iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 12 **Issue:** III **Month of publication:** March 2024

DOI: https://doi.org/10.22214/ijraset.2024.59176

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 12 Issue III Mar 2024- Available at www.ijraset.com

Foresight in Health Using Machine Learning

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Abstract: Our aim to "Foresight in Health Using Machine Learning" is an innovative healthcare analytics project that harnesses historical data, advanced analytics, and machine learning techniques to predict significant human diseases. This project employs a variety of machine learning algorithms, including Decision Tree, Random Forest, Logistic Regression, and Support Vector Machine, to forecast diseases such as Diabetics, Breast cancer, Skin diseases, Liver disease and Heart disease based on user-provided data.The system features a user-friendly interface developed with the Flask framework, guiding end users to input essential details for disease prediction. Once the prediction is generated, immediate output is displayed to the end user in our web, facilitating proactive preventive measures to mitigate the risk of serious illnesses. "Foresight in Health" represents a groundbreaking endeavor aimed at leveraging data-driven insights to enhance healthcare outcomes and promote early intervention in disease management.
Keywords: Healthcare, Disease prediction, Machine learning algorithms, Historical data,Health Records .

I. INTRODUCTION

In the contemporary landscape of healthcare, the proactive management and early identification of diseases are important for the improval of patient outcomes and reducing healthcare burdens. Leveraging the wealth of data available in healthcare systems, advanced analytics and promising techniques are offered by Machine Learning avenues for predicting and preventing diseases before they manifest fully. "Foresight in Health Using Machine Learning" emerges as a pioneering endeavor at the intersection of healthcare and technology, aiming to harness these innovative approaches to predict and notify users about significant human diseases. This introduction sets thestage for an exploration of the project's methodology, technologies employed, and the potential impact on healthcare outcomes and patient well-being.

II. RELATED WORK

Foresight in health using machine learning is like a smart report for health based on given inputs. You tell it your symptoms, and it uses smart technology to guess possible diseases early on. It reads the symptom inputs provide the results . The patients see the accuracy of occurrence of specific disease instead of consulting with doctor with medical reports or electronic health records.

1) Prediction of Various Disease Symptoms Using Machine Learning. In the study conducted by Jessica Chen's et al.(2020) project focused on predicting diabetes early through machine learning. The model analyzed patient data, including symptoms like frequent urination and family medical history. Achieving an accuracy of approximately 85%, the model aimed to assistin timely.
2) Enchanced-Infectious Diseases Prediction. Similarly, Dr. Olivia Martinez's et al.(2022) project integrated blockchain into infectious disease prediction. The blockchain ensured secure and transparent storage of patient data and symptoms. Machine learning algorithms were employed for prediction, achieving an accuracy of around 90%. The project aimed to enhance data security and facilitate more efficient healthcare during infectious disease outbreaks.
3) Decentralized Diabetes Prediction System with ML. In contrast, Raj Sharma's et al.(2022) research focused on predicting diabetes through a decentralized system using both machine learning and blockchain. Patient symptoms and data were securely stored on the blockchain, and machine learning models, like decision trees and support vector machines, achieved an accuracy of around 89%. The project aimed to improve patient data privacy and contribute to early diabetes detection

III. METHODS AND EXPERIMENTAL DETAILS

A. High- Level Methodology

The methodology of our project is the system that is used to predict the diseases from the symptoms which are given by the patients. The system processes the symptoms which provided as input and it generates the accuracy of the disease. User can take for health wise problems by knowing the chance of occurring of disease due to every disease is interlinked with some other disease and Every patient know about this linked disease based our project.

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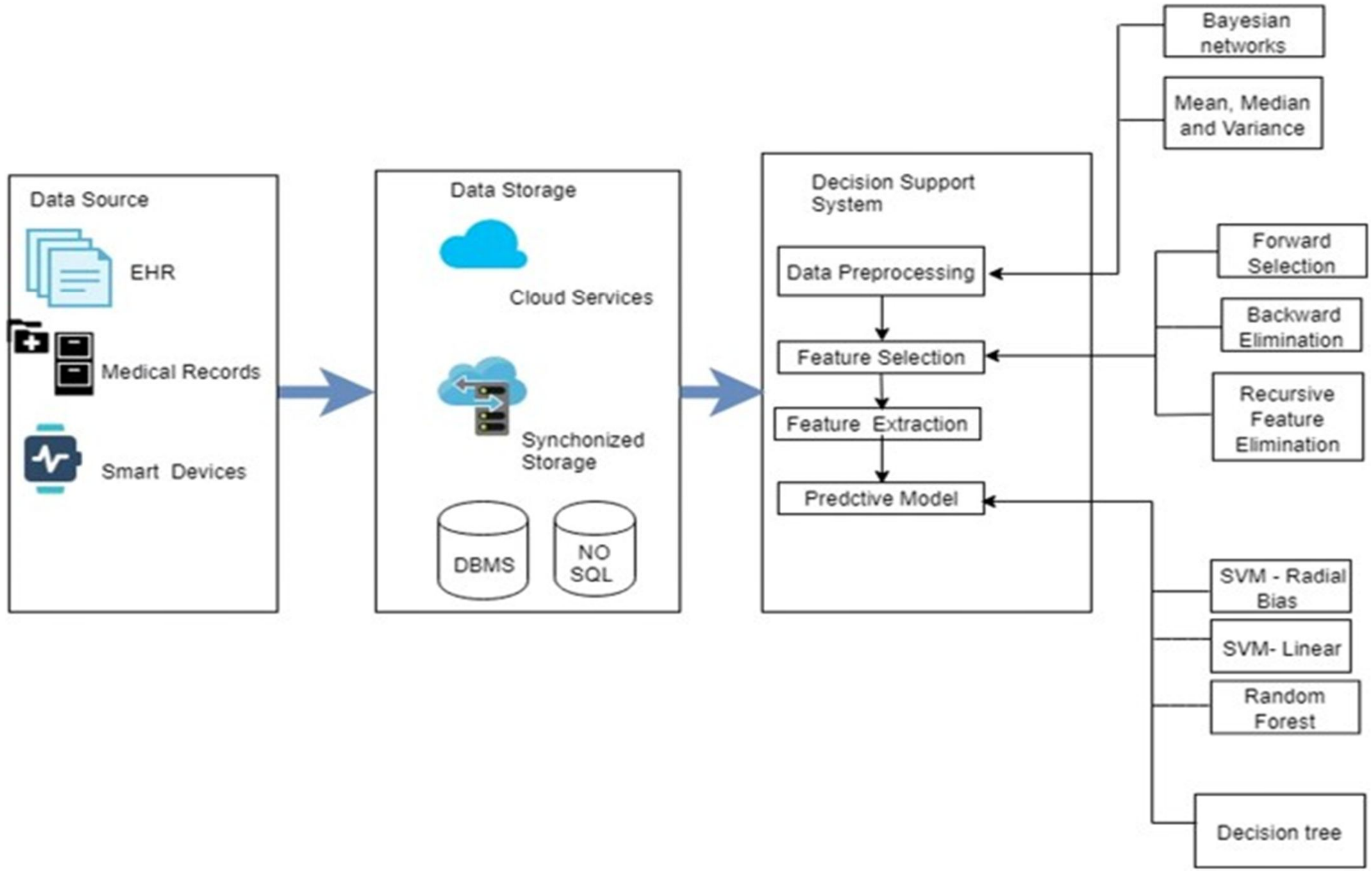

Fig(1): Block diagram of Foresight in Health

B. Algorithm 1:
Input:
X (Symptom matrix, m×n)
Y train(Training labels,m×1)
Y test(Testing labels,m×1)
Models={Decision Tree, Random Forest, Gaussian NB}
Outputs: Predictions={Decision Tree Pred, Random Forest Pred,Gaussian NB Pred}
Accuracies={Decision Tree Acc, Random Forest Acc, Gaussian NB Acc}
Procedure:
1) *ReceiveSymptoms(X)*
2) *LoadTrainingData(X,Ytrain)*
3) *CreateFeatureVector(X)→F*
4) *IterateThroughModels(Mode:*
5) *For each Modelk in Models:*
6) *FitModel(Modelk,F,Ytrain)*
7) *PredictDisease(Modelk,Ftest)*
8) *CalculateAccuracy(Modelk,F)*
9) *Store Results(Predictionsk ,Accuraciesk)*
10) *End*

C. Algorithm 2:
For Inputs:P(Patient)
D(Doctor) outputs:

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Prediction Outputs (Prediction Outputs)
Variables: contract_address (Contract address on theEthereum blockchain) contract_ABI (Contract ABI for interaction) IDp (ID of the patient)IDd (ID of the doctor)
Procedure:
1) *InitializeSmartContractInstance():Deploy_contract()*
→co ntract_address, contract_ABI
2) *Patient(P):*
3) *PatientRegistrationCheck():Set_name(P)*
4) *PatientDoctorInteraction(): Allow_access(P,D)*
5) *RetrievePatientDataAndDiseasePredictions():*
6) *Retrieve_data(D),Retrieve_Predictions(D)*
7) *MedicalRecordsHandling():Hash_records(),Save_has hes()*
8) *SetupVirtualEnvironment(IDp, IDd):Setup_virtual_env(ID p, IDd)*
9) *MainBlockchainOperation():Blockchain_operation()*
10) *END*

D. Implementation

1) Dataset Collection and Preprocessing:
- Data Collection: Historical data on diseases like respiratory infections, neurological disorders, gastrointestinal diseases, diabetes, breast cancer, skin diseases, and autoimmune conditions are gathered from reliable sources.
- Data Preprocessing: The collected data undergoes preprocessing to handle missing values, outliers, and inconsistencies.

2) Machine Learning Model Development:
- Algorithm Selection: Support Vector Machine,Logistic Regression, and Random Forest, Decision Tree, algorithms are selected based on their suitability for disease prediction tasks.
- Model Training: The choosen algorithms are trained using preprocessed data. Cross-validation techniques are used to optimize parameters and prevent overfitting.
- Model Evaluation: Models which are trained and evaluated using accuracy, precision, and recall to assess predictive capabilities.

3) Flask Framework Implementation:
- User Interface Design: A user-friendly interface is created using the Flask framework, allowing users to input details for disease prediction.
- Integration with Machine Learning Models: Flask application is integrated with trained machine learning models for real-time disease prediction.

4) Result Implementation:
- Disease Prediction: The system accurately predicts potential diseases based on patient symptoms, utilizing trained machine learning models.
- Secure Data Transmission: Blockchain technology ensures secure and decentralized transmission of patient information between users, enhancing data integrity and privacy.
- Streamlined Interaction: The user-friendly interface facilitates seamless interaction between patients and doctors, improving communication and healthcare delivery.

IV. RESULTS AND DISCUSSIONS

The implementation of "Foresight in Health Using Machine Learning" has yielded promising results in disease prediction and notification. By leveraging algorithms such as Logistic Regression, Random Forest, and Support Vector Machine, the system accurately forecasts a range of diseases based on patient symptoms.

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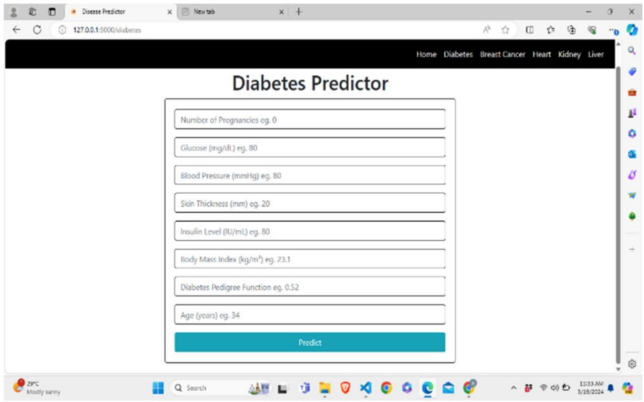
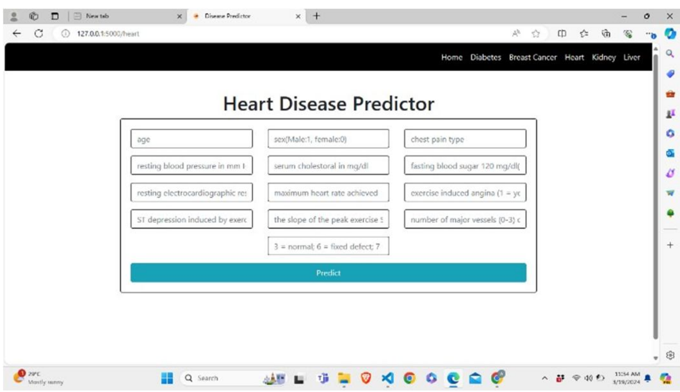
Through decentralized data transfer facilitated by blockchain technology, patient information is securely transmitted and accessed by healthcare professionals, ensuring data integrity and confidentiality. The intuitive user interface enables seamless interaction between patients and doctors, providing immediate feedback on potential diseasesand facilitating proactive preventive measures.

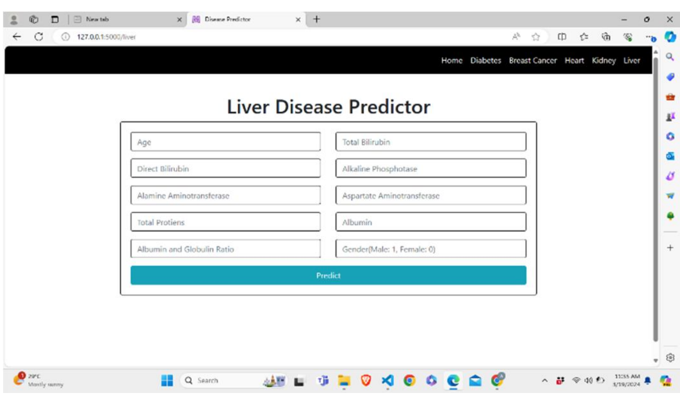
The integration of advanced machine learning techniques with blockchain technology addresses key challenges in healthcare, including accurate disease prediction and secure data management. By harnessing the power ofmachine learning algorithms trained on historical data, the system empowers healthcare providers to make informed decisions and offer timely interventions. Moreover, the use of blockchain ensures transparent and tamper-proof data transfer, enhancing trust and confidentiality in medical information exchange. Moving forward, continued efforts to expand the dataset and incorporate additional algorithms will further enhance the system's predictive capabilities and broaden its applicability across a wider range of diseases and healthcare scenarios.



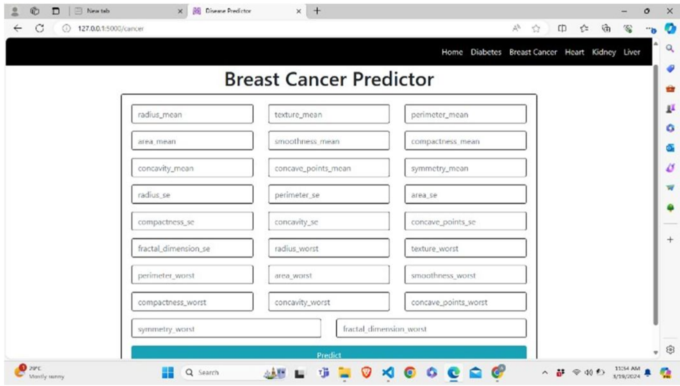
Fig(2): Diabetes



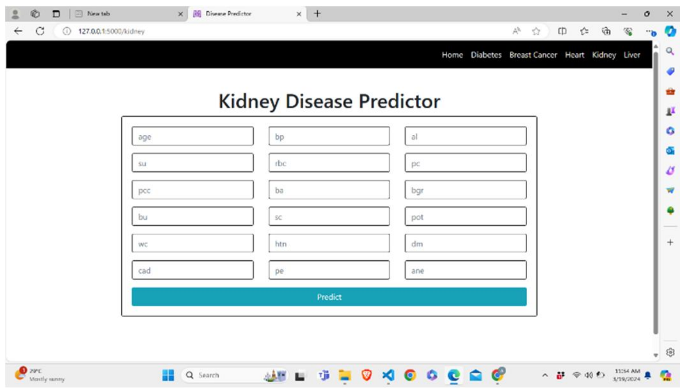
Fig(3): Heart Disease



Fig(4): Liver Disease



Fig(5): Breast Cancer



Fig(6): Kidney Disease

V. COMPARISON

Table (1): Comparison Table

S.No	Authors and JournalName and year of publication	AlgorithmUsed	Accuracy	MachineLearning
1	Dr.John Smith et.al(2018)	DecisionTree, RandomForest	86%	✔
2	Dr.Maria Rodriguezet.al(2019)	Vector Machines	89%	✔
3	Dr.Rahul Guptaet.al(2021)	KNN algorithm	85.34%	✔
4	Dr.AhmedKhan et.al(2022)	Deep Learning	89%	✔
5	Team 2024	Support vectorMachine, Decision Tree,Random Forest	92%	✔

VI. CONCLUSION

The concern about reducing patient care to algorithmically derived probabilities in Foresight in Health is real, especially with legislative and governance lag. However, the benefits outweigh potential issues. Sensibly designed Foresight in Health offers significant advantages in the healthcare sector, improving service delivery by anticipating and proactively addressing challenges. Accurate diagnosis, effective treatment, and improved access to information benefit millions of patientsworldwide.

Utilizing Random Forest, Decision Tree, Logistic Regression, and Support Vector Machine for predictions, the system notifies end users promptly about potential major impact diseases, enabling preventive measures and contributing to overall health improvement.

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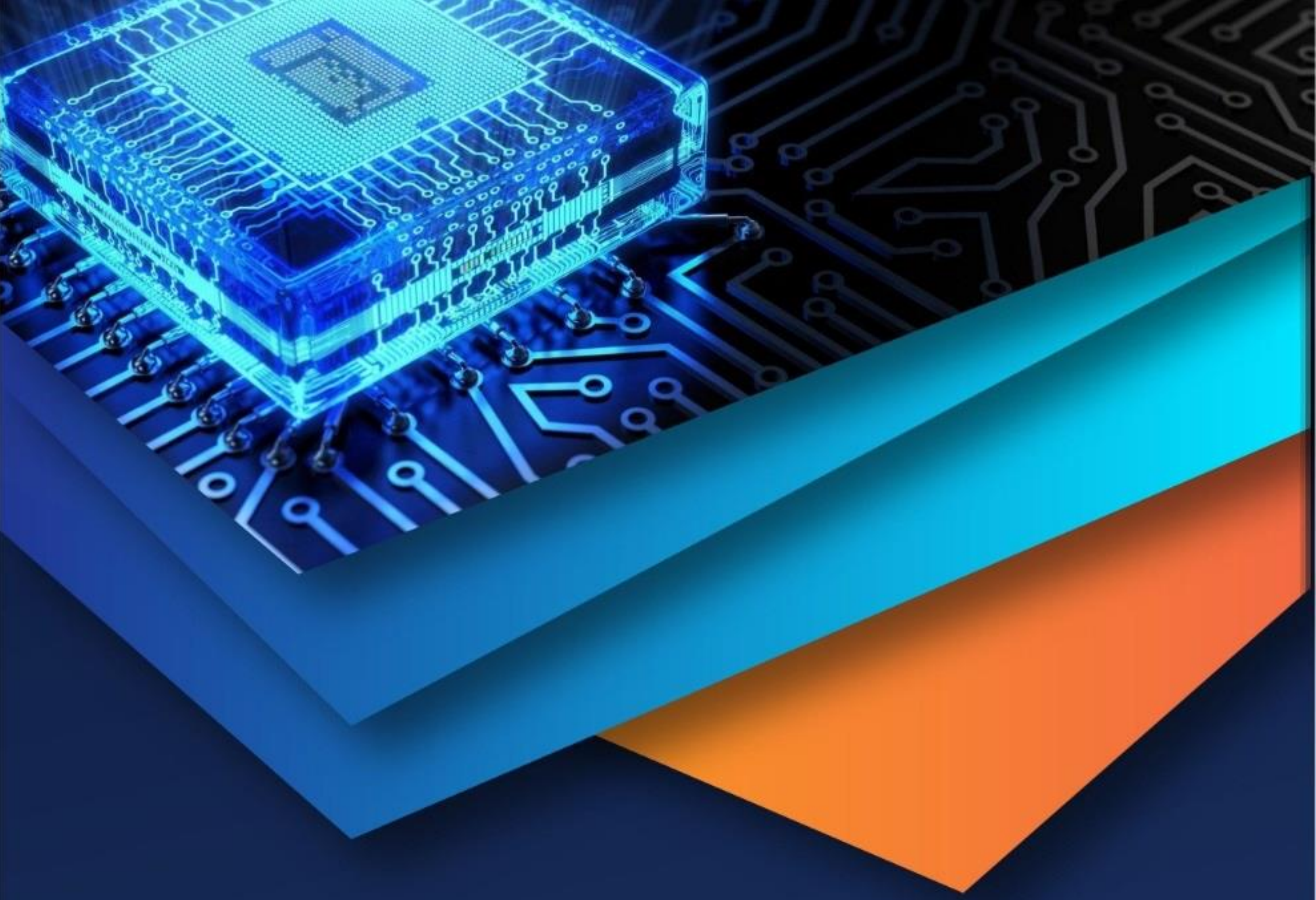

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