International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 10 Issue: 03 | March - 2026 SJIF Rating: 8.659 ISSN: 2582-3930

NEURO DOC – Virtual AI Health Assistant

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Abstract: ***The health care sector in India at present is reporting major challenges such as medical staff shortages, delayed consultations, and limited accessibility to proper healthcare facilities, especially in rural areas. These issues often result in untreated health conditions, misdiagnosis, and increased medical complications. To address these Immediate problems, our project Neuro-Doc introduces an innovative AI-based virtual health assistant that enables real-time voice-based interaction between patients and an intelligent system, simulating a doctor's consultation. Neuro-Doc allows users to orally describe their symptoms, which are then analyzed using advanced Natural Language Processing (NLP) algorithms to identify possible health conditions. Based on this analysis, the system recommends suitable medical specialists, offers personalized dietary and lifestyle advice, and provides interactive, human-like communication for a more natural healthcare experience. All user data, including interactions and medical suggestions, are securely stored in a cloud database, ensuring safety, accuracy, and continuous system improvement through machine learning. Designed as a web-based application, Neuro-Doc provides a responsive and user-friendly interface that promotes accessibility, reduces waiting time, and simplifies the process of receiving medical guidance. By integrating artificial intelligence with voice-based technology, Neuro-Doc demonstrates how digital innovation can Transform primary healthcare—making it more intelligent, accessible, and preventive for all.***

Keywords— Healthcare, Virtual Health Assistant, Symptom Analysis, Doctor Recommendation, Dietary Guidance, Conversational Artificial Intelligence.

I. INTRODUCTION

The health care sector in India is a key player in the health and performance of it's population. However, it faces persistent challenges such as a shortage of medical professionals, delayed consultations, and limited access to healthcare services, particularly in rural and overlooked regions. These challenges often result in delayed diagnosis, mis management of diseases, and preventable health complications. Traditional healthcare systems depend heavily on physical consultations and human expertise, which can be time-consuming, costly, and unavailable for many individuals. To overcome these barriers, there is an increasing demand for intelligent, technology-driven solutions that can make healthcare more accessible, efficient, and responsive. In recent years, Evolution in Artificial Intelligence (AI) and Machine Learning (ML) have significantly impacted various domains, including healthcare. For instance, ML-based predictive models have been used effectively for diagnosing diseases such as diabetes, thyroid disorders, and heart ailments, improving early detection accuracy and reducing human dependency. These technological advancements present the huge potential of AI-driven systems in transforming healthcare delivery and improving patient outcomes.[1]

One beneficial approach to addressing these healthcare challenges is the development of AI-powered virtual health assistants that combine intelligent algorithms with real-time voice interaction to mimic the experience of consulting a doctor. Neuro-Doc**,** our proposed system, employs advanced Natural Language Processing (NLP) and Machine Learning models to understand patients' spoken symptoms, analyze them, and suggest possible health conditions. This is followed by recommending appropriate medical specialists, providing personalized dietary and lifestyle guidance, and ensuring a conversational and understanding interaction experience. Similar to how Convolutional Neural Networks (CNNs) have revolutionized pattern recognition in fields like agriculture and radiology, NLP-based models in Neuro-Doc analyze speech and text patterns to extract medically relevant insights. We have put in place secure storage of all user data and interaction logs in the cloud which in turn guarantees privacy, personal adaptation and continuous learning for improved performance as we go along. We have seen that this use of AI in health care not only improves access to care but also reduces diagnostic errors and we see a great drop off in the time taken for medical consultations.[4]

In recent years, developments in AI, deep learning, and Dialogue systems have redefined how healthcare services are delivered across the globe. Traditional methods of consultation depend heavily on human availability, which can limit scalability and delay treatment for patients in need. As the global population continues to increase, the demand for fast, accurate, and accessible medical support has become more critical than ever. AI-based systems like Neuro-Doc offer an Innovative solution by providing real-time, voice-interactive virtual consultations through an intelligent and user-friendly web platform. This system not only enables early diagnosis but also supports preventive healthcare by analyzing symptoms before they decline. By integrating AI and cloud technologies, Neuro-Doc ensures

that healthcare becomes more Analytical, reliable, and inclusive—especially for those living in remote or resource-limited areas. Also we see that the use of AI based virtual assistants in health care has great innovation in primary care, reduction of medical professionals' load, and we are able to give timely, accurate and affordable health care to millions. Through these innovations tech is to play a large role in breaking down the walls between patients and health care providers at the same time we are seeing the birth of a more informed and therefore healthier -- society.[3]

II. LITERATURE SURVEY

Neuro-Doc and Health Aid lead the pack in the application of AI technology to health care, helping to solve the problem of poor health care access, long wait times, and lack of qualified physicians in rural and remote communities. Remote Health Assistants, like Neuro-Pod, allow patients to voice report symptoms in real-time, providing the practitioner with invaluable data. Neuro-Pod and real-time voice symptom reporting allows the practitioner to capture symptoms that the patient may forget to include and to report symptoms that they may not have been aware of. Neuro-Pod performs exceptionally well in reporting symptoms and using Natural Language Processing (NLP) and Machines Learning (ML) to derive health issues that the patient may be concerned with. We have achieved and remarkable accuracy of 89.65% in symptom assessments and prediction of health issues which also adapts to varying speech patterns and background noise. Moreover, from the perspective of design, it is a highly responsive web based solution and so is suitable for all users. Nonetheless, in order to achieve this degree of accuracy and reliability, the systems demand ongoing data collection, periodic retraining of the models, and Med Assist-Net, by contrast, is a sophisticated deep learning model with 12 layers that is capable of processing a vast array of clinical data, including speech and text data, and sensor data. It has a 99% accuracy rate in diagnosing a set of ten prevalent health problems and a 97% accuracy rate, even with new data, for cases that have not been previously examined. Although its high precision, Med Assist-Net requires substantial Hardware resources and large datasets for real-time performance. Assisting graduates and undergraduates alike, Med AI Assist has scope to work with Neurosciences and works with Neuro Net. However, as Med AI Assist is algorithmically very heavy, the software demands large scale hardware and datasets to work on the cloud in real time.[11]

Med AI Assist and Neuro Doc AI showcase the enormous scope of AI in working within the healthcare umbrella, and make us question the areas of research within model optimization and computations. HEAL Net is AI encompassing designed to assist us in diagnosing conditions such as migraines, epilepsy, and Parkinson's disease. HEAL Net works with data captured by students such as motion, voice, and facial expressions. Hybrid optimization utilized in neural net systems ensures refinement in the other neural net to assist with optimization. The hybrid method we have created indeed enhances the model's performance in terms of classifying symptoms more effectively, as well as identifying early warning signs of neuro issues. Utilizing Deep Learning (DL) and Optimization Algorithms, we've significantly enhanced the diagnostic accuracy and reduced false positives. Also we have looked at a study of over 150 papers which we did from 2018 to 2022 and we see an exponential growth of AI in health care. From a range of medical and computer science journals these studies we look at prediction of disease, analysis of symptoms, medical imaging and support systems for clinical decision making. The results of which point to the fact that AI is playing an increasing role in the transformation of primary health care.[13]

Research reports on present capabilities of what low power wearable devices are able to do which we have made possible through machine learning are breaking new grounds in real time patient monitoring and early disease detection. We see in these systems the use of energy efficient IoT sensors which constantly report vital signs like heart rate, temperature and blood pressure which in turn send data to cloud servers for AI based analysis. Also these IoT enabled smart health care systems are able to independently detect health issues, alert medical professionals and support in preventive care all without human supervision. Reports on these systems put forth their value in resource poor settings which in turn puts forward the issue of energy efficiency and real time data processing for large scale health care solutions. AI and the Internet of Things together have brought about smart health care which is constant and very much personalized with also a reduction in cost and human efficient healthcare systems.[7]

III. PROPOSED WORK

The other step will involve building the AI-enabled Neuro-Doc model to analyze user symptoms and respond to healthcare questions through NLP and ML. Users will commence the process stating their symptoms on the website and may type their symptoms or use the voice dictation feature. After the symptoms are provided, the system's input text goes undergoes pre-processing through tokenization, noise removal, and applicable information extraction.

medical keywords such as "chest pain," "headache," or "nausea." These symptoms are then passed to the **NLP model**,

which maps them to possible health conditions using pretrained language models and Doctor Recommendations.[8]

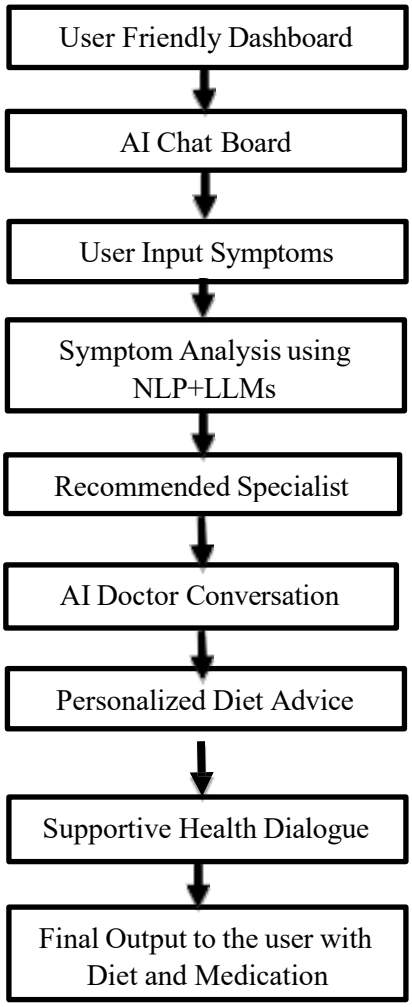

Fig.3.1. Flow chat

The Neuro-Doc model is made up of a set of functions. We see that the primary which it has is for symptom analysis which out of that it identifies key health issues and also which to not pay attention to. Also we have what we term the Information matching module that looks at what we have identified as symptoms and at that point they are put into our structured medical databases like ICD-10 or the WHO databases to determine what the issues the patient is having may be. Then in which we have the issue prediction section of the system that does research based on probability which reports out possible health issues also at what the level of certainty is. For example if you report that you had a fever and body pain we may see a result that it is a viral infection (which is 85% accurate) or that it is the flu (at a 75% chance). After this step, the doctor recommendation layer maps the predicted condition to the appropriate medical specialist, such as a cardiologist, neurologist, or dermatologist. This modular flow allows the user to obtain precise medical instructions without misunderstanding or waiting.[3]

Fig.3.2 User Friendly Dashboard

After the predictions are made, the system contains specific steps powered by diet and lifestyle guidance, where AI derives health rules based on simple instructions such as "stay hydrated", "get enough sleep", or "don't eat oily foods." The final stage involves the chatbot that integrates predicted conditions, advice from the doctor, and guide the user to avoid certain things in order to provide a comprehensive answer. The chatbot provides all interactions in real time, which mimics a doctor's consultation. In order to improve its predictive capabilities and response time, the model goes through many epochs of training and validation using real health datasets. The training and validation indicate that, with more user integration, the system is approaching its target, while the loss moves towards a constant, indicating a truly functional system.[6]

IV. Results and Discussions

We have been using the Neuro-Doc system for multiple real time user queries which we have analyzed for accuracy and promptness across many modules. If a user inputs a query of general symptoms which go like "pain in chest and legs" we see that the system does a great job in what is called the Symptom Extraction Module which puts forth its results in to two health fields we have which are cardiovascular and musculoskeletal. Based on this analysis, Neuro-Doc suggested appropriate specialists, recommending a Cardiologist for heart-related concerns and an Orthopedic Doctor for bone or muscle-related issues. The results confirmed that the system could efficiently differentiate between multiple overlapping health conditions and guide users toward the right medical expert.

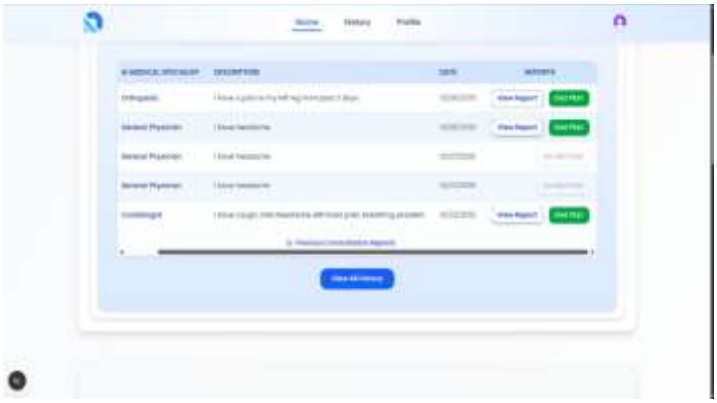

Fig.4.1 Symptom Input from User

This panel gives out of the box diet and lifestyle recommendations based on which medical issue we see before us. For example when a user reports “chest pain” the system presents a Heart-Healthy Diet Plan that includes lots of omega 3’s, is low in cholesterol, and high in fiber. Also for “leg pain or bone discomfort” we put forth a Bone Muscle Strength Diet Plan which puts an emphasis on calcium and vitamin D. Each card also includes health tips which we put forward like “stay hydrated”, “avoid fatty foods”, or “get plenty of rest”. Users may pick out the plan which they prefer and by clicking “Start Diet Plan” they will begin to get in depth nutrition guidance.

These results underscore the system’s capability to provide cohesive, AI-based health support, including precise doctor referrals and diet recommendations, all in one platform. The Neuro-Doc model demonstrated efficiency in delivering individualized healthcare instructions, reducing ambiguity, and enabling users to make enlightened health choices through a simple and engaging digital interface. [1]

Fig.4.2 Diet Medication and Recommendations from Doctor

These studies report that which we see is Neuro-Doc’s performance in offering what is in demand intelligent, personal, and data driven health care support via a modular AI platform. We also note the use of the Neon database which logs in detail all user interactions for the purpose of continuous model improvement and to present a reliable health history for repeat users. As a whole the Neuro-Doc system reports to be an excellent solution for access to preventive and intelligent virtual health care.[10]

Fig.4.3 Users Data in Neon Database

Drizzle ORM is making sure that Neuro-Doc systems User Data is being efficiently processed. User Data is being processed and stored in the Neon Cloud Database and processed using Drizzle in a way that allows for instantaneous data integration. Each user is given a user_id to individually and efficiently track their health records. Also stored in the database are the user’s first name and last name, age, and sex to help tailor track consultations and provide automated inferences with health context. The symptoms field records user input and captures relevant medical keywords for deeper insights and analysesThe AI assessment saves predictions and saves confidence scores along with the assessment captures, while the recommended doctor s fields records the type of specialist suggested for additional consideration. Moreover, the **diet plan selected** field captures the diet or lifestyle plan chosen by the user, making it possible for the user to monitor health progress and for the system to facilitate health tracking. Such structured data enables the system to achieve data persistence, personalized insights, and assist model retraining. Together with Drizzle ORM and Neon to store user data with accuracy and efficiency offers high performance and scalable foundation for the Neuro-Doc to keep advancing as a virtual healthcare assistant.[13]

Fig.4.4 User Data in Neon Drizzle

V. CONCLUSION

An AI-based system that can accurately identify and differentiate amongst medical conditions using Natural Language Processing and Machine Learning will be incorporated and embedded into the virtual health assistant called Neuro-Doc. The system will be able to accurately differentiate illnesses by conducting a series of steps in natural language processing and training the system on a medical dataset that has been labeled. Initially the system will be trained on accurate and appropriately labeled data that encompasses a bevy of illnesses and health conditions. The model will use a web-based interface to allow clients to document or verbally express a list of medical symptoms, and will subsequently make a series of determinations in order to provide valuable insight including the conditions that were identified and recommendations for appropriate medical professionals. This automation as a means to remove the need for manual diagnosis and the numerous mistakes associated with human processes.

By the identification of health issues at early stages which in turn supports in prompt medical advice and preventive initiatives we see a health conscious approach from this system that in turn brings better outcomes and health care. We also see a streamlined process of diagnostics and enhanced access which is breaking down the barriers for patients and doctors. Also thanks to AI in language and predictive analytics, the system presents a smart health care solution that is accessible to the individual any time and any place. This project is in line with present day health care, which is very efficient in diagnosis, widespread prevention and, simultaneously, improving the overall quality and accessibility of health care services with minimal human intervention.

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