

# **PROJECT BASED EXPERIENTIAL LEARNING PROGRAM (NALAIYA THIRAN)**

## **Early Detection of Chronic Kidney**

**Disease using**

**Machine Learning**

**A PROJECT REPORT**

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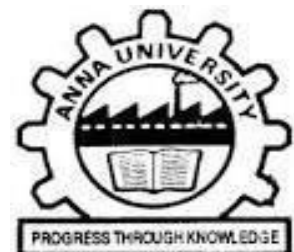
**TEAM ID : PNT2022TMID15999**

**DEPARTMENT OF ELECTRONICS AND COMMUNICATION  
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## LITERATURE SURVEY:

### INTRODUCTION:

Many individuals around the world are afflicted by kidney-related illnesses. In terms of the number of persons affected by kidney-related diseases, India comes in front. even while population is important

Add to that the fact that China, which has a population that is higher than ours yet ranks far lower than us in terms of the number of people who suffer from kidney-related diseases. Most kidney illnesses are brought on by the human kidney's aberrant physiological functioning. As a result, the difference between the kidney's normal physiological capabilities and pathological physiological functionalities leads to the development of the typical symptoms. The main causes of differences in kidney function are people's lifestyles and food preferences.

### PAPER TITLE 1:

Performance Analysis of Machine  
Learning Classifier for Predicting  
Chronic Kidney Disease

### ALGORITHM OR TECHNIQUE USED:

Logistic Regression and  
Classification, Decision  
tree classifier, Random  
Forest classifier.

### DESCRIPTION:

This proposed system detects chronic kidney disease using machine learning; They have attained an accuracy of 100% in decision tree classifier, 95.12% in random forest and 98.82% in logistic regression.

PAPER TITLE 2:

Statistical and Data Mining Aspects on Kidney Stones: A Systematic Review and Meta-analysis.

ALGORITHM OR TECHNIQUE USED:

Random Forest, Support vector machine, Logistic and NN.

DESCRIPTION:

They predicted good accuracy with Classification tree and Random Forest (93%) followed by Support

Vector Machines (SVM)

(91.98%). Logistic and NN

has also shown good

accuracy results with zero

relative absolute error and

100% correctly classified

results.

PAPER TITLE 3:

Chronic Kidney Disease Prediction

using Machine Learning.

ALGORITHM OR TECHNIQUE USED:

Ant Colony

Optimization technique

and Support Vector

Machine (SVM)

classifier.

DESCRIPTION:

This study proposes the use

of machine learning

techniques for CKD such as

Ant Colony Optimization

(ACO) technique and

Support Vector Machine

(SVM) classifier.

Final output predicts

whether the person is

having CKD or not by using

minimum number of

features.

PAPER TITLE 4:

A Machine Learning Methodology

for Diagnosing Chronic Kidney

Disease.

ALGORITHM USED :

Logistic regression,

Random Forest, Support

vector machine, k-nearest

neighbour, Naive Bayes

classifier, and Feed

Forward Neural

Network.

DESCRIPTION:

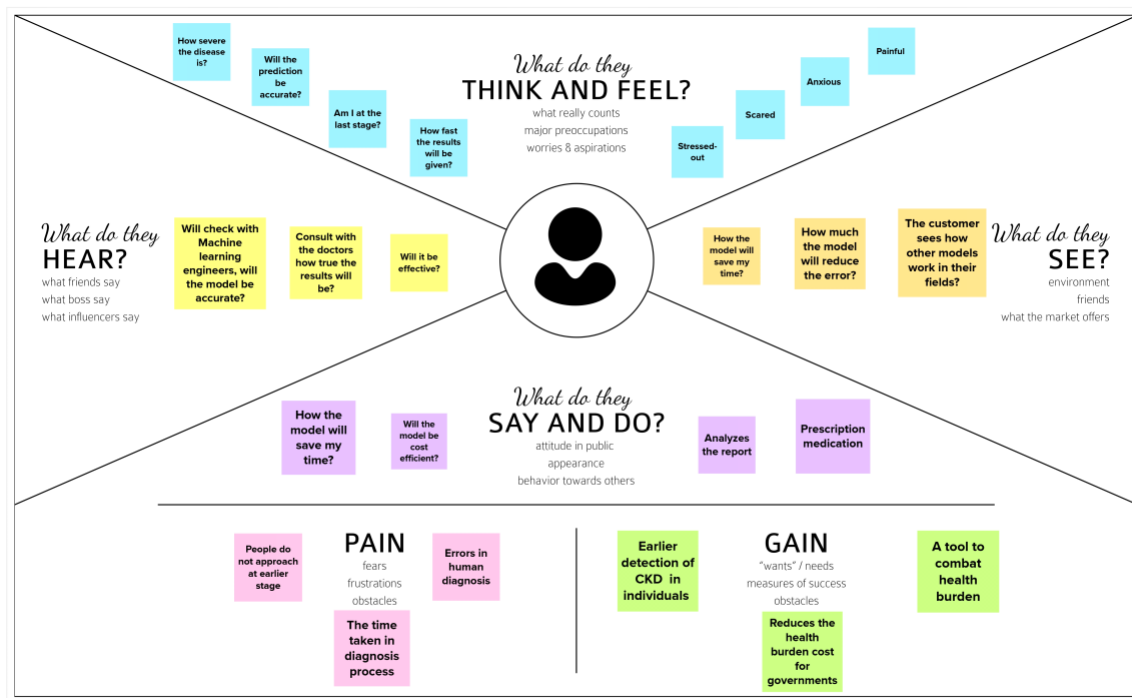
A machine learning

approach for diagnosing

CKD was proposed in this study. An ensemble model that combines logistic regression and random forest with the aid of perceptron was utilized and it was able to attain an average accuracy of 99.83% after ten times of simulation.

## IDEATION & PROPOSED SOLUTION:

### EMPATHY MAP:



### PROBLEM STATEMENT:

## PROBLEM: EARLY DETECTION OF CHRONIC KIDNEY DISEASE

- Chronic Kidney Disease prediction is one of the most important issues in healthcare

analytics. The most interesting and challenging tasks in day-to-day life is prediction in

medical field.

- Chronic kidney disease (CKD) means your kidneys are damaged and can't filter blood the

way they should. The main risk factors for developing kidney disease are diabetes, high

blood pressure, heart disease, and a family history of kidney failure.

- 10% of the population worldwide is affected by chronic kidney disease (CKD), and millions

die each year because they do not have access to affordable treatment.

- People are at risk for kidney disease if people have diabetes, high blood pressure, heart

disease, or a family history of kidney failure. If you have risk factors, get tested for kidney

disease and protect your kidneys by making healthy food choices, being more active, aiming

for a healthy weight, and managing health conditions that cause kidney damage.

- Chronic kidney Disease can be cured, if treated in the early stages. The main aim of this

project is to predict whether the patient have chronic kidney disease or not, in more accurate

and faster way based on certain diagnostic measurements like Blood Pressure (Bp),

Albumin(AI).



## BRAIN STROM:



## PROPOSED SOLUTION:

**Project Design Phase-I  
Proposed Solution  
Template**

Team ID	PNT2022TMID15999
Project Name	Early Detection of Chronic Kidney Disease using Machine Learning
Maximum Marks	2 Marks

**Proposed Solution :**

S.No	Parameter	Description
1.	Problem Statement (Problem to be solved)	Patients who suffer from chronic kidney diseases need a way to control its progression to an advanced state with early detection and appropriate treatment. Machine learning has advanced to the point that it is now possible to look through patient medical information and identify chronic kidney disease in its early stages.
2.	Idea / Solution description	Since certain data are missing, the initial step is to perform pre-processing by cleaning the dataset, along with scaling and normalisation of values. The next step is to use dimensionality reduction to identify the key features in the dataset and to remove any irrelevant ones. To accomplish early detection of chronic kidney disease utilising the indicated key traits, a decision tree model must be fitted.
3.	Novelty / Uniqueness	<ul style="list-style-type: none"><li>An indicator of how well the kidneys is working is the amount of a waste product called creatinine in the blood. By examining this data, early kidney disease can be identified by detecting deviations from the norm.</li><li>In the case of healthcare</li></ul>

		management products, it is especially important to have a UI that is very user-friendly and open to everyone.
4.	Social Impact / Customer Satisfaction	The primary goal of this application is early prediction, and appropriate treatments may be able to prevent or delay the disease's progression to an advanced state.
5.	Business Model (Revenue Model)	<ul style="list-style-type: none"><li>• The suggested strategy has the potential to generate income from</li></ul>











		<p>direct patients as payment for the development of immediate outcomes.</p> <ul style="list-style-type: none"> <li>• It can also collaborate with the healthcare sector to generate revenue from patients who come in for kidney disease diagnosis.</li> </ul>
6	Scalability of the Solution	<ul style="list-style-type: none"> <li>• The dimensionality reduction process can be adjusted to produce precise predictions with an increase in the features taken into account.</li> <li>• The accuracy of many models can be compared in order to determine which is best.</li> <li>• It can be used for a variety of illnesses in addition to chronic disorders.</li> </ul>

PROBLEM SOLUTION FIT:

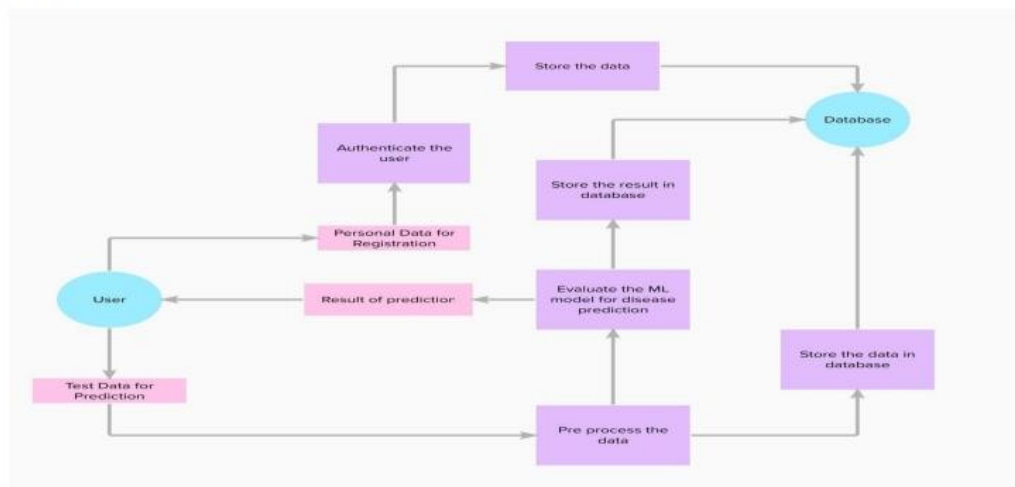
Define CS, fit into CC	<b>1. CUSTOMER SEGMENT(S)</b> <span>CS</span> People with CKD	<b>6. CUSTOMER CONSTRAINTS</b> <span>CC</span> Patients are afraid of using new technology. Budget and Unaware about the symptoms.	<b>5. AVAILABLE SOLUTIONS</b> <span>AS</span> Never intake Alcohol. Reduce salt intake.	Explore AS, differentiate
	<b>2. JOBS-TO-BE-DONE / PROBLEMS</b> <span>J&amp;P</span> Problem related to identifying the chronic kidney disease. Accuracy of patients test result. Time taken to produce test result.	<b>9. PROBLEM ROOT CAUSE</b> <span>RC</span> The root cause of the problem is inaccurate result. The test takes much time to evaluate the result.	<b>7. BEHAVIOUR</b> <span>BE</span> They blindly trust the inaccurate result and become anxious and sad.	
Focus on J&P, map into BE, understand RC	<b>3. TRIGGERS</b> <span>TR</span> The Dilemma and confusion whether they really have chronic disease or not.	<b>10. YOUR SOLUTION</b> <span>SL</span> Predict faster and accurately. Time and cost of the test is drastically reduced. Helps to take treatment at right time.	<b>8. CHANNELS of BEHAVIOUR</b> <span>CH</span> Online: Aware of symptoms of chronic kidney failure.  Offline: people must take the treatment once CKD is detected	Identify strong TR & EM
	<b>4. EMOTIONS: BEFORE / AFTER</b> <span>EM</span> Before: Anxious about their medical condition. After: Able to follow Doctor's advice and Prescription .			

PROJECT DESIGN:

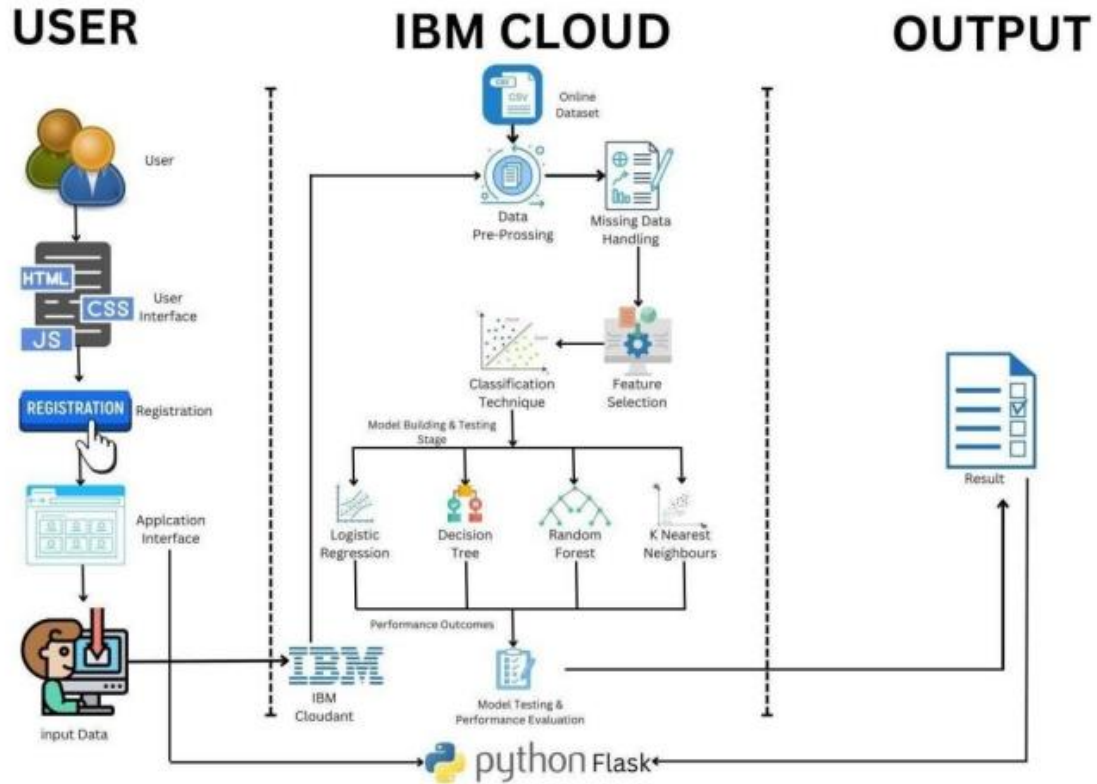
CUSTOMER JOURNEY

Phase of Journey	Enter  What do people experience as they begin the process?	Engage  In the core moments in the process, what happens?	Exit  What do people typically experience as the process finishes?
<b>Steps</b>  What does the person (or group) typically experience?	Collect Dataset Open Dataset Check Data in Dataset	Visualizing Data in Dataset Preprocessing Data in Dataset Developing Models	Developing the UI Frame Work Pushing the model to Dataset
<b>Interactions</b>  What interactions do they have at each step along the way? <ul style="list-style-type: none"> <li>People: Who do they see or talk to?</li> <li>Places: Where are they?</li> <li>Things: What digital touchpoints or physical objects would they use?</li> </ul>	Compare with another Data Identifying Users capacity Pre-processing Data	Identifying and removing the Outliers Identifying and removing the missing values	User gives the input Fitting the prepared model To framework Obtaining a Feedback from customer
<b>Goals &amp; motivations</b>  At each step, what is a person's primary goal or motivation? ("Help me..." or "Help me avoid...")	To achieve the data collections from Doctor (customer) To achieve the Prediction of Chronic Kidney disease to patient's Obtaining the Necessary data from patient or Doctor	Identifying the proper model for the disease prediction To achieve the prediction with high accuracy	To provide a usable interface to customers To provide a Necessary features that customer deal
<b>Positive moments</b>  What steps does a typical person find enjoyable, productive, fun, motivating, delightful, or exciting?			

Data Flow Diagram:



## TECHNOLOGY ARCHITECTURE:



**Table-1 : Components & Technologies:**

S.No	Component	Description	Technology
1.	User Interface	An Interface for the user to interact with the prediction model.	HTML, CSS, JavaScript
2.	User Registration	User can register in the web application	HTML forms
3.	Disease Prediction	The user enters the data which is given as input to model to predict the disease.	Machine Learning with Python.
4.	Update Prediction result	The result of disease prediction is updated in the Web UI for the user to know the output.	Python.
5.	Database	Relational database structure to store the user data	MYSQL.
6.	Cloud Database	Database services on IBM cloud.	IBM Cloudant.
7.	Machine Learning Model	To predict the chronic kidney disease (CKD) with various input parameters.	Random Forest, KNN, Decision tree, Logistic Regression.
8.	Infrastructure (Server / Cloud)	Application Deployment on Cloud	IBM Cloud.

**Table-2: Application Characteristics:**

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	The python open-source frameworks are used to build the web application as well as to build Machine Learning model.	Python Flask, Numpy, Scikit-Learn etc.
2.	Scalable Architecture	The 3-tier architecture used with a separate user interface, application tier and data tier make it easily scalable.	IBM Watson Studio.
3.	Availability	The web application is highly available as it is deployed in cloud.	IBM Cloud.
4.	Performance	The performance of the website is improved with caching and security.	IBM Cloud Internet Services.

**PROJECT PLANNING PHASE MILESTONE STRUCTURE:**



<b>TITLE</b>	<b>DESCRIPTION</b>	<b>DATE</b>
<b>Literature Survey &amp; Information Gathering</b>	Literature survey on the selected project & gathering information by referring the technical papers, research publications , journals etc.	29 SEPTEMBER 2022
<b>Prepare Empathy Map</b>	Prepare Empathy Map Canvas to capture the user Pains & Gains, Prepare list of problem Statements that are to be solved by this project.	29 SEPTEMBER 2022
<b>Ideation</b>	List the ideas by organizing a brainstorming session and prioritize the top 3 ideas based on the feasibility & importance.	03 OCTOBER 2022
<b>Proposed Solution</b>	Prepare the proposed solution document, which includes novelty, feasibility of idea, revenue model, social impact, scalability of solution, etc.	06 OCTOBER 2022
<b>Problem Solution Fit</b>	Prepare problem - solution fit document.	12OCTOBER 2022
<b>Solution Architecture</b>	Prepare solution architecture document.	14 OCTOBER 2022
<b>Customer Journey</b>	Prepare the customer journey maps to understand the user interactions & experiences with the application (entry to exit).	19 October 2022
<b>Functional Requirement</b>	Prepare the functional requirement document.	20 OCTOBER 2022

**ADVANTAGES:**

<b>Data Flow Diagrams</b>	Draw the data flow diagrams and submit for review.	25 OCTOBER 2022
<b>Technology Architecture</b>	Prepare the technology architecture diagram.	29 OCTOBER 2022
<b>Prepare Milestone &amp; Activity List</b>	Prepare the milestones & activity list of the project.	03 NOVEMBER 2022
<b>Project Development - Delivery of Sprint-1, 2, 3 &amp; 4</b>	Develop & submit the developed code by testing it.	IN PROGRESS..

Easy to identify the disease.

Simple process

Cost effective

**DISADVANTAGES:**

Must study the values correctly

Make sure that values enter are accurate otherwise won't able to get results

Hazards sometimes.

**CONCLUSION:**

This article objects to predict Chronic Kidney Disease based

On full features and important features of CKD dataset.