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AI-Driven Disease Insights-Doctor Referral and Appointment Utility

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Abstract: ***Many deadly diseases are preventable and curable if addressed early. However, because the early signs of an illness are mild, people often overlook them. As a result, it is always recommended to get a regular body check-up in order to avoid future health difficulties. Early illness prediction has become the most critical work, and accurate disease prediction is the most difficult task. We presented a web application to help people detect diseases based on their symptoms. There are numerous applications for online consultations with doctors, however there are less applications for prediction of the disease. There are systems that can only predict one health problems. however our approach can predict forty-one common diseases. For projections, we require symptom data. Using the Kaggle platform's disease symptom dataset, we discover a massive quantity of information to analyze in our system to ensure correct prediction. The system uses random forest, decision tree, and knn algorithms to identify diseases. After predicting disease, the system will offer a list of specialists who are experts in that particular condition. Patients can schedule an appointment with the doctors at their desired time and day. Patients can also communicate with a doctor to receive consultations.***

Keywords: Machine Learning, Diseases, Symptoms, Decision tree, Random forest tree, KNN.

I. INTRODUCTION

The use of data mining is increasingly important in the healthcare and medical sectors. Effective processing methods can extract significant information from enormous databases, enabling medical practitioners to make early decisions and improve health services. Machine Learning is a promising method for disease prediction and diagnosis. This paper proposes to predict diseases using patient symptoms . Machine learning algorithms, such as KNN, Decision Tree, and Random Forest, are used to forecast diseases. Python is used to complete the implementation. Ignoring diseases and health issues, such as malaria, impetigo, diabetes, migraine, jaundice, and chickenpox, can have serious consequences for one's health and even death. The healthcare business can improve decision-making by "mining" its enormous databaseto identify hidden patterns and linkages. Data processing methods such as Decision Trees, Random Forests, and Naive Bayes can address the current situation. We created an automated approach to retrieve disease-related knowledge from a historical database using algorithmic rules.Our approach effortlessly integrates cutting-edge AI technology and healthcare access. This allows users to acquire deepinsights into their health conditions through symptom analysis, receive tailored doctor referrals, and easily scheduleappointments, transforming the way we approach healthcare in a user-friendly, efficient, and accessible manner.

II. RELATED WORK

In the quest for innovation and efficiency, modern projects frequently rely on existing solutions as fundamental buildingblocks for development. This approach not only recognizes the expertise and advancements of those who came before us but also nurtures a collaborative ecosystem where ideas can evolve and confront new challenges. In our project, we wholeheartedly embrace this ethos, conscientiously integrating elements from existing solutions to enrich our endeavor. These existing solutions serve as guiding lights, offering insights and frameworks that shape the direction of our project.

1) *Disease Prediction using ML on users Symptoms:* Vamshi Krishna and Sai Nath, in 2022, delved intodisease detection using machine learning, particularly targeting the healthcare industry. Their objective was topredict patients' using symptoms.By K-Nearest Neighbors (KNN) algorithm. Through meticulous model training and symptom analysis, they achieved an impressive 87% accuracy rate in disease prediction..
2) *Online Doctor Appointment System:* Venkatesh Rallapalli and Dipti Menghani in 2016 developed an Online Doctor Appointment System, a web-based platform enabling patients to choose doctors according to their medical requirements and view their profiles. This system primarily facilitates appointment schedulingwith different doctors, without incorporating disease prediction functionality.

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3) *Practo which Provides Doctor Search and AppointmentBooking:* Shashank ND and Abhinav Lal founded Practo in 2008. Practo provides medical services online. It's all about your healthcare needs. With Practo, you can find the right doctors, book appointments, keep track ofyour health records, and even get medical advice throughtelemedicine.
4) *Sminq App:* Shachin Bharadwaj and Santhosh Nagarajanlaunched the Sminq app in 2015. It lets users check livequeue status for doctor appointments and offers real- time updates on trending places worldwide. Sminq focuses on managing queues and cutting wait times for different services. Users can join virtual queues and getinstant updates on their queue status through the app.

III. PROPOSED SYSTEM

Our solution is a web application that allows users to input their symptoms. Once a disease is identified, the system suggests specialized doctors and facilitates easy appointmentbooking and real-time consultations. It employ decision tree,random forest,and KNN algorithms for disease identification.Users can conveniently book appointments if they suspect they have any of the identified diseases.

In Fig 1 administrators have the capability to oversee and manage details regarding doctors, patients, and diseases, as well as receive valuable patient feedback. Doctors can directly communicate with patient's health status. The systemefficiently handles all aspects of doctor-related information, including schedules, fees, and appointment management.

Users have access to video consultations and can engage in chat sessions with doctors

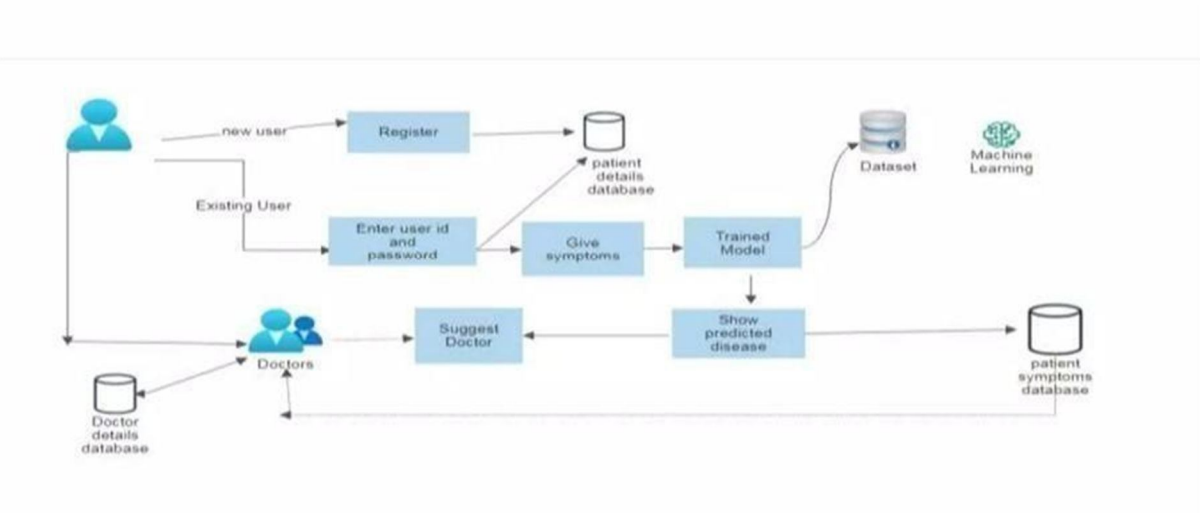


Fig 1. System Design

IV. METHODS AND EXPERIMENTAL DETAILS

A. *Decision Tree*

It partitions a set of data repeatedly into subgroups based on the numerical values of the input features. Ateach node, the algorithm chooses the optimum feature and threshold to partition the data, seeking to optimize homogeneity within each subset. This splitting process continues until a stopping requirement is satisfied, such as achieving a maximum depth or a minimum quantity of samples per node. The resulting tree structure contains a set of decision rules forecast new data points by traversing the tree from the root to the appropriate leaf node. In classification tasks, each leaf node provides a class label, but in regression tasks it depicts a predicted value.

B. *KNN*

The K-Nearest Neighbors (KNN) algorithm operates by data points including classifications or regression values during the training phase.When presented with new data for classification or prediction, KNN calculates the distances between the input data point and all other data points in the training set, typically using the Euclidean distance metric. Byselecting a predefined number of nearest neighbours (K), KNN identifies the K closest data points to the input and determines their classifications or regression values. Finally, it assigns highest class label or averages the regression valuesamong the K neighbours to predict value for the input data point, making it a versatile and intuitive algorithm for variousmachine learning tasks.

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C. Random Forest

It is an ensemble learning technique that combines the predictions of many different decision trees to improve accuracy and robustness in classification and regression. Random Forest teaches through developing a multiple decision trees at each node using bootstrap sampling and random feature selection. Each tree separately predicts the target variable, and output is combining the various tree forecasts using majority voting (for classification) or averaging (for regression).

D. Methodology

In our model development, we proceed with the expectation that users have a comprehensiveunderstanding of their symptoms.Data preprocessing is the name of the data mining approach that converts or encodes the data into a format that the algorithm can understand with ease. The preparation methods used in thework that is being presented include: Data Cleaning: Datais cleaned up by procedures like adding missing values, which eliminates data discrepancies. Data reduction: We have also eliminated orthographic errors from the dataset and substituted the true value for any missing data.Three algorithms are used by this system to try and forecast the diseases:

1) KNN Classifier
2) Random Forest Classifier
3) Decision Tree Classifier

A research that examines each algorithm's performance inside the database under consideration is offered.When the user provides symptoms as input to the model, the system processes those symptoms in accordance with the rule set created, resulting in classifications and the prediction of the most likely disease.

V. RESULTS AND DISCUSSIONS

By entering symptoms, we achieve accurate disease predictions. We gathered a lot of information from the disease symptom dataset on Kaggle, which helps our system work better. There will be list of symptoms in which patients can select their symptoms and check for their diseases. In this project we used Pycharm for the execution of our project and SQL for storing the database and SQLyog for checking the data updates in the project. After running in pycharm the admin has to login, he can approve new doctors registrations. Patient has to login or register then can take actions as to know disease or appointment list. Doctor has to register for first time andthen approve patients request. Using this project users canefficiently know about predicted disease at the same timecan book appointments. In fig2.patient is login and can select symptoms using ml algorithms disease will be predicted and book appointment with the list of specialized doctors. Then book appointment .this has to be approved by doctor.

Other applications focusing on symptom-based disease prediction often fall short in terms of effectiveness, offering only a limited number of diseases with relatively low accuracy and lacking a convenient appointment booking system. In contrast, platforms like Practo aim to enhance overall healthcare experiences by providing comprehensive online medical services and solutions for individuals seeking better self-care.

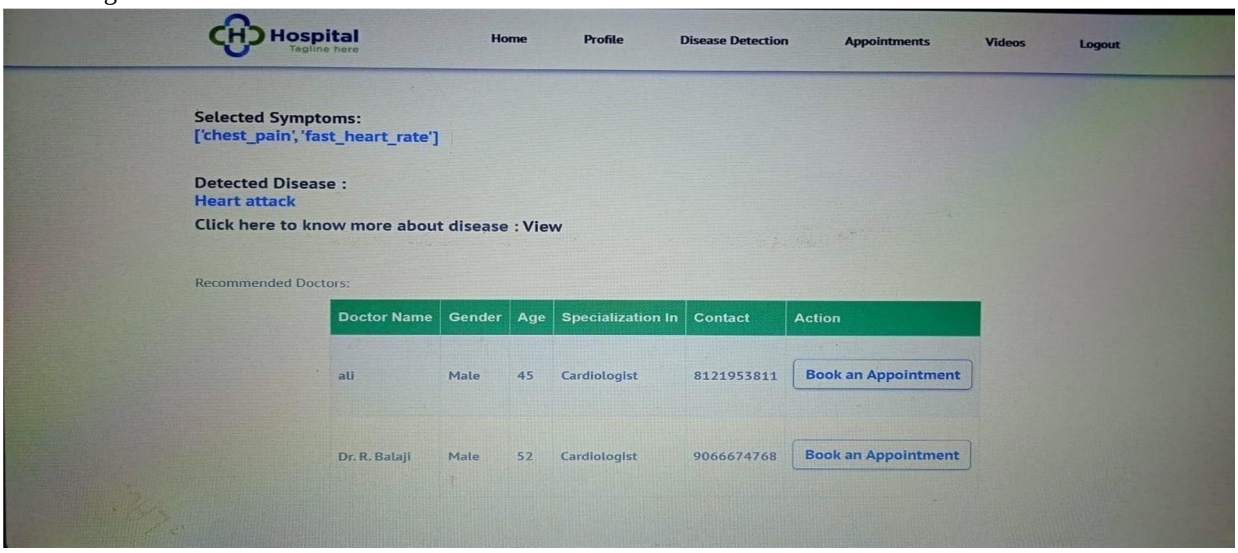


Fig 2.Patient Interface

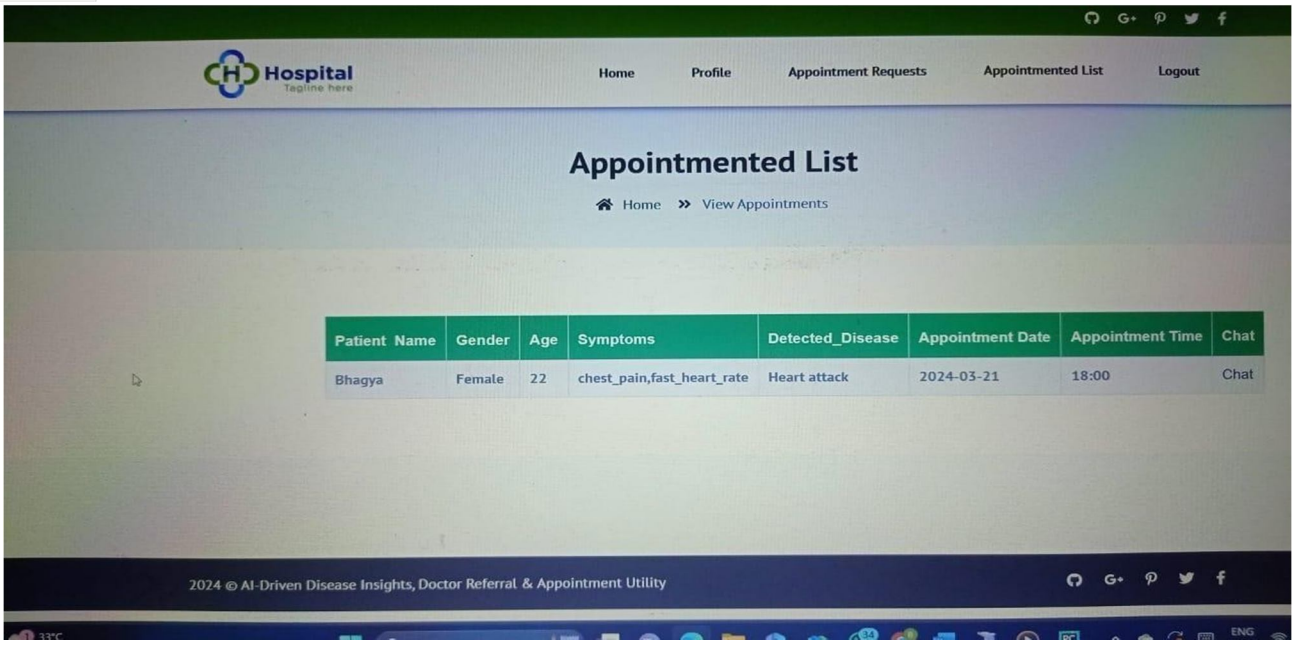


Fig 3.Doctor Interface

In fig.3 shows the patient's appointment acceptance by doctor.It is the interface for managing and arranging appointments depending on the doctors preferences or needs. Using appointments list option doctors check for their availability toprovide the desired time to patients depending on their medical needs. After checking and accepting the patient appointment the above figure is depicted as output.As a result,project helps consumers may examine several available booking slotsand select their chosen day and time. This minimizes physical waiting time, saving users time while also improving the appointment process' efficiency. This program allows the doctor to alert his own timetable. Hospitals can conveniently manage their registration and appointment processes, as well as track patient flow to doctors.

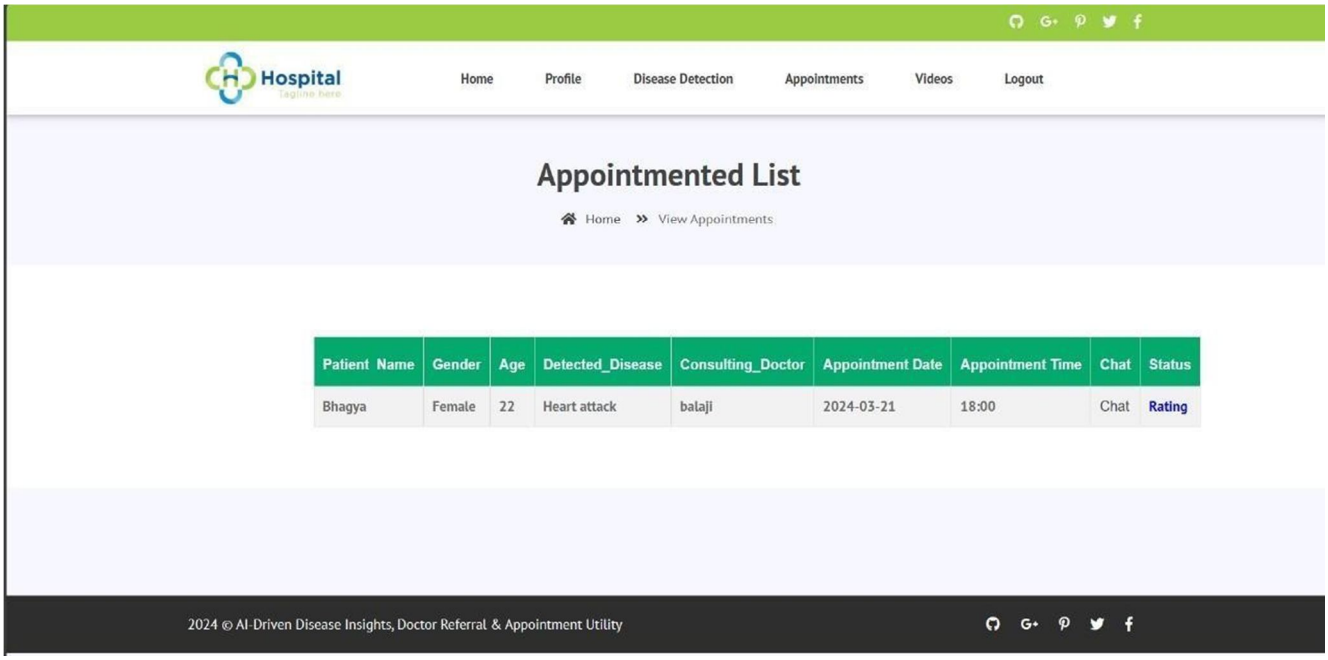


Fig 4.Patient Appointment Interface

In fig.4 It shows the appointments booked by patient.Here, patient can login and check their appointment and give rating to doctor depending on his experience with medication

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VI. CONCLUSION

We'd like to demonstrate how vital this initiative is in everyone'sdaily life, who rely on these algorithms to anticipate the needs of patients problems based on their basic information and symptoms. It is frequently helpful for the health business to enlighten the userbecause it has become such a significant part intreating patients illnesses is also beneficial for the user if he or she does not want totravel to the hospital or other clinics, because the user can learn about the disease . This method may enhance the health sector by allowing patients to enter symptoms and other relevant information

The proposed system will be more effective to find doctors nearby with disease speciality for patients rather than finding them manually or going clinic to clinic.

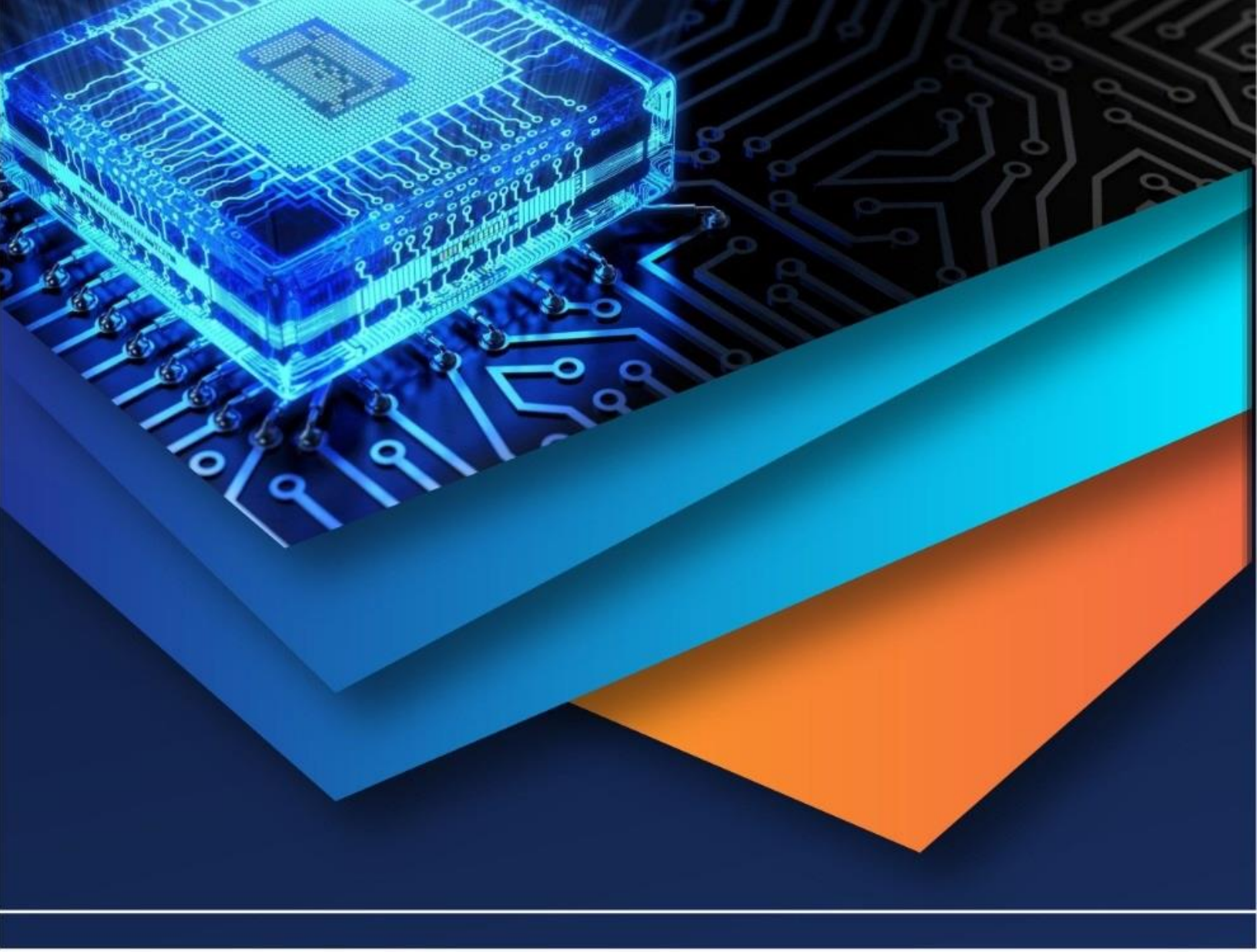
This system is not intelligent enough to provide a 100% precise disease hence further we provide the user with nearby doctors or hospitals or any specialist doctor regarding that particular disease. Another feature that will predict the diseases for the users or patients who provide the symptoms as input to ease the process of doctor recommendation directly with face to face appointment with doctors.Another feature which can be added in future is to provide a user interface friendly to the user with the help of AI chatbots and image processing. We will try to provide a user based report with respect to its past information such as predicted diseases of patient/user and the doctors appointed.

This system providing a seamless experience for everyone involved. This lowers tiredness and frustration while also providing an easy way to schedule appointments in today's society.

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