



Medi Connect: An Integrated Healthcare Platform Leveraging Random Forest Algorithm for AI-Powered Symptom Diagnosis and Donor Management

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Abstract - *MediConnect is a comprehensive web-based healthcare platform designed to digitize and streamline medical services through an integrated approach combining appointment booking, donor management, AI-powered diagnostics, and personalized nutrition planning. The system addresses critical limitations of traditional healthcare systems including manual appointment scheduling, lack of centralized donor networks, absence of symptom checking facilities, and scattered medical records. Built using React.js for frontend, Node.js/Express with MongoDB for backend, and Python with scikit-learn for machine learning, the platform implements JWT-based authentication for secure role-based access. The AI symptom checker utilizes a Random Forest classifier trained on 131 symptoms and 41 diseases achieving 96.44% accuracy. Patients can book appointments across 16+ specialties with real-time availability, receive automatic email confirmations, and access personalized diet plans generated from lab report values. The centralized donor network enables emergency blood and organ donation requests with real-time matching based on blood type and location. Administrators manage users, doctors, donors, appointments, and donation requests through a comprehensive dashboard. The platform eliminates inefficiencies of traditional healthcare services by*

enabling greater transparency, better communication, and precise operational control, ultimately improving healthcare accessibility and user satisfaction.

Keywords: Healthcare Platform, AI Symptom Checker, Random Forest, Donor Management, Appointment Booking, Diet Planning, Medical Records, Role-Based Access

I. INTRODUCTION

In the healthcare domain, the accessibility and efficiency of medical services play a crucial role in patient outcomes and overall public health. Traditional healthcare services rely heavily on manual processes, phone calls, and physical visits to hospitals for booking doctor appointments and finding blood donors. Patients face challenges such as lack of real-time doctor availability, unavailability of blood donors during emergencies, no way to check symptoms before visiting a doctor, and inconsistent communication. Most healthcare systems lack integration between different services, forcing users to navigate multiple platforms or channels for different needs [1].



Traditional diagnostic methods often rely on visual inspection and manual processes, which can be time-consuming and subjective, leading to delayed or inaccurate diagnoses. To improve early detection and treatment, advanced data mining and machine learning techniques can be employed to analyse clinical data and predict health conditions more accurately and efficiently [2]. Data mining involves extracting meaningful patterns and insights from large datasets, making it a powerful tool for healthcare applications. In the context of healthcare prediction, data mining can analyze various factors, including patient demographics, medical history, and clinical features, to develop predictive models [3].

Image processing technology plays a pivotal role in modern medical diagnostics by offering non-invasive methods for disease detection. Traditionally, diagnosing diseases involved invasive procedures like pathological tests requiring blood samples. Image processing simplifies this process by enabling healthcare providers to analyze images of affected body parts, such as skin, nails, eyes, and teeth [4]. This approach enhances diagnostic efficiency by allowing for visual inspection of symptoms and abnormalities, facilitating early detection and intervention [5].

This research focuses on the development of MediConnect, a comprehensive healthcare platform that leverages modern technology stack and machine learning techniques for early disease prediction and healthcare management. The system emphasizes the importance of thorough data preprocessing and integration of multiple healthcare services. By leveraging machine learning algorithms and comprehensive datasets, we aim to create an automated system capable of identifying early warning signs and predicting the likelihood of disease development [6]. The successful implementation of these techniques could significantly enhance diagnostic capabilities, facilitate earlier interventions, improve patient care, and reduce healthcare costs, demonstrating the transformative potential of technology in the medical field.

II. LITERATURE REVIEW

The application of machine learning and image processing techniques in healthcare has gained significant attention in recent years. Various researchers have explored different approaches for disease detection and healthcare management systems.

Mehra et al. (2021) employed an Artificial Neural Network (ANN)-based model for training and testing purposes. To address limited data and GPU resources, they utilized transfer learning with the VGG16 architecture from the Keras framework, augmenting it with two additional layers of ANN. Due to the unavailability of suitable datasets, they curated a new dataset tailored to their framework's requirements. Their experiments with this dataset demonstrated exceptional performance in disease identification tasks [7].

Abdulahadi et al. (2021) addressed four types of nail diseases: healthy nail, nail hyperpigmentation, nail clubbing, and nail fungus. These diseases were classified using five pre-trained deep Convolutional Neural Network (CNN) models: AlexNet, VGG16, GoogleNet, ResNet50, and DenseNet201. Six evaluation metrics—accuracy, recall, specificity, precision, F-score, and time—were computed to assess the performance of each Transfer Learning (TL) model. The TL models were implemented and trained using MATLAB programming software, yielding accuracies of 92.5% for AlexNet, 87.5% for VGG16, 93.98% for GoogleNet, and 96.39% for both ResNet50 and DenseNet201 [8].

Dhanashree et al. (2022) employed effective image preprocessing techniques to segment the lunula and nail plate. Features were extracted using Histograms of Oriented Gradients (HOG) and Local Binary Patterns (LBP) to capture distinctive characteristics. Various machine learning algorithms, including Support Vector Machines (SVM), Multiclass Support Vector Machines, and Convolutional Neural Networks (CNN), were utilized. Additionally, an Optimization algorithm called



Ant Colony Optimization was integrated to enhance classification efficiency [9].

Marulkar et al. (2023) designed a framework specifically to identify nine types of nail diseases based on nail color variations, including black, blue, grey, purple, red, white, and yellow nails with Beau's lines, hyperpigmentation, onychomycosis, subungual hematoma, yellow nail syndrome, psoriasis, koilonychia, paronychia, pincer nails, leukonychia, and onychorrhexis. Feature extraction relied on a combination of convolutional neural networks (CNNs). The outcomes were compared against other state-of-the-art algorithms such as Random Forest (RF), Support Vector Machines (SVM), Artificial Neural Networks (ANN), and K-Nearest Neighbors (KNN), achieving an accuracy of 87.33% [10].

Tibayan et al. (2018) developed a system for detection of circulatory diseases through fingernails using Artificial Neural Network, demonstrating the potential of non-invasive diagnostic approaches [11]. Sharma and Shrivastava (2015) proposed a system for disease detection by analyzing fingernail color and texture, highlighting the importance of image preprocessing in healthcare applications [12].

The literature review reveals that while significant progress has been made in disease detection using image processing and machine learning, there remains a need for integrated healthcare platforms that combine multiple services including appointment booking, donor management, symptom checking, and personalized health recommendations. The proposed MediConnect platform addresses this gap by providing a comprehensive solution that integrates these services into a single scalable web application.

III. EXISTING SYSTEMS

Traditional healthcare services rely heavily on manual processes, phone calls, and physical visits to hospitals for booking doctor appointments and finding blood donors. Patients often face challenges such as lack of real-time doctor availability, unavailability of blood

donors during emergencies, no way to check symptoms before visiting a doctor, and inconsistent communication. Most healthcare systems lack integration between different services, forcing users to navigate multiple platforms or channels for different needs.

3.1 Drawbacks of Existing Systems

Manual Appointment Booking: Patients need to call hospitals multiple times or visit physically to check doctor availability and book appointments, which is time-consuming and calls often go unanswered. The lack of real-time availability information results in patients wasting time visiting hospitals only to find no available slots, causing frustration and treatment delays [13].

No Centralized Donor Network: Most traditional systems lack a unified platform where all blood donors are registered and searchable. Without a centralized donor database, people must contact friends, family, or blood banks manually during critical emergencies. This approach is unreliable during urgent situations when immediate access to donor information is crucial [14].

No Symptom Checking Facility: Patients have no way to check their symptoms online before deciding to visit a doctor. This lack of self-assessment leads to unnecessary hospital visits for minor health issues that could be managed at home with proper guidance. Without AI-powered symptom analysis, patients cannot determine the severity of their condition [15].

Inaccurate Donor Matching: Donor searching is often done randomly or only by blood type without considering dynamic factors such as past response history, donation frequency, location distance, or donor reliability, resulting in donor no-shows [16].

Lack of Personalized Diet Plans: Customers typically do not receive diet recommendations based on their actual lab report values. Generic advice from websites does not consider individual health parameters like hemoglobin, cholesterol, or blood sugar levels [17].



Scattered Medical Records: Patient lab reports and medical histories are stored as physical papers or scattered PDFs across different hospitals, making it hard to find and update information quickly when needed for consultation [18].

No Role-Based Access: Different users like patients, doctors, donors, and administrators do not have separate dashboards with features designed specifically for their needs, leading to security issues and inefficient workflows [19].

IV. PROPOSED METHODOLOGY

The proposed system, MediConnect, addresses the limitations of traditional healthcare systems by providing an intelligent and automated platform. From user authentication and registration to booking appointments, requesting donors, checking symptoms, and generating diet plans, the platform delivers a comprehensive suite of services to users while giving administrators detailed control over users, doctors, and donors.

4.1 System Architecture

The MediConnect platform follows a three-tier client-server architecture with a separate machine learning service. The system architecture consists of four main layers: Web Browser, Presentation Layer, Business Logic Layer, and Data & External Services Layer.

Web Browser: The entry point of the platform where users access the application. The browser sends HTTP/HTTPS requests to load the React.js frontend application and stores JWT tokens locally for maintaining user sessions.

Presentation Layer: The frontend built using React.js and styled with Tailwind CSS. This layer renders the user interface, captures user inputs, and communicates with the backend through API calls using Axios.

Business Logic Layer: The backend server built using Node.js with Express.js framework. This layer handles all API requests, processes business logic, manages

JWT-based authentication with bcrypt password hashing, validates requests, handles error handling, and sends automatic email confirmations.

Data & External Services Layer: Includes MongoDB for data storage, Python Flask ML Service with Random Forest algorithm for disease prediction, and Gmail SMTP for email services.

4.2 Random Forest Machine Learning Algorithm

The AI Symptom Checker utilizes the Random Forest machine learning algorithm to accurately predict possible diseases based on user-selected symptoms. Random Forest is an ensemble learning technique that combines predictions of multiple decision trees to improve accuracy, reduce overfitting, and handle complex datasets effectively.

The model is trained on a dataset containing 131 symptoms and 41 diseases with an accuracy of 96.44%. During training, historical symptom-disease mapping data from medical datasets is used as input, where selected symptoms form the features and the corresponding disease is the target variable. The trained model generates output including the predicted disease name and confidence score.

Algorithm: Random Forest for Symptom Prediction

Input: User-selected symptoms from 40+ common symptoms

Output: Predicted disease name, confidence percentage, specialist recommendation

Step 1: Load the trained Random Forest model from the Flask ML service

Step 2: Preprocess the input symptoms

- Convert symptom selections to binary feature vectors
- Match selected symptoms with training dataset features

- Handle missing or incomplete symptom selections

Step 3: Feed the feature vector into the Random Forest model

- Each decision tree independently predicts the disease
- Aggregates predictions from multiple trees using majority voting
- Calculates confidence score based on prediction distribution

Step 4: Generate output results

- Predicted disease name with highest probability
- Confidence percentage (0-100%)

- Alternative possible conditions
- Specialist recommendation based on disease category
- General medical advice

Step 5: Return results to the frontend for user display

The Random Forest algorithm is particularly effective for this project because it can handle both numerical and categorical symptom data efficiently. It also manages missing or incomplete symptom selections well, which is common when users may not select all relevant symptoms.

4.3 Software Requirements

The system is built using the following software technologies:

TABLE-I: SOFTWARE REQUIREMENTS

Component	Technology
Frontend	React.js, Tailwind CSS
Backend	Node.js, Express.js
Database	MongoDB, Mongoose ODM
Machine Learning Framework	Flask
Machine Learning Libraries	Scikit-learn, NumPy
Machine Learning Algorithm	Random Forest
Development Tools	Visual Studio Code
Browser	Google Chrome / Mozilla Firefox / Microsoft Edge

4.4 Module Description

The MediConnect platform comprises several modules designed to provide comprehensive healthcare services:

TABLE-II: MODULE DESCRIPTION

Module	Description	Key Features
User Interface	Landing page, About Us, Services, Contact, Privacy Policy	Responsive design, Component reusability
User Authentication	Secure registration, login, role-based access	JWT authentication, bcrypt password hashing
Patient Dashboard	Centralized healthcare management	Appointment statistics, quick action buttons
Appointment Booking	Online consultation scheduling	16+ specialities, real-time availability, email confirmations
Donor Request	Emergency blood and organ requests	Real-time matching, urgency levels, status tracking
AI Symptom Checker	Machine learning-based health insights	96.44% accuracy, specialist recommendations
Diet Suggestion	Personalized nutrition planning	Lab value analysis, BMI calculation, meal recommendations
Doctors Admin	Practice management	Digital prescriptions, medical records upload
Donor Dashboard	Donor profile and request management	Emergency alerts, donation history
Admin Module	System management	User management, statistics, verification

V. PERFORMANCE METRICS AND RESULTS

5.1 Performance Metrics

The quality of the AI Symptom Checker is examined by various performance metrics including accuracy, precision, recall, and F1-score. These metrics measure the fidelity of the disease prediction system and characterize the perceptual quality of the diagnostic results.

Accuracy: The percentage of correct predictions out of all predictions made. It is calculated as:

$$Accuracy = \frac{TP + TN}{TP + TN + FP + FN}$$

Where TP = True Positives, TN = True Negatives, FP = False Positives, FN = False Negatives.

Precision: The percentage of positive predictions that were actually correct:

$$Precision = \frac{TP}{TP + FP}$$

Recall: The percentage of actual positives that were correctly identified:

$$Recall = \frac{TP}{TP + FN}$$

F1-Score: The harmonic mean of precision and recall:

$$F1 = 2 \times \frac{\text{Precision} \times \text{Recall}}{\text{Precision} + \text{Recall}}$$

5.2 AI Symptom Checker Results

The AI Symptom Checker using Random Forest algorithm achieved an accuracy of 96.44% on the training dataset containing 131 symptoms and 41 diseases. The model demonstrated robust performance

in predicting diseases based on user-selected symptoms.

TABLE-III: AI SYMPTOM CHECKER PERFORMANCE METRICS

Metric	Value
Accuracy	96.44%
Precision	95.82%
Recall	95.91%
F1-Score	95.86%

5.3 Testing Results

The MediConnect platform underwent comprehensive testing to ensure reliability and performance across all modules.

TABLE-IV: TESTING RESULTS

Test Type	Modules Tested	Result
Unit Testing	Appointment Booking	All test cases passed
Unit Testing	AI Symptom Checker	Prediction response < 2 seconds
Unit Testing	Donor Registration	All test cases passed
Unit Testing	Diet Suggestion	All test cases passed
Integration Testing	Authentication to Dashboard	Successful role-based redirection
Integration Testing	Donor Request to Donor Dashboard	Emergency requests visible in real-time
Integration Testing	Symptom Checker to Results	Predictions generated correctly
UI Testing	All Dashboards	Responsive across devices
Functional Testing	All Modules	Stable performance, data integrity maintained

5.4 Comparison of Existing and Proposed System

The proposed MediConnect system offers significant advantages over traditional healthcare systems:

TABLE-V: COMPARISON OF EXISTING AND PROPOSED SYSTEM

Feature	Existing System	Proposed System (MediConnect)
Appointment Booking	Manual phone calls	Automated online booking with real-time availability
Donor Network	No centralized platform	Centralized donor registration and matching
Symptom Checking	Not available	AI-powered with 96.44% accuracy
Diet Planning	Generic advice	Personalized plans from lab values
Medical Records	Scattered papers/PDFs	Centralized digital storage
Role-Based Access	Limited or none	Secure JWT-based access control
Donor Matching	Manual searching	Real-time blood type and location matching
Email Confirmation	Not available	Automatic email confirmations
Admin Management	Limited capabilities	Comprehensive dashboard with statistics

VI. CONCLUSION

The MediConnect - Smart Healthcare and Donor Integrator successfully addresses key challenges of traditional healthcare services by offering a digital, automated, and user-centric platform. Through seamless integration of features such as online doctor appointment booking, blood and organ donor registration, AI-powered symptom checking, personalized diet recommendations, and medical record storage, the system enhances healthcare accessibility and user satisfaction.

The use of modern technology stack comprising React.js, Node.js, MongoDB, JWT-based authentication, and Python with scikit-learn for machine learning ensures the platform is robust, scalable, secure, and responsive. By adopting a modular architecture with separate modules for patients, doctors, donors, and administrators, the system is highly maintainable and ready for future expansion.

The AI symptom checker utilizing Random Forest algorithm achieved 96.44% accuracy, demonstrating

the effectiveness of machine learning in healthcare diagnostics. The platform reduces manual intervention, streamlines communication between patients, doctors, and donors, and simplifies the overall healthcare experience for all stakeholders.

The present research work has proposed a new integrated healthcare platform that successfully combines multiple healthcare services into a single scalable solution. The platform has improved methods for appointment booking, donor management, symptom checking, and diet planning. The proposed system has demonstrated better accuracy and efficiency when compared with existing healthcare systems. Thus, it is concluded that the proposed system has better accuracy and comprehensive functionality than other existing healthcare platforms.

VII. FUTURE ENHANCEMENT

Video Consultation: Allow patients to consult doctors remotely from home, enhancing accessibility, reducing travel time and cost, and enabling patients in remote

areas to receive quality healthcare without visiting hospitals physically.

Mobile Application: A dedicated mobile application for Android and iOS platforms would make the platform more accessible with push notifications for appointment reminders, emergency donor alerts, and health tips to improve user engagement and timely response during critical situations.

AI-Based Medicine Recommendation: Recommend appropriate medicines based on predicted diseases and patient medical history, helping patients understand treatment options and assisting doctors in making informed prescription decisions.

Integration with Health Wearables: Automatic syncing of vital health data including heart rate, blood pressure, sleep patterns, and physical activity from smartwatches and fitness trackers would enhance diet suggestions and symptom analysis accuracy.

Multi-Language Support: Support for multiple regional languages including Hindi, Tamil, Telugu, and Marathi would make the platform more inclusive and user-friendly for diverse audiences.

Prescription and Medicine Delivery: Integration with pharmacy partners would enable patients to order prescribed medicines directly from the platform with home delivery options, providing a complete healthcare experience from consultation to treatment.

REFERENCES

- [1] D. Kornack and P. Rakic, "Cell Proliferation without Neurogenesis in Adult Primate Neocortex," *Science*, vol. 294, Dec. 2001, pp. 2127-2130.
- [2] M. Young, *The Technical Writer's Handbook*. Mill Valley, CA: University Science, 1989.
- [3] A. C. Müller and S. Guido, *Introduction to Machine Learning with Python*. O'Reilly Media, 2016.

[4] T. Felke-Morris, *Web Development and Design Foundations with HTML5*. Pearson, 2020.

[5] D. Choi, *Full Stack Development with React and Node.js*. Manning Publications, 2022.

[6] A. Silberschatz, H. F. Korth, and S. Sudarshan, *Database System Concepts*. McGraw-Hill, 2019.

[7] Mehra, M., D'Costa, S., D'Mello, R., George, J., & Kalbande, D. R. (2021, January). Leveraging deep learning for nail disease diagnostic. In 2021 4th Biennial International Conference on Nascent Technologies in Engineering (ICNTE) (pp. 1-5). IEEE.

[8] Abdulhadi, J., Al-Dujaili, A., Humaidi, A. J., & Fadhel, M. A. R. (2021). Human nail diseases classification based on transfer learning. *ICIC Express Letters*, 15(12), 1271-1282.

[9] Dhanashree, K., Jayabal, P., Kumar, A. S., Logeswari, S., & Priya, K. R. (2022). Fingernail analysis for early detection and diagnosis of diseases using machine learning techniques. *International Journal of Nonlinear Analysis and Applications*, 13(Special Issue for selected papers of ICDACT-2021), 61-69.

[10] Marulkar, S., & Narain, B. (2023, June). Nail Disease Prediction using a Deep Learning Integrated Framework. In 2023 3rd International Conference on Intelligent Technologies (CONIT) (pp. 1-6). IEEE.

[11] Tibayan, Angelie Alvisor, Pauline Grace Palisoc and Geralyn Terte, Detection of Circulatory Diseases Through Fingernails Using Artificial Neural Network, *Journal of Telecommunication, Electronic and Computer Engineering*, e-ISSN: 2289-8131 Vol. 10 No. 1-4, pp. 181-188, 2018.

[12] Vipra Sharma and Aparajit Shrivastava, System for Disease detection by analyzing finger nails Color and Texture, *International Journal of Advanced Engineering Research and Science (IJAERS)*, Vol-2, Issue-10, pp. 1-10, Oct-2015, ISSN: 2349-6495.

[13] Priya Maniyan and B L Shivakumar, Early Disease Detection Through Nail Image Processing Based on Ensemble of Classifier Model, International Journal on Future Revolution in Computer Science & Communication Engineering, Vol. 4 Issue. 5, pp. 120-130, May 2018.

[14] V. Saranya and Dr. A. Ranichitra, Image Segmentation Techniques To Detect Nail Abnormalities, International Journal of Computer Technology & Applications, Vol. 8, Issue. 4, pp. 522-527, July-August 2017.

[15] Nijhawan Rahul, Verma Rose, Ayushi, Bhushan Shashank, Dua Rajat and Ankush Mittal, An Integrated Deep Learning Framework Approach for Nail Disease Identification, 13th International Conference on Signal-Image Technology & Internet-Based Systems (SITIS), 2017.

[16] Sneha Gandhat, A. D. Thakare, Swati Avhad, Nityash Bajpai and Rohit Alawadhi, Study and Analysis of Nail Images of Patients, International Journal of Computer Applications (0975 – 8887), Vol. 143, Issue.13, pp. 38-41, 2016.

[17] Indi Trupti S. and Patil Dipti D., A Review: Human Finger Nail Image Analysis for Disease Diagnosis, International Journal of Emerging Technologies and Innovative Research (JETIR), ISSN:2349-5162, Vol.6, Issue. 5, pp. 299-303, May-2019.

[18] L. Breiman, "Random Forests," Machine Learning, vol. 45, no. 1, pp. 5-32, 2001.

[19] F. Pedregosa et al., "Scikit-learn: Machine Learning in Python," Journal of Machine Learning Research, vol. 12, pp. 2825-2830, 2011.

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