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Machine Learning Based Disease Prediction Based On Symptoms and Doctor Appointment Booking

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Abstract

There is rapid growth in healthcare domain as people are more health conscious nowadays. There are artificial intelligence techniques which are recent evolution may impact more in intelligent healthcare systems. Proposed system uses machine learning techniques such as random forest, Support vector machine, logistic regression and voting classifier which are trained on symptoms and the relevant diseases. It is observed that voting classifier is giving better performance compared to other classifiers used. So, for further user input for symptoms in web application, voting classifier is applied for disease prediction. Interactive web application is designed for demonstration of this application where user can select the symptoms they have and voting classifier finds the disease the patient has and gives options to book the doctor appointments. Doctors can see the requests they received and can either approve the appointment or reject based on their availability. This application provides better solution than all manual and traditional techniques of disease prediction and doctor appointment booking.

Keywords: Machine learning, Doctor appointment, disease prediction, intelligent Healthcare.

I. INTRODUCTION

The rapid proliferation of intelligent technology that can identify diseases at an early stage and handle patient appointments more efficiently is largely due to the increased desire for easy and efficient healthcare. Due to manual symptom evaluation, large patient numbers, and inefficient scheduling, patients in traditional healthcare settings frequently lose time, which results in lengthy wait times and subpar care. Automated medical appointment schedulers and machine learning-based symptom assessments have emerged as potential answers to these long-standing problems due to the development of digital health applications. These devices would facilitate prompt medical responses by streamlining clinical procedures, automating the diagnostic process, and providing real-time first diagnosis.

Recent advances in artificial intelligence (AI) make it possible to get relevant data based on the user's reported symptoms, medical history, and behavioural patterns. Clinical decision support models can now use data to identify high-risk patients, anticipate a variety of diseases, and direct patients to the appropriate medical departments or specialists. Studies have demonstrated the effectiveness of using natural language processing techniques, deep learning architectures, and machine learning classifiers in symptom-based prediction systems to improve early disease diagnosis accuracy and reduce clinical workload [1], [8]. Concurrently, the advancement of chatbot-enhanced healthcare facilitates the enhancement of patient engagement by means of continuous monitoring, responses to medical enquiries, and practical guidance derived from conversational interfaces [2], [5], and [16].

Healthcare appointment scheduling is another significant field that is currently undergoing digitisation. Missed appointments and so-called no-shows disrupt patient flow, lower clinical

productivity, and result in serious operational inefficiencies. Numerous studies have shown that predictive models can be used to identify patients who are likely to miss appointments based on their time, behaviour, and demographics, giving hospitals the opportunity to proactively reschedule [3], [4], [9], and [11]. Machine learning algorithms and intelligent scheduling frameworks have also been used in strategies to maximise resource utilisation, lessen crowding, and improve the general quality of healthcare service delivery [10], [12], and [14].

Despite the advancements, issues with data imbalance, poor symptom coverage, non-personalization, privacy, and the inability to integrate several prediction modules into a single implementation still plague the existing systems. The majority of current systems limit their ability to take into account clinical instances in the real world, where both processes are interrelated, by concentrating on either disease prediction or appointment scheduling independently. Additionally, most of the research that is now accessible is based on domestic datasets, and it is still difficult to generalise to a large population.

II. LITERATURE SURVEY

In [1], the model by Shetty et al. (2019) is a symptom-based health prediction model which relies on machine learning to predict the possibility of a disease based on symptoms self-reported by the user. In order to develop a supervised learning framework, the study compiled a list of often encountered symptoms and projected them to diseases. The system analyses the trend of the symptoms and makes predictions using techniques such as Naive Bayes and decision-based classifiers in conjunction with text processing. They found that symptom-based diagnosis can facilitate quick provisional tests, particularly in situations where symptoms are clearly defined and similar to each other, e.g., in common diseases. The paper showed that automation of clinical triage was possible early and that well structured symptom sets were key to enhancing the effectiveness of health-prediction systems.

[2] Sudhakar et al. (2025) suggested a multifaceted healthcare system to combine disease prediction, brain tumour detection, chatbot support, and schedule a doctor appointment into one web-based platform. The authors have created a multi-module solution in which symptoms typed in by the user are processed with machine learning classifiers like Gradient Boosting and Random Forest to produce a list of potential diagnoses. Moreover, a CNN-based tumour detection model can recognize four large categories of brain tumours using medical images. The system also has conversational AI interface to provide answers to health-related questions and in-built appointment booking facility to simplify the process of interacting with doctors. The findings showed that these integrated systems are capable of enhancing accessibility, lessening platform switching, and enabling proactive health administration.

Srinivas and Salah (2021) studied the variability in consultation length and patient no-show behaviour in cardiology clinics with the help of a two-part machine learning process. Their first model categorized appointments as a no-show and attended, and then regression was used to predict positive consultation times. The authors used random forests, boosted trees, and deep neural networks algorithms to process semicontinuous consultation patterns by analyzing two years of actual clinical data. Their results indicated that the hybrid model was much more effective compared to traditional scheduling techniques and it minimized prediction errors and maximized efficiency in clinics. The paper has also indicated major predictors of no-shows and how predictive scheduling would decrease patient waiting time and idle time on the part of the doctor by better time allocation. [3]

Using an interpretable deep learning model in paediatric medical visits, Liu et al. (2022) developed a predicting no-shows model. The authors developed a model that integrates data imputation and external variables, such as local meteorological conditions, to enhance the level of forecasting data because they used hospital data with a high percentage of missing data. Their logistic regression and neural network models had a low false-alert rate and a significant proportion of likely no-show instances at the time of scheduling. Notably, the approach is interpretable at the case level, allowing doctors to understand the characteristics influencing each prediction. According to the study, incorporating explainable no-show prediction into scheduling procedures can make it easier to organise

resources and carry out targeted interventions to improve appointment attendance rates. [4]

A integrated healthcare system with chatbot support, real-time doctor visit schedules, and machine learning-based disease prediction was proposed by George et al. in 2024. They have CNN, SVM, and random forest algorithms in their system that can accurately identify conditions like brain tumours, breast cancer, kidney disease, and cardiovascular diseases. By assessing huge symptom datasets, the model outperforms conventional techniques in terms of convergence and reliability. In addition to disease prediction, the authors developed a WebRTC-based video visit module that enables direct communication with physicians and a chatbot with NLP support that assists with medical enquiries. This all-inclusive system demonstrates how machine learning can enhance patient interaction, early diagnosis, and access to digital healthcare through a single platform. [5]

[6] Magar et al. (2024) proposed a multimodal healthcare system that uses machine learning to automate doctor appointment scheduling and predict different ailments. In order to test four supervised algorithms—Random Forest, Logistic Regression, KNN, and Naïve Bayes—the authors oversampled the dataset. The performance results showed that Random Forest was consistently the most accurate algorithm, with accuracy above 95% across all evaluation metrics. To provide real-time disease predictions, these trained models were incorporated inside a web interface and saved as serial files. The study demonstrates the effectiveness of machine learning techniques in aiding the identification of various illnesses and the continued strength of Random Forest in clinically orientated classifications.

Slat-warren and Rodriguez (2017) presented a web-based patient management system that uses machine learning to forecast illnesses, propose physicians, and recommend complementary therapies. A Random Forest Classifier is part of the system to analyse the symptoms, identify possible illnesses, and assist physicians in making decisions. Additionally, it has a pharmacy management system that helps users control drug availability and keep track of prescription medications. Additionally, this is paired with email-based appointment confirmation, which increases user convenience. The platform will improve patient happiness, reduce clinical burden, and enable efficient healthcare service delivery through intelligent automation through predictive analytics and an intuitive user interface.[7]

III. PROPOSED METHOD

The proposed system aims to use machine learning to develop an efficient and accurate bankruptcy prediction model. The system will analyse financial data of businesses according to their learning patterns and classify them as either bankrupt or non-bankrupt.

The initial step of the technique is the collection of financial datasets based on credible sources, such as public repositories. These databases have important financial metrics such as assets, liabilities, sales, and profitability ratios. The acquired data is subjected to data preprocessing which involves cleaning the data, filling in of missing values, removal of inconsistencies and normalisation of the data to ensure consistency.

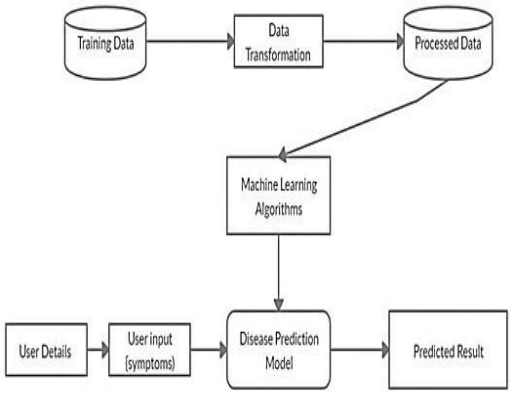


Fig 3.1. Overall Structure of Disease

Following preprocessing, the most pertinent financial characteristics that greatly influence bankruptcy prediction are identified by feature selection. In doing so, dimensionality is decreased and model performance is enhanced.

The next stage of model creation involves several machine learning techniques, such as Support Vector Machine, Random Forest, Decision Tree, and Logistic Regression. To determine trends associated with financial distress, these models are trained on historical data. Ensemble methods such as

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Random Forest, in particular, are particularly helpful because they are able to reduce overfitting and improve the accuracy.

The dataset is divided into training and testing sets to ensure that the data is evaluated correctly. The model training involves the learning of the algorithms based on the training data whereas the model testing involves the use of unseen data to demonstrate the performance. To maximise model efficiency, hyperparameter adjustment is also used.

Lastly, performance measurements like accuracy, precision, recall, F1-score, and ROC curve are used to assess the models. The model that does the best is used in making predictions. The technology assists stakeholders in making decisions through generating a reliable output, which shows whether a company is at risk of becoming bankrupt.

IV. RESULTS

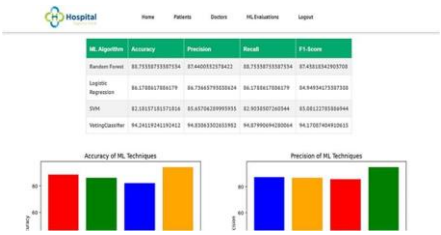


Fig 4.1: Machine Learning Classifier.

These are machine learning algorithms used in this project. i.e. Random forest, Logistic regression, svm and Voting Classfier. In which accuracy varies from 88 to 95.

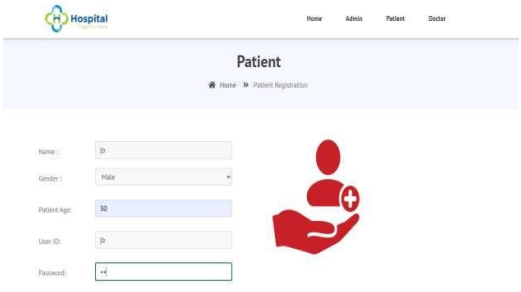


Fig 4.2: Patient Module

Here Patient can register with his personal details.

After registration, patient can login with his user ID and password.

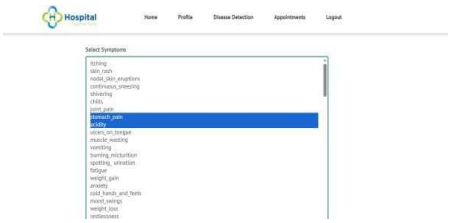


Fig 4.3: Disease Selection

Here patient can select his symptoms to detect disease and take appointment.

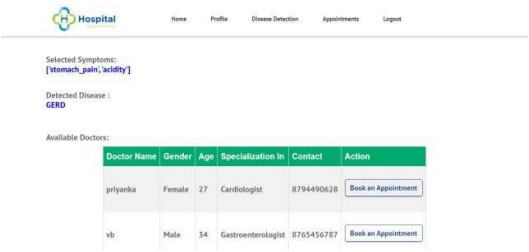


Fig 4.4: Doctor Appointment selection

After selecting symptoms, disease will be detected. Then portal will show available doctors . So patient can see available doctors and book appointment according to disease.

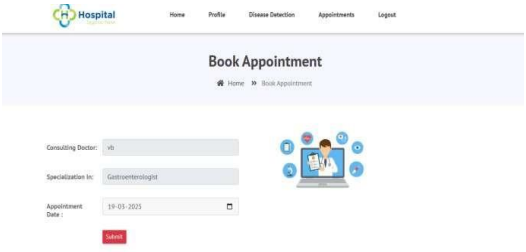


Fig 4.5: Schedule Date for appointment

For booking an appointment , patient can book appointment date with specified doctor.

Once doctor tries to login, it will show above message pop up. That means once admin approve doctor then only doctor can login.

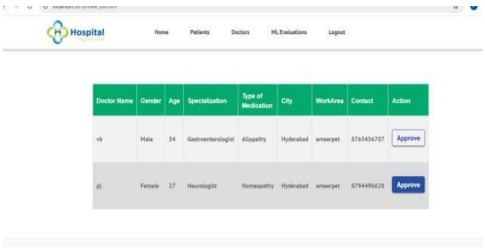


Fig 4.6: Doctor Approval view

Here admin approve doctors after seeing this details.



Fig 4.7: Doctor Profile

Once doctor login, he can see first his profile.

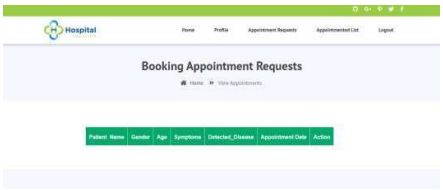


Fig 4.8: Appointment requests

Doctor can see patient available appointments requests. Now there is no appointment for above doctor so there are no appointments shown here

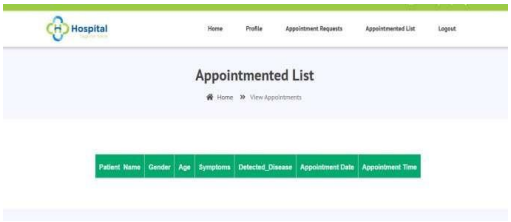


Fig 4.9: Appointment list

Here can doctor see patients details with symptoms, detection, appointment Date, Appointment Time.

V. CONCLUSION

Compared to traditional methods, this paper demonstrates that machine learning tools can greatly contribute to the prediction of bankruptcy. Due to their robustness and ability to deal with complex data, the ensemble models, such as Random Forest, were superior to the other models that were analyzed. The results highlight the importance of selecting features and pretreating data to enhance model accuracy. The suggested technique facilitates improved financial domain decision-making and offers a dependable method for forecasting financial trouble.

The areas that can be focused on in future research include how to improve the performance of the models using larger and more diverse datasets. To capture intricate financial trends, time-series models and sophisticated deep learning techniques can be investigated. Natural language processing can further be used to integrate textual and real-time data to increase the accuracy of prediction. Also, it can be enhanced by developing models that can be explained and making the system a web-based application.

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