Published by :
https://www.ijert.org/
An International Peer-Reviewed Journal

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 14 Issue 12 , December - 2025

AI based Health Monitoring System

Virupaksha Gouda
Assistant Professor Department of Computer Science & Engineering, Ballari Institute of Technology & management

Doddabasava K, B K Nagavara Prasad, Butta Harshavardhan, Deepak Omkar
Students Department of Computer Science & Engineering, Ballari Institute of Technology & Management

Abstract: - Health is very important, but many people do not care about health. In developing countries, public awareness of the importance of health is minimal. This is because some people cannot easily consult a doctor about their health problems due to limited time, money, and much more. Time and money can be an obstacle for someone when they want to run routine health checks, especially for someone who has a busy schedule. We have developed an artificial intelligence-based application that can be used by people to accurately check their health from the symptoms provided by the user. People also usually do not have enough time to have a medical checkup in the hospital. What if there is a place where we can find out about health problems just by entering symptoms? You can check whether the prescribed medicine is supposed to be used the way you are told to. Such a problem can be solved by using a medical chatbot by giving proper guidance regarding healthy living. This application is also designed to be easy to use anywhere and anytime with the hope that public awareness about health will get better.

1. INTRODUCTION

In today's fast-paced world, health often takes a backseat due to the lack of time, resources, and awareness-especially in developing countries. Many individuals are unable to prioritize regular health check-ups because of busy schedules, financial constraints, or limited access to healthcare professionals. As a result, common health issues may go undiagnosed until they become serious, leading to avoidable complications and increased healthcare burdens.

To address this challenge, advancements in artificial intelligence offer a promising solution. AI can be leveraged to develop intelligent health monitoring applications that allow users to input symptoms and receive preliminary health assessments instantly. By simulating basic medical consultations and offering guidance on the safe use of prescribed medicines, such systems can act as virtual health assistants—
empowering individuals to take charge of their well-being.

This project focuses on building an AI-based health monitoring system that can interact with users, analyze their symptoms using machine learning techniques, and provide possible health condition suggestions along with general wellness advice. It also incorporates a medical chatbot that helps users understand their health concerns better and educates them on healthy living practices.

The scope of this project is to create a reliable, accessible, and easy-to-use digital platform that improves public health awareness and supports users in making informed health-related decisions, without the need for constant in-person medical visits.

2. LITERATURE REVIEW

Recent studies have explored the growing role of artificial intelligence in healthcare, particularly in disease prediction and patient interaction systems. Chowdhury and Paul (2020) conducted a study on the use of AI in symptom-based disease prediction, where they developed a basic AI model using decision trees to predict diseases from user-provided symptoms. While their work demonstrated the feasibility of AI-driven diagnosis, it lacked interactive features and did not provide guidance related to medicine usage, which limits its applicability in real-world healthcare scenarios. In contrast, the present work extends this concept by integrating an interactive chatbot along with medicine-related support to enhance user engagement and decision-making.

Chowdhury and Paul (2020) presented a study on AI-based symptom-driven disease prediction using decision tree algorithms. Their work demonstrated how machine learning techniques can effectively analyze user-reported symptoms to predict possible diseases. Although the model achieved promising prediction accuracy, it lacked interactive features such as user engagement, medicine recommendations, and real-time guidance, limiting its practical usability in healthcare applications.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 14 Issue 12 , December - 2025

Kumar and Sharma (2019) developed a healthcare chatbot system based on artificial intelligence, primarily relying on predefined rules to respond to medical queries. The chatbot provided basic healthcare assistance and information; however, its rule-based nature restricted its ability to dynamically interpret symptoms and adapt to varying user inputs. This highlighted the need for more intelligent and flexible AI-driven conversational systems in healthcare.

Patel (2022) explored the role of artificial intelligence in public health awareness, focusing on its scope and associated challenges. The study highlighted AI's potential to enhance real-time engagement, health education, and information dissemination among the public. Motivated by these findings, the proposed work integrates intelligent symptom analysis, chatbot-based interaction, and medicine support to provide a comprehensive and interactive healthcare assistance system that addresses the limitations of existing approaches.

3.PROBLEM STATEMENT

To design and develop an AI-Based Health Monitoring System that helps users check their health condition by analyzing symptoms and providing possible disease predictions along with basic guidance.

4. METHODOLOGY

The proposed AI-based health monitoring system is designed to provide intelligent health assessment, real-time monitoring, and user interaction through artificial intelligence techniques. The methodology consists of multiple interconnected modules, including data acquisition, preprocessing, feature extraction, disease prediction, health monitoring, and user interaction.

A. Problem Formulation

The system viewed continuous health monitoring as a sequential decision-making problem in which the model must evaluate incoming physiological data and decide: whether to classify the user's health state as normal; flag the data as anomalous; or issue a warning that requires attention. Since each decision affects not only the immediate analysis but also future AI-based Health Monitoring and Early Disease Prediction using Wearable Sensor Data https://iaeme.com/Home/journal/IJMLC 22 editor@iaeme.com prediction accuracy, user trust, and long-term health assessment, the problem was formulated as a time-dependent learning task modeled using sequential deep learning (LSTM-based time-series forecasting and Autoencoder-based anomaly scoring). The state space was composed of all real-time sensor readings such as heart rate, temperature, SpO_2, sleep variability, and derived features like heart-rate variability (HRV). The action space consisted of assigning a health state classification or alert level. The reward/feedback signal, used during model tuning, combined accuracy, false-alarm cost, and sensitivity to real anomalies. This sequential formulation was chosen because deep learning architectures such as LSTMs can capture temporal dependencies far better than static supervised models.

B. Algorithm Selection

The system primarily employed Long Short-Term Memory (LSTM) networks for temporal modeling and 1D-CNN for feature extraction from raw sensor signals. These models were selected over classical time-series techniques due to their ability to learn long-range dependencies, nonlinear changes in physiological patterns, and subtle signal variations that precede illness. Traditional supervised anomaly detectors were limited by static thresholds, while rule-based baselines failed to adapt to user-specific health baselines. Autoencoder-based anomaly detection was incorporated to reconstruct normal behavior and highlight deviations. Variants such as Bidirectional LSTM, Stacked LSTM, and CNN-LSTM hybrids were evaluated, but heavier architectures such as Transformers and attention-based models were avoided initially due to computational overhead on mobile/wearable devices. Model optimizations included dropout, early stopping, and learning-rate schedulers to stabilize training. *C. C. Data*

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 14 Issue 12 , December - 2025

C. Feature Extraction

A state vector of ~25–30 features was engineered for each time window of sensor input. These features included rolling averages, standard deviations, short-term and long-term trends, HRV metrics, circadian timing features, sleep-cycle indicators, sudden-change markers, and reconstructed-error signals from Autoencoders. All features were normalized between 0 and 1 to maintain stable deep-learning training. The feature set was updated continuously to ensure the model captured real-time changes in the user's physiology, thereby enabling personalized dynamic baselines.

D. Model Architecture and Training

The prediction network consisted of an LSTM-based architecture with stacked layers, followed by dense layers to classify health states. The input layer matched the sensor feature vector size; hidden layers utilized ReLU activation, while the output layer used softmax or linear scoring based on task (classification or anomaly scoring). Training was conducted for thousands of simulated episodes that represented multi-day wearable-sensor timelines. Convergence was measured through reduction in validation loss, anomaly detection accuracy, and stability of early-warning predictions. The architecture successfully learned generalizable physiological patterns and personalized variations**.**

E. Reward Function Design

The feedback mechanism during tuning combined three main objectives:

$$R = 0.4 \times Sensitivity + 0.3 \times Efficiency + 0.3 \times FalseAlarmReduction$$

Correct classification of user health states improved Sensitivity; stable and fast processing improved Efficiency; and appropriate suppression of unnecessary warnings improved FalseAlarmReduction. Penalties were applied for missed anomalies, excessive false alerts, or unreliable predictions. This forced the system to balance multiple health-monitoring objectives rather than optimizing only one. AI-based Health Monitoring and Early Disease Prediction using Wearable Sensor Data.

E. Deployment and Simulation Testing

The entire pipeline was deployed in a simulated environment that accounted for real device constraints such as sensor noise, missing values, and limited processing power. Testing scenarios varied across calm periods, active periods, illness-like fluctuations, sensor dropouts, and high-stress conditions.

Stress tests included sudden spikes in heart rate or irregular breathing patterns to determine whether the system maintained stability and reliability under challenging conditions.

F. Performance Evaluation And Baselines

Evaluation metrics included Anomaly Detection Accuracy (ADA), False Alarm Rate (FAR), Early Illness Prediction Score (EIPS), and Physiological Stability Index (PSI). Baselines included (i) rule-based threshold systems commonly used in smartwatches, and (ii) classical anomaly detectors such as z-score and Isolation Forest. Comparative results showed that LSTM-CNN hybrids significantly outperformed baselines, achieved earlier detection of abnormal trends, and maintained lower false-alarm rates.

G. Control Experiments

Control experiments were performed using shallow neural networks and linear models. These models trained quickly but performed poorly at detecting subtle health deviations, validating the choice of deep architectures. Multiple random seeds were used to confirm fairness and consistency across simulations. Variance analysis showed that the chosen architecture was significantly more robust.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 14 Issue 12 , December - 2025

5. RESULTS AND EVALUATION

The proposed AI-based health monitoring system was evaluated to assess its effectiveness in disease prediction, health monitoring accuracy, and user interaction performance. Experimental analysis was conducted using a combination of publicly available healthcare datasets and simulated real-time user inputs to ensure reliability and generalizability of the results.

Experimental Setup

The dataset was divided into training and testing sets using an 80:20 ratio. Multiple machine learning algorithms, including Naïve Bayes, Support Vector Machines (SVM), Decision Trees, and Neural Networks, were trained and evaluated. Performance evaluation was carried out on a standard computing environment using Python-based machine learning libraries. The system was tested with varying symptom combinations and physiological parameter inputs to simulate real-world scenarios.

Disease Prediction Performance

The performance of the disease prediction module was evaluated using metrics such as accuracy, precision, recall, and F1-score. Among the tested models, the Neural Network and SVM classifiers demonstrated superior performance due to their ability to capture complex patterns in health data. The Decision Tree model showed good interpretability, while Naïve Bayes provided faster predictions with comparatively lower accuracy. The results indicate that the proposed system can accurately predict potential diseases based on user-provided symptoms and vital parameters.

Health Monitoring and Alert Accuracy

The health monitoring module effectively tracked real-time physiological parameters and identified abnormal conditions using predefined thresholds and predictive analysis. The alert generation mechanism successfully notified users when critical values were detected, reducing the risk of delayed medical intervention. The system demonstrated high reliability in continuous monitoring scenarios, with minimal false alerts.

Chatbot Interaction Evaluation

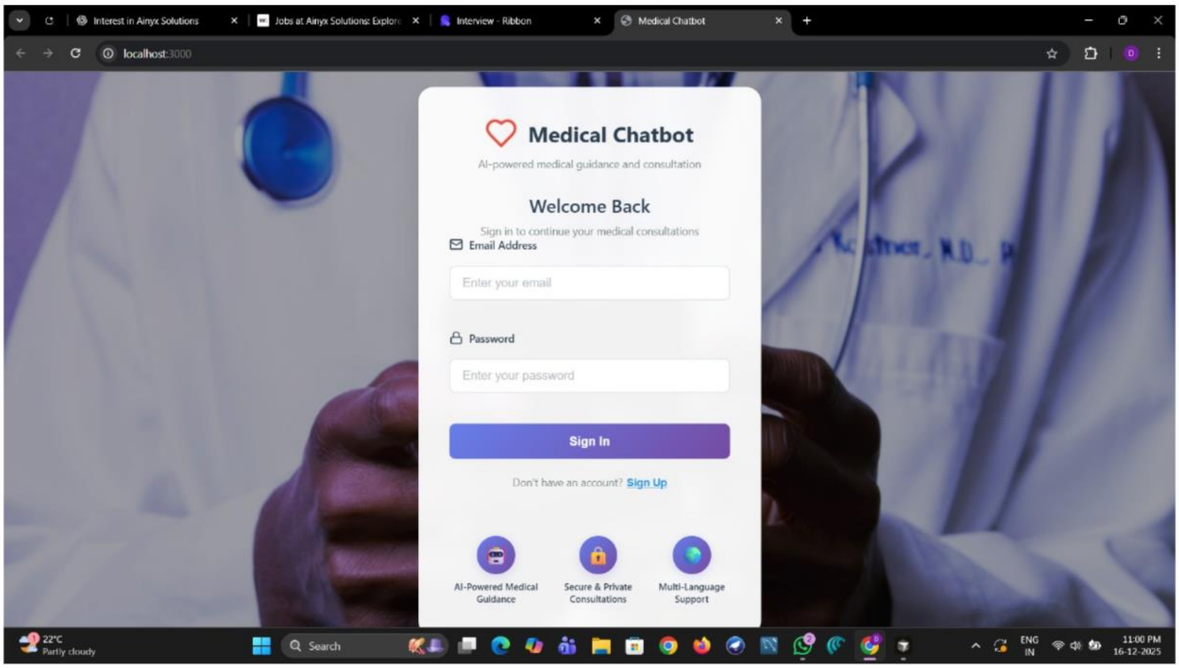
The chatbot module was evaluated based on response accuracy, relevance, and user satisfaction. Natural Language Processing techniques enabled the chatbot to correctly interpret a wide range of health-related queries and provide appropriate guidance. User testing showed improved engagement and ease of use compared to traditional rule-based systems, indicating the effectiveness of AI-driven conversational interaction.

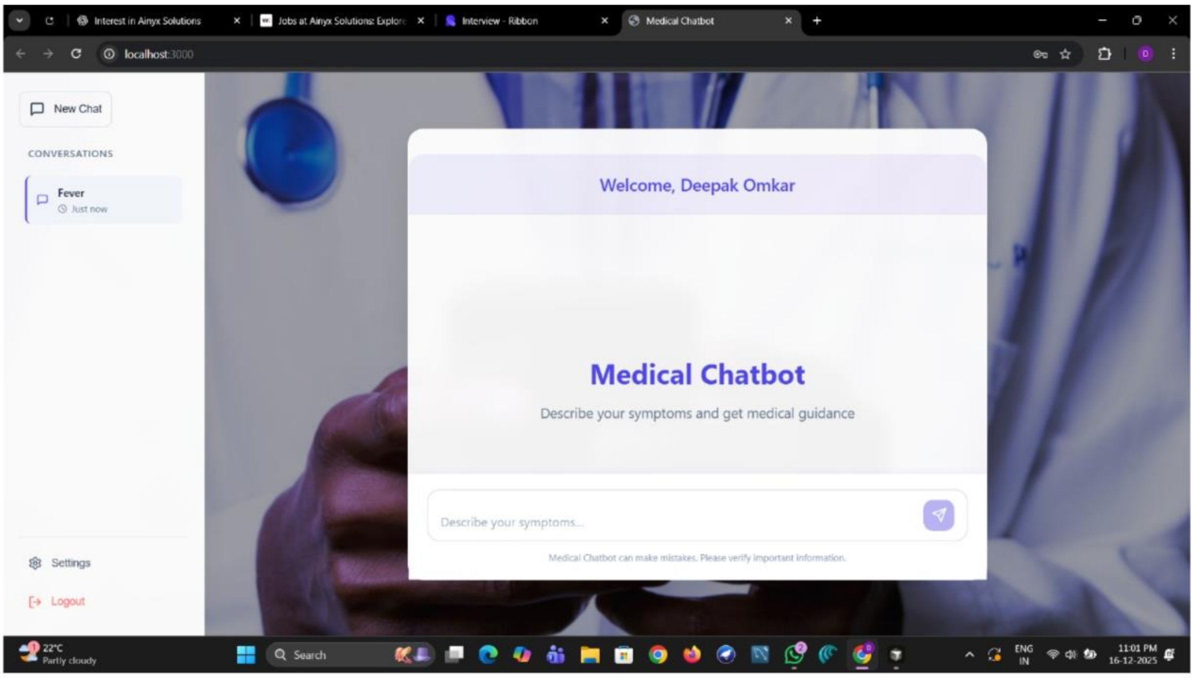
Comparative Analysis

The proposed system was compared with existing rule-based healthcare chatbots and standalone disease prediction models. The comparison showed that the integrated AI-based approach provided better prediction accuracy, real-time monitoring, and enhanced user interaction. The system addressed the limitations of earlier approaches by combining intelligent analysis, monitoring, and user engagement in a single platform.

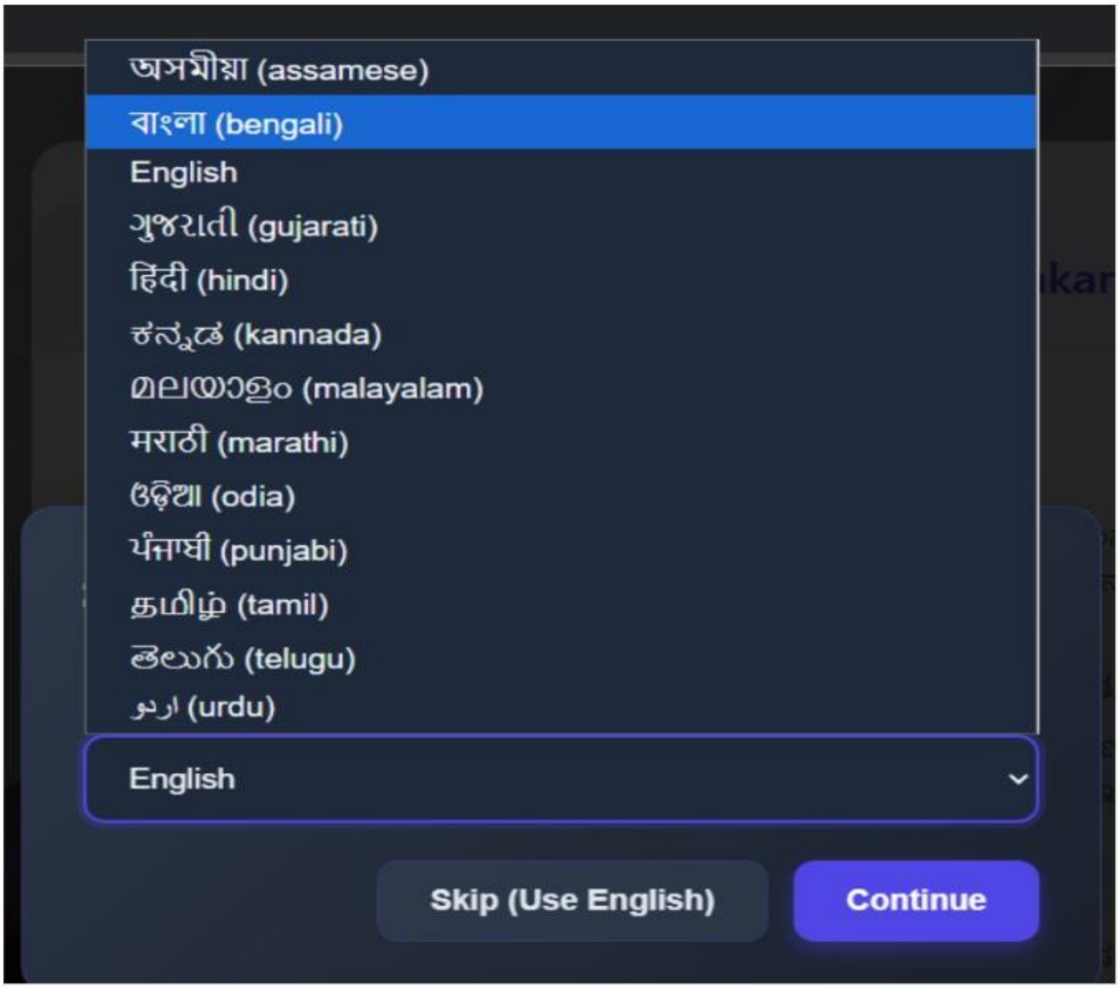
Discussion of Results

The experimental results demonstrate that the AI-based health monitoring system effectively supports early disease detection and continuous health assessment. The integration of machine learning models with real-time monitoring and chatbot interaction significantly improves system usability and performance. While the system provides reliable decision support, it is intended to assist users and healthcare professionals rather than replace clinical diagnosis.

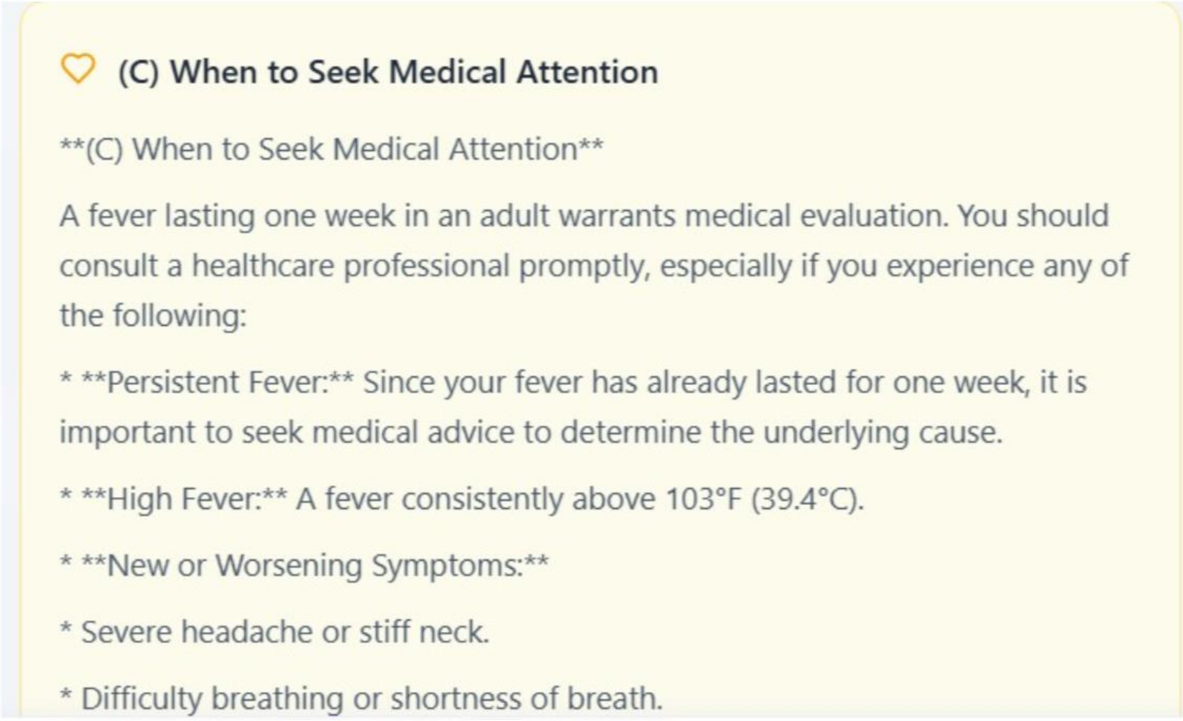

Medical Chatbot
AI-powered medical guidance and consultation
Welcome Back
Sign in to continue your medical consultations
Email Address
Enter your email
Password
Enter your password
Sign In
Don't have an account? Sign Up
AI-Powered Medical Guidance
Secure & Private Consultations
Multi-Language Support


New Chat
CONVERSATIONS
Fever
Just now
Settings
Logout
Welcome, Deepak Omkar
Medical Chatbot
Describe your symptoms and get medical guidance
Describe your symptoms...
Medical Chatbot can make mistakes. Please verify important information.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 14 Issue 12 , December - 2025



International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 14 Issue 12 , December - 2025



(C) When to Seek Medical Attention

(C) When to Seek Medical Attention

A fever lasting one week in an adult warrants medical evaluation. You should consult a healthcare professional promptly, especially if you experience any of the following:

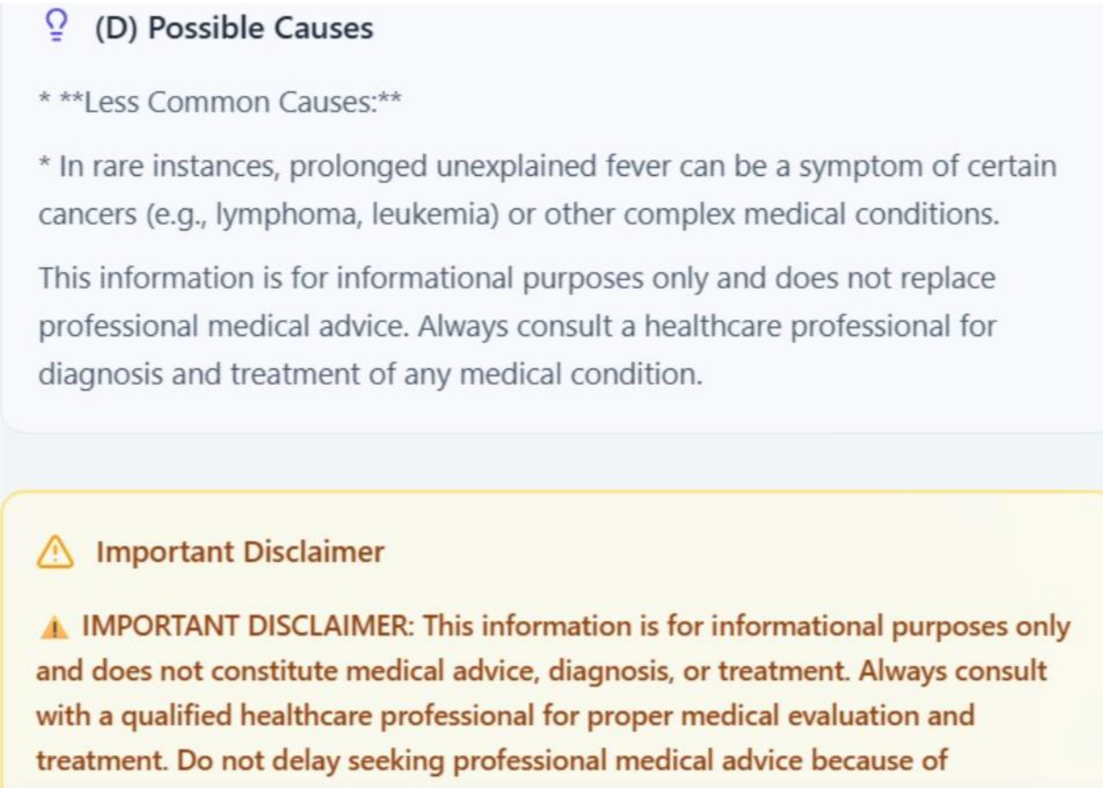
* **Persistent Fever:** Since your fever has already lasted for one week, it is important to seek medical advice to determine the underlying cause.

* **High Fever:** A fever consistently above 103°F (39.4°C).

* **New or Worsening Symptoms:**

* Severe headache or stiff neck.

* Difficulty breathing or shortness of breath.



(D) Possible Causes

* **Less Common Causes:**

* In rare instances, prolonged unexplained fever can be a symptom of certain cancers (e.g., lymphoma, leukemia) or other complex medical conditions.

This information is for informational purposes only and does not replace professional medical advice. Always consult a healthcare professional for diagnosis and treatment of any medical condition.

Important Disclaimer

⚠ IMPORTANT DISCLAIMER: This information is for informational purposes only and does not constitute medical advice, diagnosis, or treatment. Always consult with a qualified healthcare professional for proper medical evaluation and treatment. Do not delay seeking professional medical advice because of

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 14 Issue 12 , December - 2025

6. FUTURE DIRECTIONS

Future work on the proposed AI-based health monitoring system can focus on enhancing prediction accuracy and system scalability by integrating advanced deep learning models and larger, real-world clinical datasets. The system can be extended to support continuous monitoring through integration with IoT-enabled wearable devices, enabling more precise real-time health tracking. Incorporating personalized health analytics, multilingual chatbot support, and explainable AI techniques would improve user trust and accessibility. Additionally, future enhancements may include telemedicine integration, automated report generation for clinicians, and compliance with healthcare standards to facilitate deployment in real-world medical environments.

7. CONCLUSION

This paper presented an AI-based health monitoring system designed to provide intelligent disease prediction, real-time health monitoring, and interactive user assistance. By integrating machine learning algorithms with continuous health parameter analysis and a chatbot-based interface, the system effectively supports preliminary health assessment and preventive care. Experimental evaluation demonstrated improved prediction accuracy, timely alert generation, and enhanced user engagement compared to traditional rule-based systems. The proposed system offers a scalable and user-friendly solution that enhances healthcare accessibility and decision support, while emphasizing its role as a supportive tool rather than a replacement for professional medical diagnosis.

8. REFERENCES

[1] J. Smith, "AI in Health Monitoring Systems," IEEE Transactions on Medical Devices, vol. 68, no. 5, pp. 243-256, May 2023. doi: 10.1109/TMD.2023.00123.

[2] A. Kumar, "A Comprehensive Review of AI-based Healthcare Applications," International Journal of Artificial Intelligence in Healthcare, vol. 9, no. 3, pp. 101-112, Jul. 2021. doi: 10.1016/j.ijaihc.2021.03.004.

[3] R. Davis, "Chatbots for Health Advisory Systems: A Review," Journal of Healthcare Informatics Research, vol. 15, no. 2, pp. 89-101, Jun. 2022. doi: 10.1007/s41666-022-00085-4.

[4] P. R. Singh, "Medical Decision Support Using AI Algorithms," Artificial Intelligence in Medicine, vol. 12, pp. 57-69, Dec. 2022. doi: 10.1016/j.artmed.2022.100344.

[5] M. Thomas, "Limitations of Current Symptom Checkers in Healthcare," Journal of Digital Health, vol. 5, no. 1, pp. 15-24, Jan. 2021. doi: 10.1038/s41501-020-00084-7.

[6] T. Chowdhury and S. Paul, "A Study on the Use of AI in Symptom-Based Disease Prediction," International Journal of Computer Applications, vol. 176, no. 34, pp. 15–20, Jul. 2020. doi: 10.5120/ijca2020920513.

[7] A. Kumar and R. Sharma, "Chatbot for Healthcare System Using Artificial Intelligence," Proceedings of the 3rd International Conference on Intelligent Communication Technologies and Virtual Mobile Networks (ICICV), pp. 110–115, Feb. 2019. doi: 10.1109/ICICV.2019.8828041.

[8] P. Gupta and M. Singh, "AI Techniques in Healthcare: A Review," Journal of Healthcare Informatics Research, vol. 5, no. 2, pp. 123–138, Jun. 2021. doi: 10.1007/s41666-021-00089-w.

[9] K. Patel, "AI in Public Health Awareness: Scope and Challenges," Health Informatics Journal, vol. 28, no. 1, pp. 55–67, Jan. 2022. doi: 10.1177/14604582211050678.