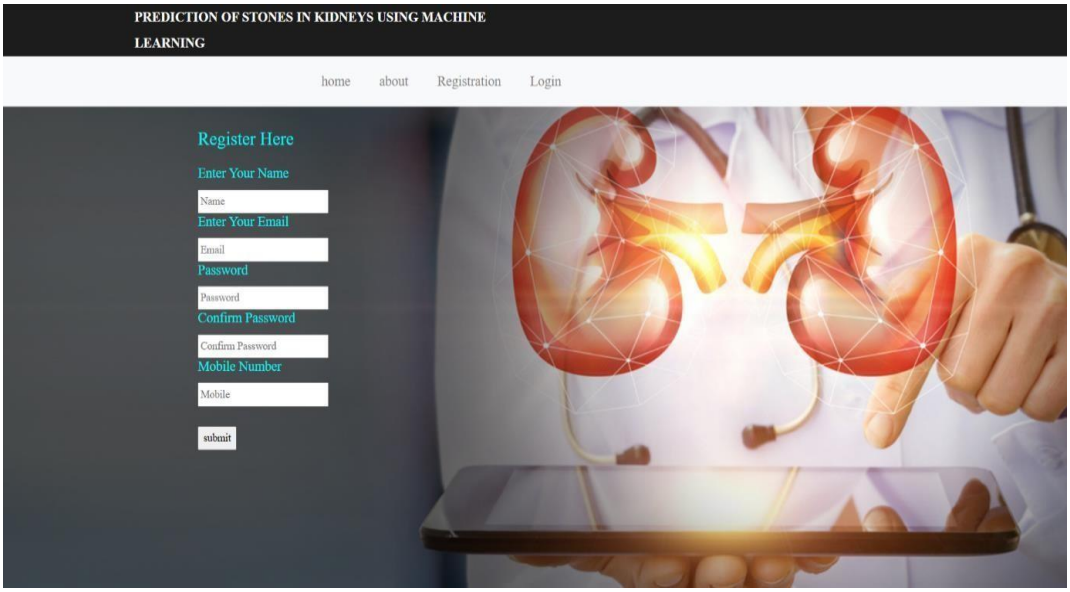
Home Page:



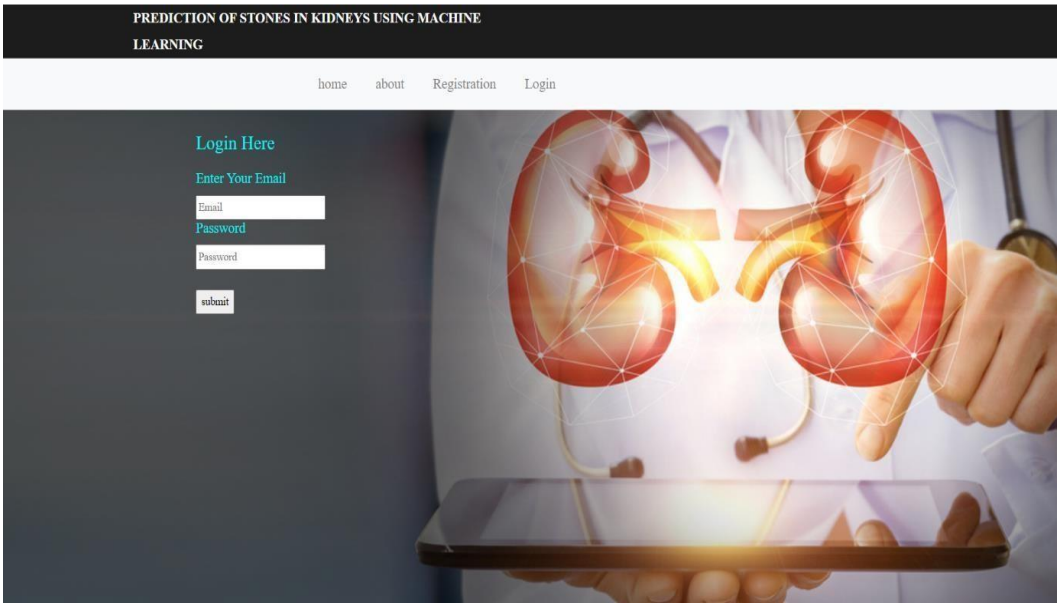
About Page:



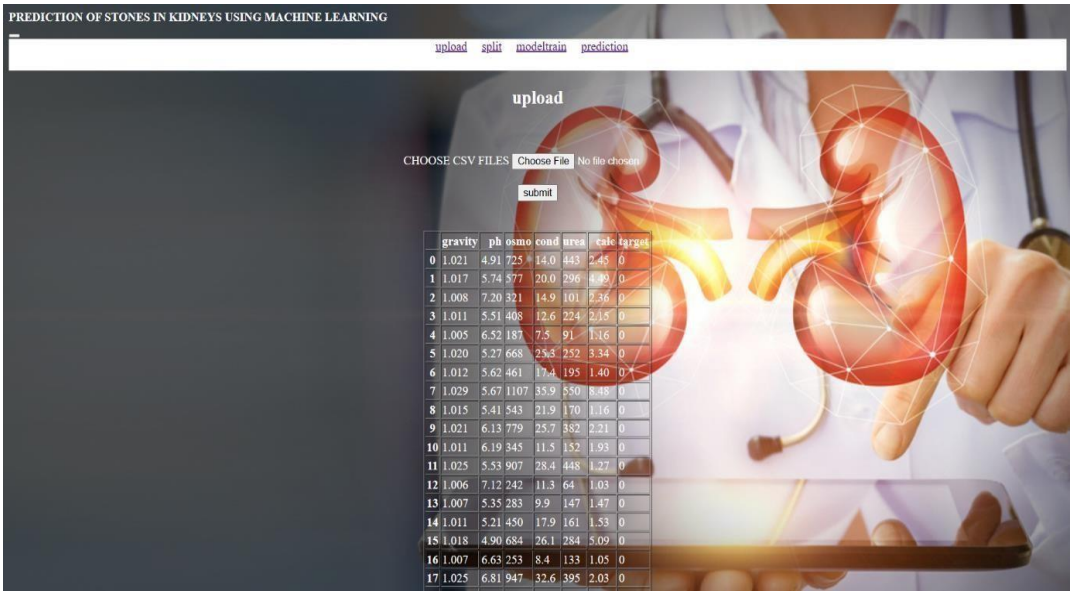
Register Page:



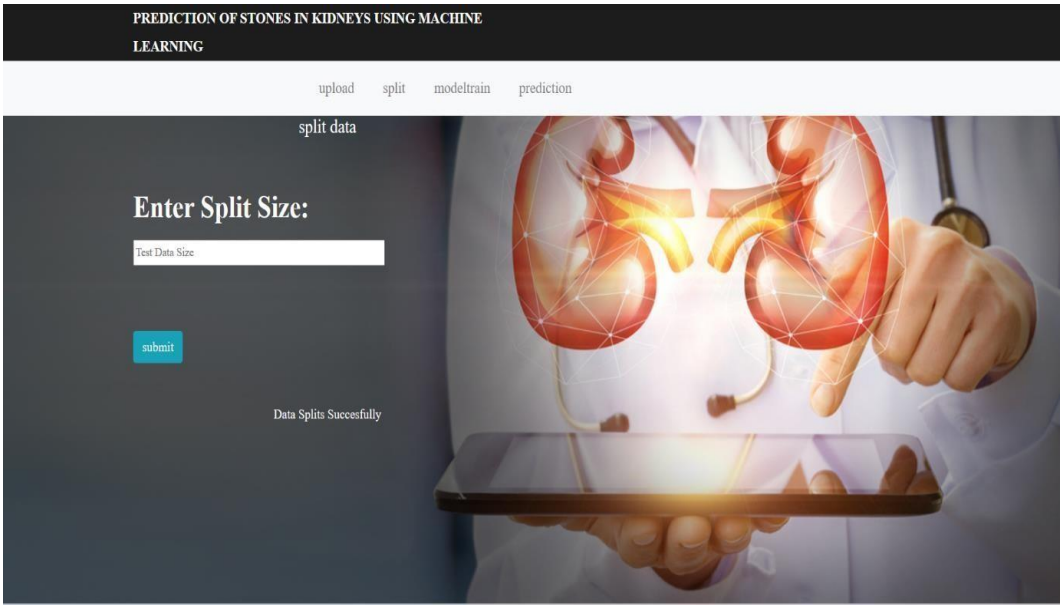
Login Page:



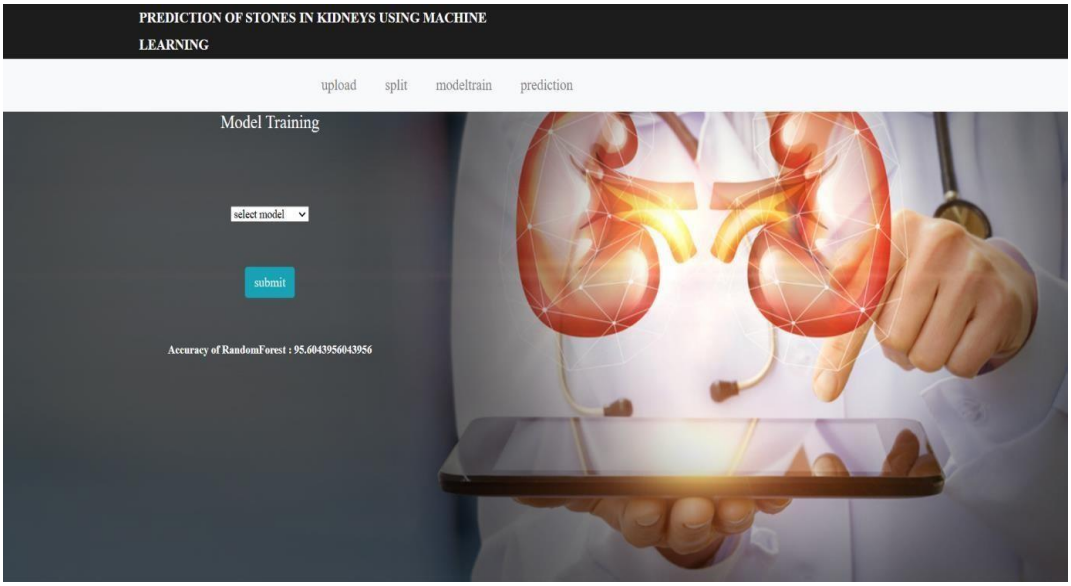
Upload Page:



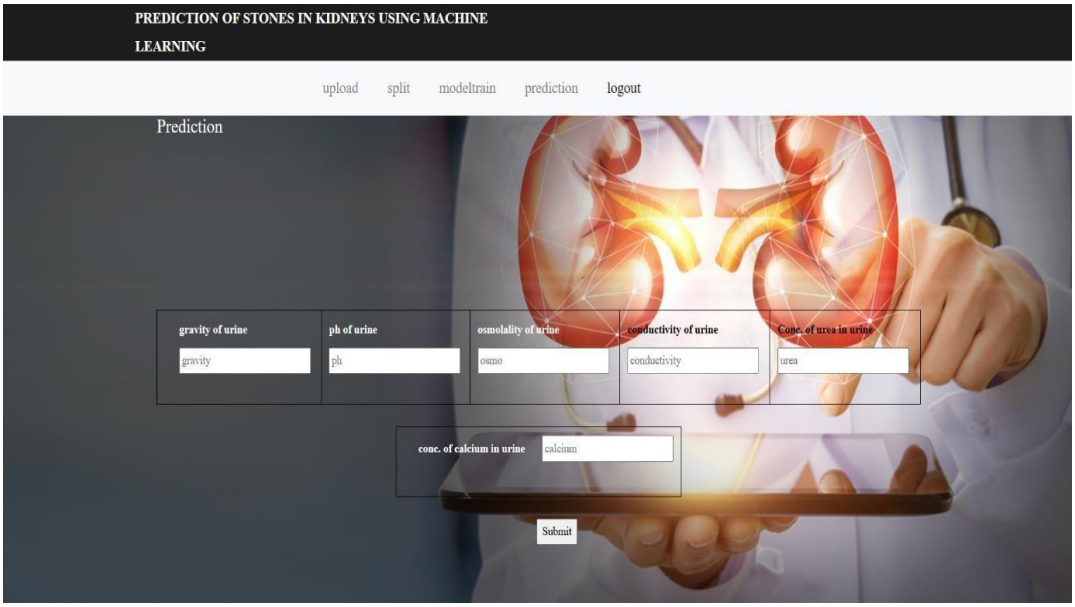
Split Page:



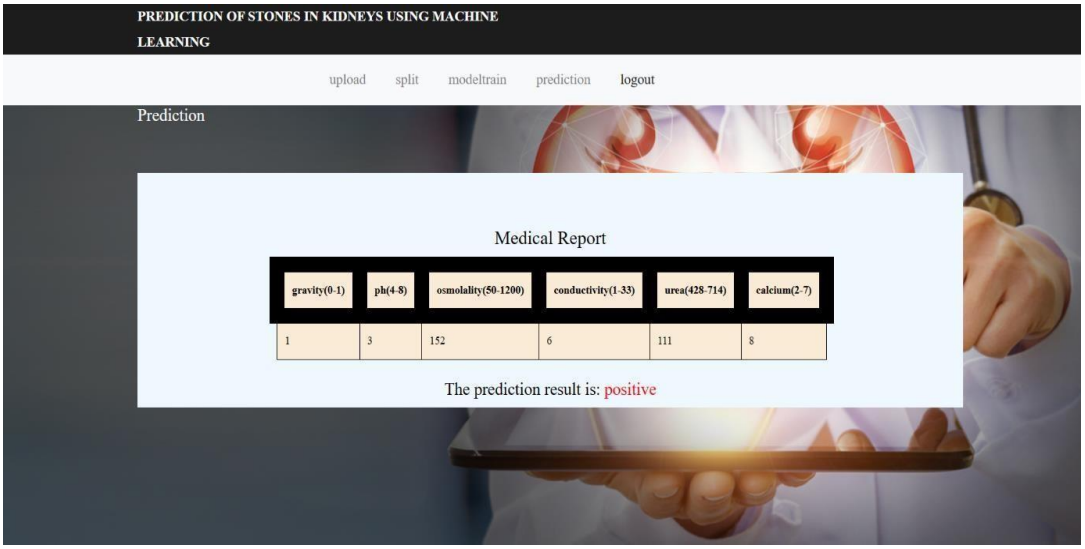
Model Training:



Prediction:



Medical Report:



TEST CASES:

Input	Output	Result
Input	Tested for the classifier for The kidney stones prediction	output

Test cases Model building:

S.NO	Test cases	I/O	Expected O/T	Actual O/T	P/F
1	Read the dataset.	Dataset path.	Dataset need to read successfully.	Dataset fetched successfully.	P
2	Performing pre-processing on the dataset	Pre-processing part takes place	Pre-processing should be performed on dataset	Pre-processing successfully completed.	P
3	Model Building	Model Building for the clean data	Need to create model using required algorithms	Model Created Successfully.	P
4	Classification	Input values provided.	Output would be any one of the classification	Model classified successfully	P

CHAPTER 6

6.CONCLUSION AND SCOPE FOR FUTURE WORK

6.1 Conclusion:

The project methodology of predicting the presence of stones formed in kidneys has been accomplished by using Machine Learning Algorithms such as Decision Tree and Random Forest. The crucial combination of these two methods is confirmed to be an accurate system for the discovery of kidney stones. The accuracy of Decision Tree and Random Forest is 91% and 97.1% respectively, which is competent enough as distinguished from previous algorithms.

6.2 Future Scope:

This can be utilized in future to classify the types of different classifications easily that can tend to find out the kidney stones using different machine learning algorithms.

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