

ABSTRACT

Chronic kidney disease(CKD) or chronic excretory organ disease has become a significant issue with a gradual rate. An individual will solely survive while affected by ckd for a mean time of eighteen days, that makes an enormous demand for a excretory organ transplant and chemical analysis. It is necessary to own effective strategies for early prediction of CKD. Machine learning strategies area unit effective in CKD prediction. This work proposes a workflow to predict CKD standing supported clinical knowledge incorporating knowledge in missing worth handling methodology with cooperative filtering and attribute choice. Out of the eleven machine learning strategies, thought about the additional tree classifier and random forest classifier area unit shown to lead to the best accuracy and nominal bias to the attributes. The analysis conjointly assortment and highlights the importance of incorporative domain knowledge once victimization machine learning for CKD standing prediction .

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Early Detection Of Chronic Kidney Disease

1.INTRODUCTION

Chronic kidney disease (CKD) is a widespread disease worldwide. CKD is the 11th leading cause of death worldwide, with 1.2 million deaths each year, and according to the Kidney Foundation in Bangladesh, about 40,000 people with CKD experience kidney failure each year, and several thousand die in the short stage of life due to CKD. Predictive analytics for healthcare using machine learning is a challenging task to help doctors make accurate treatment decisions to save lives. Together, the researchers researched chronic kidney disease, with most of their work being on purely statistical models, which created numerous gaps in the development of machine learning models. In this paper, we discussed the current methods and proposed an improved technology based on XGBoost (Extreme Gradient Boost), which combined the significant characteristics of the F-score and evaluated four pre-processing scenarios. In addition, we provided machine training methods for predicting chronic kidney disease with clinical information. Four machine learning techniques including Support Vector Regressor (SVR), Logistic Regressor (LR), AdaBoost, Gradient Boosting Tree, and Decision Tree Regressor are explored. Components are

constructed from the UCI CKD dataset and the results of these models are compared to determine the best regression model for prediction.

1.1. PROJECT OVERVIEW

Chronic Kidney Disease refers to the kidneys' inability to fulfill their normal blood filtration role and other functions (CKD). The term "chronic" refers to progressive deterioration of kidney cells over time. A kind of artificial intelligence is machine learning (ML) (AI). Its heart is algorithmic procedures, which allow the machine to solve issues without the need for specialist computer programming. The widespread use of ML in the medical industry promotes medical innovation, lowers medical expenses, and improves medical quality. However, further research on using ML to solve clinical problems in nephrology is needed. Hence, the prediction and diagnosis of CKD in its early stages is quite essential, it may be able to enable patients to receive timely treatment to ameliorate the progression of the disease.

1.2.PURPOSE

Machine learning refers to a computer program, which calculates and deduces the information related to the task and obtains the characteristics of the corresponding pattern . This technology can achieve accurate and economical diagnoses of diseases hence, it might be a promising method for diagnosing CKD. It has become a new kind of medical tool with the development of information technology and has a broad application prospect because of the rapid development of electronic health record . In the medical field, machine learning has already been used to detect human body status , analyze the relevant factors of the disease and diagnose various diseases. For example, the models built by machine learning algorithms were used to diagnose heart disease , diabetes and retinopathy , acute kidney injury , cancer and other diseases .

2.LITERATURE SURVEY

2.1 EXISTING PROBLEM

The current system of diagnosis is based on urine examination using the serum creatinine level. Many medical methods are used for this purpose, such as screening, ultrasound method. During the screening,

patients with hypertension, cardiovascular disease in the anamnesis, diseases in the past and patients who have relatives with kidney disease are examined. This technique involves calculating an estimated GFR from the serum creatinine level and measuring the urinary albumin-to-creatinine ratio (ACR) in the first morning urine sample. This paper focuses on machine learning techniques such as ACO and SVM by minimizing features and selecting the best features to improve prediction accuracy.

2.2 REFERENCES

Baisakhi Chakraborty [1] proposed developing a CKD prediction system using machine learning techniques such as K nearest neighbors, logistics regression, decision tree, random forests, naïve Bayes, supports vector machines, and multilayer perception algorithms. These are applied and their performance compared to the precision, and recall results. Finally, a random forests is chosen to implement this system.

S.Dilli Arasu and Dr.R.Thirumalaiselvi [2] addressed missing values in the chronic kidney disease dataset. Missing values in the dataset reduce model accuracy and predictive results. They find a solution to this problem by performing a recalculation process at the CKD level and getting unknown value in process. They replaced the missing values with newly calculated values.

S.Ramya and Dr.N.Radha [3] worked to improve diagnostic time and diagnostic accuracy using various machine learning classification algorithms. Th proposed work addresses the classification of different stages of CKD according to their severity. Analyze different algorithms such as Basic Propagation Neural Network, RBF, and RF. The analysis results show that the RBF algorithm outperforms other classifiers, achieving 85.3% accuracy.

A.Salekin and J.Stankovic [4] evaluated three classifiers to detect CKD: Random Forest, K-Nearest Neighbors, and Neural Networks. They used a dataset of 400 patients from the UCI with 24 attributes. Trait reduction analysis was performed to find attributes that recognize this disease with high accuracy using the wrapper method. By factoring in albumin, specific gravity, diabetes mellitus, hemoglobin, and hypertension, CPR can be predicted with 0.98 F1 and 0.11 RMSE.

P.Yildirim [5] studied the effect of sampling algorithms in predicting chronic kidney disease. Experiments were performed by comparing the effects of his three samplings algorithms, Resample, SMOTE and Spread Sup Sample, on predictions by the multi-layer perceptron classification algorithm. This study showed that sampling algorithms can improve the performance of classification algorithms, and that resampling methods have higher accuracy among sampling algorithms. Spread Sub Sample, on the other hand, performed better in terms of execution time.

2.3 PROBLEM STATEMENT DEFINITION

Chronic kidney disease (CKD) is a widespread disease worldwide. CKD is the 11th leading cause of death worldwide, with 1.2 million deaths each year, and according to the Kidney Foundation in Bangladesh, about 40,000 people with CKD experience kidney failure each year, and several thousand die in the short stage of life due to CKD. Predictive analytics for healthcare using machine learning is a challenging task to help doctors make accurate treatment decisions to save lives.

3. IDEATION & PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS

Empathy Map Canvas

Gain insight and understanding on solving customer problems.

Early detection of Chronic kidney disease using machine learning



3.2.IDEATION AND BRAINSTORMING

Brainstorm

Write down any ideas that come to mind that address your problem statement.

10 minutes

TIP
You can select a sticky note and for the group (don't do it alone) to start discussing!

Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you can break it up into smaller sub-groups.

20 minutes

barathkumar

- early detection can help health care workers prevent or any serious consequences of CKD
- having awareness about risk and the risk it poses so that the public is better informed
- test a way measure glt effectively as a test test to measure the level of kidney function and determine the stage
- to include test for regular health checkups to detect any risk as soon as possible

arunkumar

- early detection can help health care workers to prevent or delay any serious consequences of CKD
- creating awareness about risk and risk it poses so that the public is better informed
- to include test for regular health checkups to detect any risk as soon as possible

avinash

- using machine learning model to classify if a person is at the risk of CKD
- to build an application that allow users to easily enter detail
- it is very important to sub group of the population who are prone to the problem of CKD
- evaluating other non-modifiable risk factors such as comorbidities

fenix raja singh

- using different machine learning models to see which one can give maximum accuracy such as random forest
- to try and combine the need of laboratory tests to detect CKD accurately that accurately needed
- the entire process should be made cost effective

TIP
Ask stakeholders to help to identify notes to make it easier to find, remove, organize, and categorize important ideas as they arise within your mind.

Early detection >

- Early detection can help health care workers prevent or delay any serious consequences of CKD
- having awareness about risk and risk it poses so that the public is better informed
- to include test for regular health checkups to detect any risk as soon as possible

Factors affecting >

- Any other risk factor before such as hypertension, diabetes, kidney failure etc. This can affect the level of kidney function and determine the stage of CKD
- Having a way to measure glt effectively as a test test to measure the level of kidney function and determine the stage of CKD
- Other factors affecting CKD directly must be identified, such as Diabetes, smoking, Hypertension etc

Making Diagnosis easier-

- Since CKD has a long incubation time, it is not easy to detect early symptoms. We need to detect CKD as early as possible to prevent it from becoming a life threatening disease.
- To to and measure the level of kidney function to see if a person is at risk of CKD or not
- The entire process should be made cost effective

Using ML for early detection-

- Using different machine learning models to see which one can give maximum accuracy such as Random forest, Decision Tree, SVM etc
- The patient enters the parameters into a machine learning model to see if a person is at risk of CKD or not
- Using Machine Learning Model to classify a given person if at risk of CKD or not

Creating awareness for prevention-

- Creating awareness about CKD and the risk it poses so that the public is better informed
- To include test for regular health checkups to detect any risk as soon as possible

4

Prioritize

Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

20 minutes

+

After you collaborate

You can export the mural as an image or pdf to share with members of your company who might find it helpful.

Quick add-ons

Share the mural
Share a view link to the mural with stakeholders to keep them in the loop about the outcomes of the session.

Export the mural
Export a copy of the mural as a PNG or PDF to attach to emails, include in slides, or save it your drive.

Keep moving forward

Strategy blueprint
Define the components of a new idea or strategy.
[Open the template →](#)

Customer experience journey map
Understand customer needs, motivations, and obstacles for an experience.
[Open the template →](#)

Strengths, weaknesses, opportunities & threats
Identify strengths, weaknesses, opportunities, and threats (SWOT) to develop a plan.
[Open the template →](#)

[Share template feedback](#)

3.3 PROPOSED SOLUTION

A proposed framework for developing a prediction engine learning models and their comparison .The main goal of current research is to design a machine learning techniques to predict CKD using associative and classification algorithms. The proposed technique generates classification association rules (CARs) to determine techniques with a high percentage of correctly classified cases and identified classifiers may facilitate early diagnosis of CKD and a comparative analysis of the proposed technique is performed. using other state-of-the-art techniques.

It briefly describes different stages:

(i). Data set selection phase:

The data set is selected predict CKD for data analysis and effective knowledge. Enough data is needed to implement the machine learning technique for the selected data set. In this set experiments, CKD data are obtained from UCI machine learning repository.

(ii). Pre-processing and transformation phase:

Data set is prepared in file format with attribute 16 attributes. The data set is converted to binomial format implement associative techniques. Moreover, it is missing records, duplicate records and unnecessary fields removed for standard data format.

(iii). Feature Selection Phase:

The most promising feature of the CKD dataset are selected using the WEKA pro tool better results. Feature evaluators and search methods are used for this purpose. A function based on correlation the selection subset evaluator is used as function evaluator, and a greedy stepwise search method is used.

3.4. PROBLEM SOLUTION FIT

| | | | | |
|------------------------|---|--|--|---------------------------|
| Define CS, fit into CC | 1. CUSTOMER SEGMENT(S) CS <ul style="list-style-type: none"> The targeted customer group includes patients affected with chronic kidney disease (CKD). As seen in medical records CKD is also most common in people who are aged 65 years and older and it also affects the people of age group between 45-65. Diabetic patients are also prone to CKD. In addition, people with blood pressure (BP) are also taken into consideration. | 6. CUSTOMER CC <p>What constraints prevent your customers from taking action or limit their choices of solutions?</p> <ul style="list-style-type: none"> As this chronic kidney disease goes unnoticed over a period because many individuals are unaware of the basic symptoms and they also ignore them. And as a result of this they are not aware that they should get some medical tests done. There are also many people from lower economy who are not able to afford high billings charged by testing laboratories. | 5. AVAILABLE SOLUTIONS AS <p>Which solutions are available to the customers when they face the problem?</p> <ul style="list-style-type: none"> There are certain types of scans like: <ul style="list-style-type: none"> CT Scan Ultrasound Scan to detect some minor defects in the kidneys. In case if the CKD worsens there are many techniques like kidney dialysis which need to be done at regular intervals of time, and at a point where the complete kidney function fails to filter the waste from blood kidney transplant is done. Now the above-mentioned techniques have a very low life expectancy, so it is better to detect the CKD at early stages and provide appropriate treatments. | Explore AS, differentiate |
| | 2. JOBS-TO-BE-DONE / J& <p>Which jobs-to-be-done (or problems) do you address for your customers?</p> <ul style="list-style-type: none"> As GFR tests are there to identify defects in the rate of filtration rate of kidneys, if not checked at early stages it leads to complications in the future. So, the most important medical test data should be collected which are main causes for causing CKD. Using these data create ML models which performs best and produces accurate results in a short range of time. Finally provide the best and feasible treatments to patients. | 9. PROBLEM ROOT CAUSE L <p>What is the real reason that this problem exists? What is the back story behind the need to do this job?</p> <ul style="list-style-type: none"> For the root cause of this problem one must check for history of family disease for that particular individual, which is often not taken into consideration. Also, that CKD doesn't show any early symptoms, finding the root cause is a difficult task, even if found it is ignored by the people. Best thing one could do is to maintain a healthy lifestyle and intake of water and proper balanced diet. For people with diabetes and BP should visit their doctor at regular intervals and keep them under check. | 7. L <p>What does your customer do to address the problem and get the job done?</p> <ul style="list-style-type: none"> The patients may take medical tests and get checked in the hospital. The basic test results can be utilized by the ML model and get accurate results in which the UI is user friendly and easily available. | |

| | | | |
|---|---|---|--|
| Identify triggers, emotions, your solution, channels of behaviour | 3. TRIGGERS TR <p>What triggers customers to act?</p> <ul style="list-style-type: none"> Some people may have prolonged abdomen pains and back pain at that point of time they go for a checkup. Symptoms like nausea, hematuria, swelling of face, decreased urine output, loss of appetite are common and hence the patients go to hospital. | 10. YOUR SOLUTION SL <p>If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality.</p> <ul style="list-style-type: none"> In our solution part we are building a machine learning (ML) model to predict the risk of patients getting affected with CKD at early stages so as to get treated and cured without putting the patient's lives at risk. This predicts the results in a much faster pace and provides with accurate results, ultimately it helps the patients to take proper treatments at the right time. | 8. CHANNELS of BEHAVIOUR CH <p>8.1 ONLINE</p> <p>What kind of actions do customers take online? Extract online channels from #7</p> <ul style="list-style-type: none"> People check with the symptoms and causes through surfing and they also check for laboratories which perform the medical tests. They would also like to get the results quickly without any delay. <p>8.2 OFFLINE</p> <p>What kind of actions do customers take offline? Extract offline channels from #7 and use them for customer development.</p> <ul style="list-style-type: none"> Most of the times the patients require a complete health examination and they should visit the hospital and get the prescribed medical tests done. The medical results can be used as the input to the ML model which is deployed as web application and they can get their results. |
| | 4. EMOTIONS: BEFORE / AFTER EM <p>How do customers feel when they face a problem or a job and afterwards?</p> <ul style="list-style-type: none"> Once when people start to notice any symptoms, they would be anxious about getting checked with the doctor immediately and knowing their medical condition. After diagnosis and getting the results for their tests patients would be happy that they got to know about their condition at very early stage and get cured in a painless way. | | |

4.REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENTS

Following are the functional requirements of the proposed solution.

| FR No. | Functional Requirement (Epic) | Sub Requirement (Story / Sub-Task) |
|--------|-------------------------------|---|
| FR-1 | User Registration. | Registration through Form |
| FR-2 | User Confirmation. | Confirmation via Email Confirmation via OTP |
| FR-3 | Dataset Collection. | Collect the data set related to Chronic Kidney Disease and process the data. |
| FR-4 | Training the Model. | By using the processed data the model will be trained again and again by using back propagation techniques. |
| FR-5 | Testing the Model. | By using 20% of dataset the model will be tested. |
| FR-6 | Detection. | By using the data collected from the tested model the result is Detected. |

4.2. NON-FUNCTIONAL REQUIREMENTS

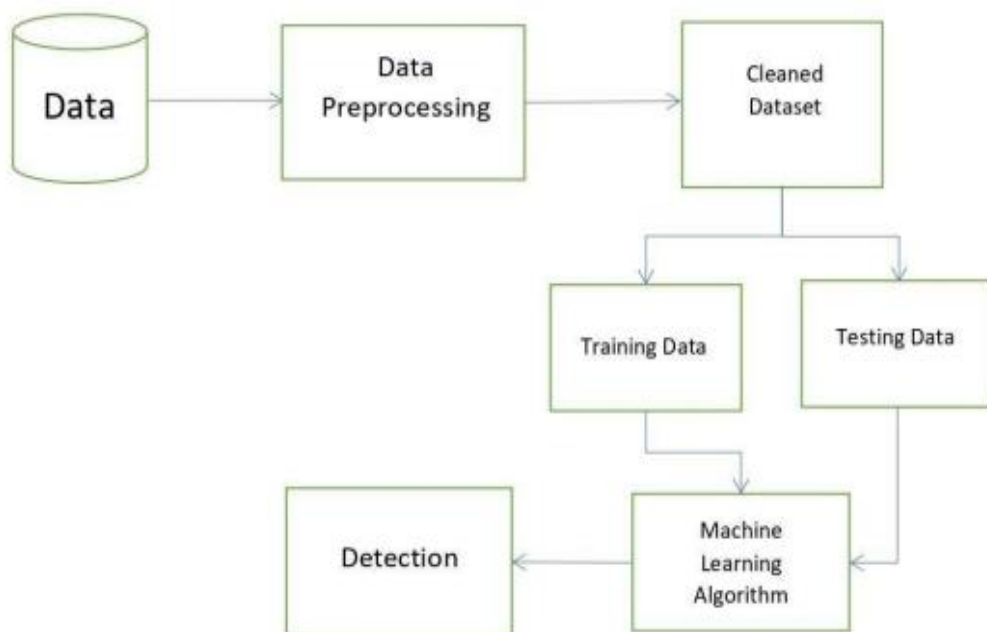
Following are the non functional requirements of the proposed solution.

| FR No. | Non-Functional Requirement | Description |
|--------|----------------------------|---|
| NFR-1 | Usability | Creating a machine learning model that uses the attributes of medical tests taken for different purposes to detect chronic kidney disease at early stage. |
| NFR-2 | Security | The reports are maintained confidentially to the patients. |
| NFR-3 | Reliability | The model will identify and detect the kidney disease earlier, so more number of clients will approach us and it results how the model is more reliable to the customers. |
| NFR-4 | Performance | We can detect the chronic kidney disease with more than 95% of accuracy. we have more hidden layers and hence its accuracy also high. |

5.PROJECT DESIGN

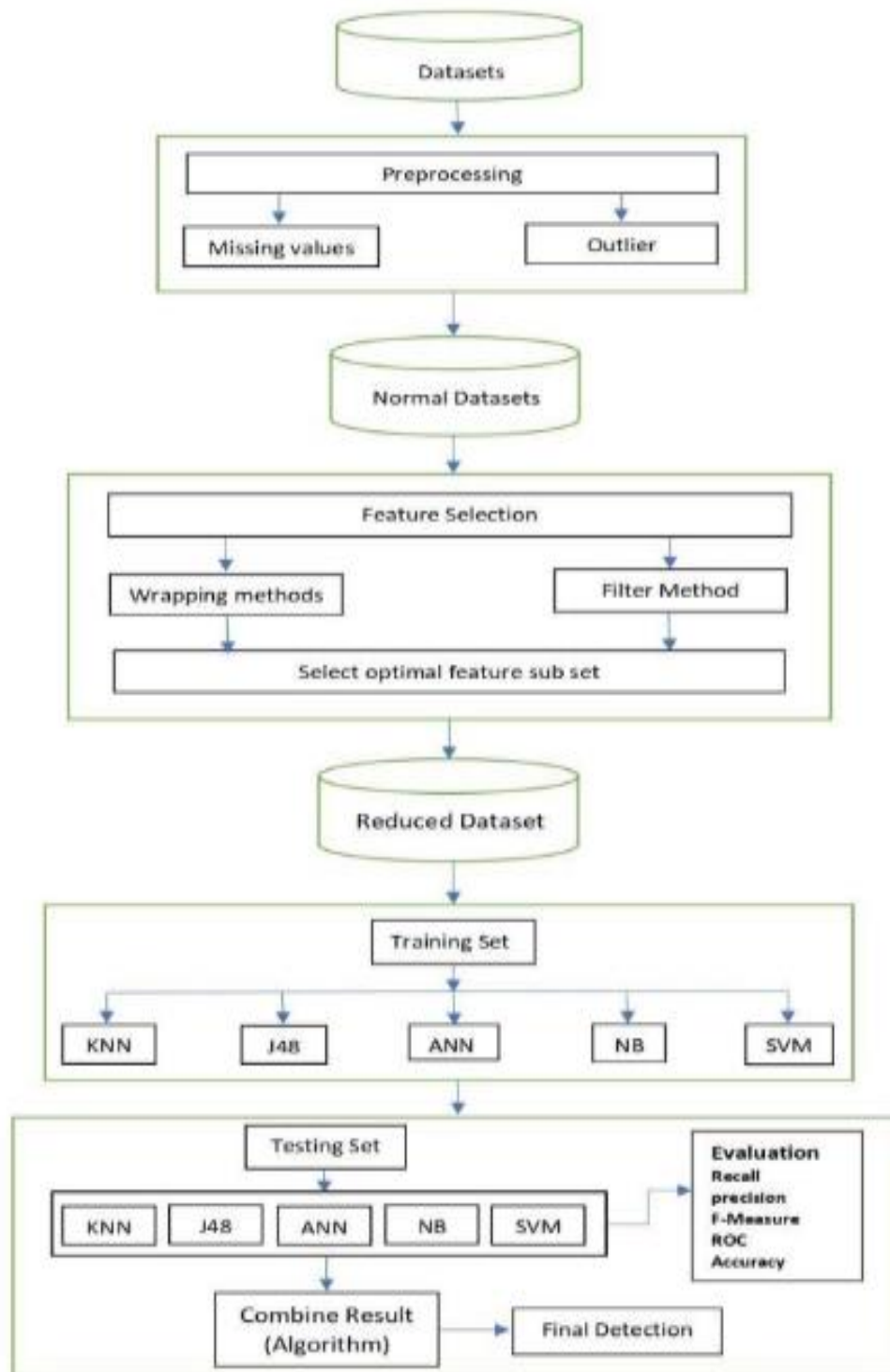
5.1. DATA FLOW DIAGRAM

A Data Flow Diagram (DFD) is a traditional visual of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.



5.2.SOLUTION AND TECHNICAL ARCHITECTURE

The deliverable shall include the architectural diagram which is as follows



5.3. USER STORIES

Use the below template to list all the user stories for the project

| User Type | Functional Requirement (Epic) | User Story Number | User Story / Task | Acceptance criteria | Priority | Release |
|-------------------------|-------------------------------|-------------------|---|---|----------|----------|
| Customer (Web user) | Registration | USN-1 | As a user, I can register for the diagnosis tool using my email and password. | I can access my account / dashboard. | High | Sprint-1 |
| | | USN-2 | As a user, I will receive confirmation email once I have registered for the diagnosis tool | I can receive confirmation email & click confirm. | High | Sprint-1 |
| | | USN-3 | As a user, I can register for the application through Facebook | I can register & access the dashboard with Facebook Login. | Low | Sprint-2 |
| | | USN-4 | As a user, I can register for the application through Gmail | I can register & access the dashboard with Gmail login. | Medium | Sprint-1 |
| | Login | USN-5 | As a user, I can log into the application by entering credentials | I can login and access past records. | High | Sprint-1 |
| | Dashboard | USN-6 | As a user, I can see my past records and activities | I can access the functionalities diagnosis tool | High | Sprint-3 |
| | Entry form | USN-7 | As a user, I must enter my pre-diagnostic test result. | I can use the form to input test results. | High | Sprint-2 |
| | Report | USN-8 | As a user, I can view the report generated by the tool | I can view negative or positive results produced after diagnosis. | High | Sprint-3 |
| Customer Care Executive | Queries | USN-9 | As a patient care executive, I must assist users that face problems | I will provide 24/7 support for the tool | Low | Sprint-4 |
| | Feedback | USN-10 | As a patient care executive, I should get input for the tools enhancement from the users. | I must work on improving tool's performance | Low | Sprint-4 |
| Administrator | Feature importance | USN-11 | As an administrator, I should identify the most significant factor that lead to chronic kidney disease. | I must identify the important features | High | Sprint-2 |
| | Train model | USN-12 | Ass an administrator, I must use the most suitable ML model for detection of chronic kidney disease. | I should efficiency train the ML model | High | Sprint-2 |

6. PROJECT PLANNING AND SCHEDULING

6.1. SPRINT PLANNING AND ESTIMATION

| TITLE | DESCRIPTION | DATE |
|--|---|------------------|
| Literature Survey & Information Gathering | Literature survey on the selected project & gathering information by referring to technical papers, research publications etc. | 29 Aug-3 Sept |
| Prepare Empathy Map | Prepare Empathy Map Canvas to capture the user Pains & Gains, Prepare list of problem statements | 5 Sept- 10 Sept |
| Ideation | List them by organizing the brainstorming session and prioritize the top 3 ideas based on feasibility & importance. | 12 Sept -17 Sept |
| Proposed Solution | Prepare the proposed solution document, which includes the novelty, feasibility of idea, business model, social impact, scalability of solution, etc. | 19 Sept -24 Sept |

| | | |
|------------------------------|---|-----------------|
| Problem Solution Fit | Prepare problem - solution fit document. | 26 Sept – 1 Oct |
| Solution Architecture | Prepare a solution architecture document. | 26 Sept – 1 Oct |

| | | |
|---|---|---|
| Customer Journey | Prepare the customer journey maps to understand the user interactions & experiences with the application (entry to exit). | 3 Oct – 8 Oct |
| Functional Requirement | Prepare the functional requirement document. | 10 Oct-15 Oct |
| Data Flow Diagrams | Draw the data flow diagrams and submit for review. | 10 Oct-15 Oct |
| Technology Architecture | Prepare the technology architecture diagram. | 10 Oct-15 Oct |
| Prepare Milestone & Activity List | Prepare the milestones & activity list of the project. | 17 Oct- 22 Oct |
| Project Development - Delivery of Sprint-1, 2, 3 & 4 | Develop & submit the developed code by testing it. | Sprint 1 24 Oct – 29 Oct Sprint 2 31 Oct – 5 Nov Sprint 3 7 Nov -12 Nov Sprint 4 14 Nov – 19 Nov |

6.2. SPRINT DELIVERY SCHEDULE

| Sprint | Functional Requirement (Epic) | User Story Number | User Story / Task | Story Points | Priority | Team Members |
|----------|-------------------------------|-------------------|---|--------------|----------|---|
| Sprint-1 | User Registration | USN-1 | As a user, I can register for the application by entering my name, email, password | 10 | High | Barathkumar Avinash Fenix raja singh Arunkumar |
| Sprint-2 | | USN-2 | As a user, I can register for the application through Gmail | 5 | Medium | Barathkumar Avinash Fenix raja singh Arunkumar |
| Sprint-1 | User Confirmation | USN-3 | As a user, I will receive confirmation email once I have registered for the application | 10 | High | Barathkumar Avinash Fenix raja singh Arunkumar |
| Sprint-2 | | USN-4 | As a user, I have remembered my email and password for login to the web application | 5 | High | Barathkumar Avinash Fenix raja singh Arunkumar |
| Sprint-2 | Data Collection | USN-5 | As a user, I will enter the input data for disease prediction in the form | 10 | High | Barathkumar Avinash Fenix raja singh Arunkumar |

| Sprint | Functional Requirement (Epic) | User Story Number | User Story / Task | Story Points | Priority | Team Members |
|----------|-------------------------------|-------------------|--|--------------|----------|---|
| Sprint-3 | Provide output to the user | USN-6 | As a user, I will get the result of disease prediction in the dashboard. | 10 | High | Barathkumar Avinash Fenix raja singh Arunkumar |
| Sprint-3 | Data Analysis | USN-7 | As the admin, I will develop modules to preprocess and store the data. | 10 | High | Barathkumar Avinash Fenix raja singh Arunkumar |
| Sprint-4 | Prediction of disease | USN-8 | As the admin, I will build a Machine Learning model to predict the disease | 10 | High | Barathkumar Avinash Fenix raja singh Arunkumar |
| Sprint-4 | Final Delivery | USN-9 | Deploy the application in IBM cloud and make it available for use. | 10 | High | Barathkumar Avinash Fenix raja singh Arunkumar |

7.CODING AND SOLUTIONING

HOME.HTML

```
<!DOCTYPE html>
<html>
<head>
<title>W3.CSS Template</title>
<meta charset="UTF-8">
<meta name="viewport" content="width=device-width, initial-scale=1">
<link                                rel="stylesheet"
href="https://www.w3schools.com/w3css/4/w3.css">
<link                                rel="stylesheet"
href="https://fonts.googleapis.com/css?family=Raleway">
<style>
body,h1,h2{font-family: "Raleway", sans-serif; color: white;}
body, html {height: 100% }
p {line-height: 2}
.bgimg, .bgimg2 {
  min-height: 100%;
  background-position: center;
  background-size: cover;
}
.bgimg      {background-image: url("https://th.bing.com/th/id/OIP.-
9gV69EbS5SnrmN4spgrAAHaEK?pid=ImgDet&rs=1")}
.bgimg2 {background-image: url("/w3images/flowers.jpg")}
</style>
</head>
<body>

<!-- Header / Home-->
<header class="w3-display-container w3-wide bgimg w3-grayscale-min"
id="home">
  <div class="w3-display-middle w3-text-white w3-center">
    <h1 class="w3-jumbo">Chronic Kidney Disease</h1>
    <h2>Online tool to predict risk of CKD</h2>
  </div>
</header>
```



```
<!-- Navbar (sticky bottom) -->
<div class="w3-bottom w3-hide-small">
  <div class="w3-bar w3-white w3-center w3-padding w3-opacity-min w3-
hover-opacity-off">
    <a href="home.html" style="width:50%" class="w3-bar-item w3-
button">Home</a>
    <a href="index.html" style="width:50%" class="w3-bar-item w3-button
w3-hover-black">CKD Predictor</a>
  </div>
</div>
```

```
<!-- About / Jane And John -->
<div class="w3-container w3-padding-64 w3-pale-red w3-grayscale-min"
id="us">
  <div class="w3-content">
    <h1 class="w3-center w3-text-grey"><b>About Chronic Kidney
Disease</b></h1>
    <p><i>Chronic kidney disease, also called chronic kidney failure,
involves a gradual loss of kidney function. Your kidneys filter wastes and
excess fluids from your blood, which are then removed in your urine.
Advanced chronic kidney disease can cause dangerous levels of fluid,
electrolytes and wastes to build up in your body.
```

In the early stages of chronic kidney disease, you might have few signs or symptoms. You might not realize that you have kidney disease until the condition is advanced.

Treatment for chronic kidney disease focuses on slowing the progression of kidney damage, usually by controlling the cause. But, even controlling the cause might not keep kidney damage from progressing. Chronic kidney disease can progress to end-stage kidney failure, which is fatal without artificial filtering (dialysis) or a kidney transplant.</i>

```
</p><br>
</div>
</div>
```

```
<div class="w3-hide-small" style="margin-bottom:32px"> </div>
```

```

</body>
</html>
INDEX.HTML
<!DOCTYPE html>
<html>
<head>
<title>index</title>
<meta charset="UTF-8">
<meta name="viewport" content="width=device-width, initial-scale=1">
<link                                rel="stylesheet"
href="https://www.w3schools.com/w3css/4/w3.css">
<link                                rel="stylesheet"
href="https://fonts.googleapis.com/css?family=Raleway">
<style>
body,h1,h2{ font-family: "Raleway", sans-serif; color: white;}
body, html {height: 100% }
p {line-height: 2}
.bgimg, .bgimg2 {
  min-height: 100%;
  background-position: center;
  background-size: cover;
}
.bgimg {background-image: url("https://advancedurology.com/wp-
content/uploads/2021/10/Advanced-Urology-August-2021-SEO-
Content_Advanced-Urology-August-2021-Can-You-Live-with-One-
Kidney.jpg")}
</style>
</head>
<body style="overflow: hidden;">

<!-- Navbar (sticky bottom) -->
<div class="w3-top w3-hide-small">
  <div class="w3-bar w3-white w3-center w3-padding w3-opacity-min
w3-hover-opacity-off">
    <a href="{ { url_for('my_home') } }" style="width:10%" class="w3-bar-
item w3-button">Home</a>

```

```
<!-- <a href="" style="width:50%" class="w3-bar-item w3-button w3-
hover-black">CKD Predictor</a> -->
```

```
</div>
```

```
</div>
```

```
<!-- Header / Home-->
```

```
<!-- <header class="w3-display-container w3-wide bgimg w3-grayscale-
min" id="home">
```

```
<div class="w3-display-middle w3-text-white w3-center">
```

```
<h1 class="w3-jumbo">Chronic Kidney Disease</h1>
```

```
<h2>Online tool to predict risk of CKD</h2>
```

```
</div>
```

```
</header> -->
```

```
<!-- About / Jane And John -->
```

```
<div class="bgimg">
```

```
<div class="w3-container w3-padding-64 w3-pale-red w3-grayscale-
min " style="margin-left: 20%; margin-right: 20%; opacity: 90%;"
id="us">
```

```
<form action="{ { url_for('predict') } }" method="post"><div class="w3-
content">
```

```
<h1 class="w3-center w3-text-grey"><b>Chronic Kidney Disease
Prediction</b></h1>
```

```
<label for="urea">Enter your Blood urea:</label>
```

```
<input type="number" id="urea" placeholder="mg/dL" name="urea"
required><br><br>
```

```
<label for="glucose">Enter your Blood Glucose random:</label>
```

```
<input type="number" id="glucose" placeholder="mg/dL"
name="glucose" required><br><br>
```

```
<label for="anemia">Select Anemia or not :</label>
```

```
<select name="anemia" id="anemia">
```

```
<option value=0>Yes</option>
```

```
<option value=1>No</option><br><br>
```

```
</select><br><br>
```

```
<label for="cad">Select Coronary Artery Disease or not :</label>
```

```
<select name="cad" id="cad" >
```

```

<option value=0>Yes</option>
<option value=1>No</option><br><br>
</select><br><br>
<label for="pus">Select Pus Cell or not :</label>
<select name="pus" id="pus">
<option value=0>Yes</option>
<option value=1>No</option><br><br>
</select><br><br>
<label for="rbc">Select Red Blood Cell Level:</label>
<input type="number" id="rbc" placeholder="/L" required
name="rbc"><br><br>
<label for="db">Select Diabetes Mellitus or not :</label>
<select name="db" id="db">
<option value=0>Yes</option>
<option value=1>No</option><br><br>
</select><br><br>
<label for="pedal">Select Pedal Enema or not :</label>
<select name="pedal" id="pedal">
<option value=0>Yes</option>
<option value=1>No</option><br><br>
</select><br><br>
<button type="submit">Submit</button>
</div></form>
</div>
</div>
</body>
</html>

```

PREDICTIONNO.HTML

```

<!DOCTYPE html>
<html>
<head>
<title>result</title>
<meta charset="UTF-8">
<meta name="viewport" content="width=device-width, initial-scale=1">
<link rel="stylesheet"
href="https://www.w3schools.com/w3css/4/w3.css">

```

```

<link                                                    rel="stylesheet"
href="https://fonts.googleapis.com/css?family=Raleway">
<style>
body,h1,h3{font-family: "Raleway", sans-serif; color: white;}
body, html {height: 100% }
p {line-height: 2}
.bgimg, .bgimg2 {
  min-height: 100%;
  background-position: center;
  background-size: cover;
}
.bgimg  {background-image:  url("https://img.etimg.com/thumb/msid-
74591313,width-640,height-480,imgsize-624446,resizemode-4/facts-
about-kidney-health.jpg")}
</style>
</head>
<body>

```

```

<!-- Header / Home-->
<header class="w3-display-container w3-wide bgimg w3-grayscale-min"
id="home">
  <div class="w3-display-middle w3-text-white w3-center">
    <h1 class="w3-jumbo">Great! You look healthy</h1>
    <h3>Seems like you are not at risk of Chronic Kidney Disease.</h3>
  </div>
</header>

```

```

<!-- Navbar (sticky bottom) -->
<div class="w3-bottom w3-hide-small">
  <div class="w3-bar w3-white w3-center w3-padding w3-opacity-min w3-
hover-opacity-off">
    <a href="home.html" style="width:50%" class="w3-bar-item w3-
button">Home</a>
    <a href="index.html" style="width:50%" class="w3-bar-item w3-button
w3-hover-black">CKD Predictor</a>
  </div>
</div>

```

```
<div class="w3-hide-small" style="margin-bottom:32px"> </div>
```

```
</body>
```

```
</html>
```

```
PREDICTIONYES.HTML
```

```
<!DOCTYPE html>
```

```
<html>
```

```
<head>
```

```
<title>W3.CSS Template</title>
```

```
<meta charset="UTF-8">
```

```
<meta name="viewport" content="width=device-width, initial-scale=1">
```

```
<link rel="stylesheet"
href="https://www.w3schools.com/w3css/4/w3.css">
```

```
<link rel="stylesheet"
href="https://fonts.googleapis.com/css?family=Raleway">
```

```
<style>
```

```
body,h1,h3{font-family: "Raleway", sans-serif; color: white;}
```

```
body, html {height: 100% }
```

```
p {line-height: 2}
```

```
.bgimg, .bgimg2 {
  min-height: 100%;
  background-position: center;
  background-size: cover;
}
```

```
.bgimg {background-image: url("https://www.news-
medical.net/image.axd?picture=2021%2F5%2Fshutterstock_1439981486.j
pg")}
```

```
</style>
```

```
</head>
```

```
<body>
```

```
<!-- Header / Home-->
```

```
<header class="w3-display-container w3-wide bgimg w3-grayscale-min"
id="home">
```

```
  <div class="w3-display-middle w3-text-white w3-center">
```

<h1 class="w3-jumbo">Unfortunately seems like you might have CKD</h1>

<h3>CKD is curable. Please do not worry and try to contact a doctor as soon as possible for further diagnosis</h3>

**</div>
</header>**

<!-- Navbar (sticky bottom) -->

<div class="w3-bottom w3-hide-small">

<div class="w3-bar w3-white w3-center w3-padding w3-opacity-min w3-hover-opacity-off">

Home

CKD Predictor

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

<div class="w3-hide-small" style="margin-bottom:32px"> </div>

</body>

</html>

STYLE.CSS

.demo{ background: #F2F2F2; }

.form-container{

background-color: #e8ddbf;

font-family: 'Nunito', sans-serif;

text-align: center;

padding: 60px 100px 100px;

border-radius: 50%;

}

.form-container .title{

color: #666157;

font-size: 30px;

font-weight: 700;

text-transform: capitalize;

```
margin: 0 0 20px;
display: inline-block;
position: relative;
}
.form-container .form-horizontal .form-group{
  font-size: 0px;
  margin: 0 0 15px;
}
.form-container .form-horizontal .form-control{
  color: #666157;
  background: #E6E6E6;
  font-size: 16px;
  font-weight: 600;
  letter-spacing: 1px;
  height: 45px;
  padding: 6px 30px;
  border-radius: 50px;
  box-shadow: inset -3px -3px 10px #eee;
  border: none;
  border-top: 2px solid #CECECE;
  border-left: 2px solid #CECECE;
}
.form-container .form-horizontal .form-control:focus{
  outline: none;
  box-shadow: none;
}
.form-container .form-horizontal .form-control::placeholder{
  color: #666157;
  font-weight: 600;
  font-style: italic;
}
.form-container .form-horizontal .btn{
  color: #fff;
  background-color: #e6a760;
  font-size: 25px;
  font-weight: 700;
  font-style: italic;
```



```

text-transform: capitalize;
width: 100%;
border: none;
border-radius: 50px;
box-shadow: inset -3px -3px 10px #bd841b;
transition: all 0.3s ease 0s;
}
.form-container .form-horizontal .btn:hover{ letter-spacing: 3px; }
.form-container .form-horizontal .btn:focus{ outline: none; }
@media only screen and (max-width:479px){
    .form-container{
        padding: 50px 50px 70px;
        border-radius: 30%;
    }
}

```

APP.PY

```

import numpy as np
import pandas as pd
from flask import Flask,request,render_template
import pickle as pk

app=Flask(__name__)
model=pk.load(open('CKD.pkl','rb'))

@app.route('/')
def home():
    return render_template('home.html')

@app.route('/Prediction',methods=['POST','GET'])
def prediction():
    return render_template('index.html')
@app.route('/Home',methods=['POST','GET'])
def my_home():
    return render_template('home.html')
@app.route('/predict',methods=['POST'])
def predict():
    input_features=[float(x) for x in request.form.values()]

```

```

features_value=[np.array(input_features)]
features_name=['blood_urea','blood                               glucose
random','coronary_artery_disease','anemia','pus_cell','red_blood_cells','dia
betesmellitus','pedal_edema']
df=pd.DataFrame(features_value,columns=features_name)
output=model.predict(df)
if(output==0):
    return render_template('predictionNo.html')
else:
    return render_template('predictionYes.html')

if __name__ == '__main__':
    app.run(debug=True)

```

8.RESULT

The development and execution of chronic kidney disease using machine learning is complete

9.ADVANTAGES AND DISADVANTAGES

ADVANTAGES

Early detection of chronic kidney disease provides a proper management that helps to

- Slow down the CKD progression,
- Prevent cardiovascular and other comorbidities and enable timely initiation of dialysis

DISADVANTAGES

- Slow and ineffective for real time prediction
- More time required for execution

10.CONCLUSION

This article deals with the early prediction of CKD in humans. The envelope method used here for feature selection is ACO. ACO is a meta-heuristic optimization algorithm. Out of the 24 attributes present, the 12 best attributes are taken for prediction. The prediction is done using a machine learning technique, SVM. In this classification problem, SVM classifies the output into two classes with CKD and without CKD. The main objective of this study was to predict patients with CKD using fewer attributes while maintaining higher accuracy.