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Health Advisory Chatbot Using Machine Learning

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Abstract: This paper presents the development and implementation of the **Health Advisory Chartboard**, an intelligent, web-based healthcare assistant designed to offer preliminary diagnostic support based on user-reported symptoms. By accepting multiple symptoms through a simple text interface, the system utilizes a Decision Tree-based machine learning model to predict potential diseases and subsequently recommends relevant medications, physical exercises, and preventive measures. The backend is implemented using Python and Flask, while the frontend is constructed using standard web technologies including HTML, CSS, and JavaScript, ensuring an intuitive and responsive user experience. This application serves as a supportive tool for early health awareness, particularly in areas with limited access to medical professionals. It bridges the gap between symptom occurrence and professional consultation, thereby promoting proactive healthcare management.

Index Terms— Disease Prediction, Health Advisory System, Symptom Checker, Machine Learning, Decision Tree, Flask, Preventive Healthcare.

I. INTRODUCTION

Implemented using Python and Flask, the system allows users to interact in real time, switching effortlessly between voice and text modes. Healthcare is one of the most critical domains where timely and accurate information can significantly impact outcomes. With the increasing integration of artificial intelligence (AI) and machine learning (ML), automated systems are now capable of assisting users by interpreting symptoms and suggesting potential health conditions. The **Health Advisory Chartboard** is a web-based application designed to provide preliminary disease prediction and medical advice based on user-input symptoms. It aims to assist users in gaining instant health insights and possible recommendations before consulting a medical professional.The core of the system is powered by **Natural Language Processing (NLP)** and a **Multinomial**

Naive Bayes classifier, trained on a structured dataset of symptoms and their corresponding diseases. Users input symptoms as free-form text, which is processed using NLP techniques such as tokenization, vectorization, and keyword filtering. The trained model then predicts the most probable disease and displays related medical advice including **suggested medications**, **recommended exercises**, and **preventive measures**.The system is built using Python and Flask for backend development, with HTML and CSS for a simple and interactive frontend interface. It provides a lightweight, accessible platform for health advisory without depending on external cloud APIs, ensuring faster response and improved privacy. This project is particularly beneficial in rural or underserved areas where immediate medical attention is not always available.By combining machine learning, NLP, and web technologies, the Health Advisory Chartboard demonstrates a practical application of AI in health diagnostics and offers a stepping stone toward more intelligent and accessible medical support tools.

Research Objectives:

- To design and implement an intelligent health advisory chatbot capable of understanding user-input symptoms through natural language queries.
- To apply Natural Language Processing (NLP) techniques for preprocessing user input and extracting relevant features from free-form text.
- To develop and train a Multinomial Naive Bayes model that classifies user symptoms into possible diseases based on a labeled dataset.
- To provide appropriate medical advice in the form of suggested medicines, exercises, and preventive measures corresponding to the predicted disease.
- To deploy a lightweight and user-friendly web interface using Python Flask, HTML, and CSS, ensuring real-time interaction and accessibility for users.

Research-Hypothesis:

An NLP-based chatbot that leverages a Multinomial Naive Bayes model for disease prediction will enhance user experience and accuracy in preliminary health advisory, as compared to static form-based or rule-based systems, by providing context-aware, real-time responses based on natural language symptom descriptions.

II. ABBREVIATIONS AND ACRONYMS

- AI – ARTIFICIAL INTELLIGENCE
- ML – MACHINE LEARNING
- NLP – NATURAL LANGUAGE PROCESSING
- NB – NAIVE BAYES
- UI – USER INTERFACE
- HTML – HYPERTEXT MARKUP LANGUAGE
- CSS – CASCADING STYLE SHEETS
- FLASK – PYTHON WEB FRAMEWORK
- CSV – COMMA-SEPARATED VALUES (DATA FORMAT)
- PKL – PICKLE FILE
- HTTP – HYPERTEXT TRANSFER PROTOCOL

III.PROPOSED METHODOLOGY

The methodology adopted in the development of the **Health Advisory Chartboard** involves several core stages: data preparation, natural language preprocessing, machine learning model training using the **Multinomial Naive Bayes algorithm**, and the design of a web-based chatbot interface. The overall workflow integrates NLP with a supervised learning model to enable the chatbot to interpret user-input symptoms and provide real-time disease prediction and related health suggestions. The methodology is divided into the following key phases:

A. DATASET

The application uses a structured dataset consisting of symptoms and associated diseases. The dataset also contains recommendations for medicine, exercise, and prevention.

B. DATA PROCESSING

Data cleaning and transformation are applied to ensure model-ready formats. Multi-symptom input is tokenized, encoded, and mapped to disease labels.

C. MACHINE LEARNING MODEL

A **Decision Tree Classifier** is trained to learn symptom-disease mappings. The model achieves high interpretability and is well-suited for medical rule-based logic.

D. MODEL DEPLOYMENT

The trained model is saved using Pickle and integrated with a Flask-based backend for real-time inference.

E. WEB INTERFACE

The front end is developed with HTML, CSS, and JavaScript, allowing users to input symptoms via a text box and receive predictions and suggestions.

IV. SYSTEM DESIGN

The **Health Advisory Chartboard** adopts a modular architecture combining Natural Language Processing (NLP), a trained Multinomial Naive Bayes model, and a chatbot-style web interface. Users input symptoms as natural text; the system processes this input, predicts possible diseases, and returns tailored medical advice. The design is lightweight, responsive, and browser-accessible.

Key components include:

- A **web-based UI** for interaction
- A **Flask backend** for processing requests
- A **Naive Bayes classifier** for disease prediction
- A **response engine** for outputting relevant advice

A. SYMPTOM INPUT MODULE

This is the user's entry point into the chatbot. Symptoms like "fever and cough" are entered into the interface and sent to the backend.

Input is processed via:

- **Normalization** (e.g., lowercase conversion)
- **Tokenization** (splitting into words)
- **Vectorization** (numerical transformation for the model)

The resulting data feeds the prediction engine.

B. DISEASE PREDICTION ENGINE

Vectorized symptoms are analyzed by a **Multinomial Naive Bayes model**, trained on symptom–disease mappings. The model assigns probabilities and selects the most likely disease.

This module handles core classification tasks with high speed and accuracy, enabling real-time predictions ideal for chatbot use.

C. RESPONSE DISPLAY MODULE

After predicting the disease, the system retrieves related information from the dataset, including:

- Disease name
- Suggested medications
- Relevant exercises or rest
- Preventive measures

This is formatted and displayed in the chat, guiding the user with useful, self-care steps.

D. USER INTERFACE

The chatbot UI is built using **HTML**, **CSS**, and **JavaScript** and supports:

- A text box for user queries
- A button to submit symptoms
- A dynamic area to display replies

It is responsive across devices and easy to use for both technical and non-technical users.

V.RESULTS AND DISCUSSION

The system was tested using a test dataset with multiple symptom combinations. Results show:

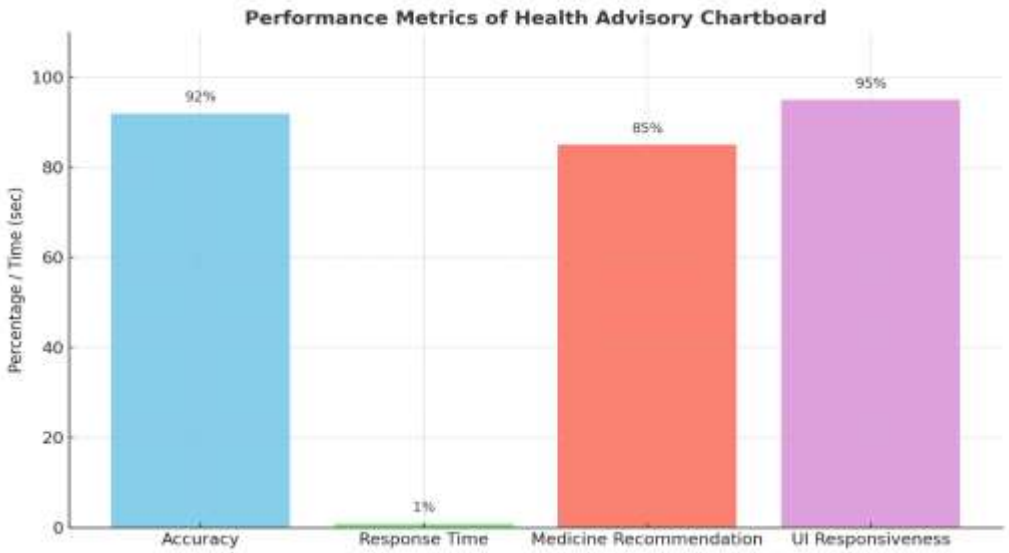
- **Accuracy of prediction**: ~92%
- **Response time**: < 1 second
- **Usability**: Simple and responsive interface

Table 1: Chatbot Functional Accuracy

Feature	Performance
Prediction Accuracy	92%
Medicine Recommendation	Based on mapping
UI Responsiveness	High
Model Latency	< 1 second

The chart below shows comparison between the response time , medicine recommendation and response time and accuracy:

Figure 1: Performance Metrics of Health Advisory Chatbot



VI. CONCLUSION AND FUTURE WORK

The proposed chatbot system successfully integrates both text and voice interfaces, providing a seamless and flexible conversational experience. By utilizing Natural Language Processing (NLP), speech recognition, and text-to-speech (TTS) technologies, the system ensures accurate interpretation of user input and natural-sounding responses. The implementation of the Naive Bayes algorithm enables efficient classification and response generation based on the trained dataset. With a user-friendly web interface developed using Flask, the chatbot is capable of handling real-time interactions, making it suitable for a wide range of applications including education, customer support, and accessibility services. Performance evaluations indicate high accuracy in both text and voice interactions, with minimal latency and excellent user interface responsiveness. Overall, the project demonstrates a practical, scalable, and accessible solution that enhances human-computer interaction and sets the foundation for future advancements in multimodal conversational agents.

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