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Developing a system based on Chabot for detecting Epidemics in educational institution

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Abstract

This study presents an intelligent Chabot system powered by Artificial Intelligence (AI) techniques, including GPT-based natural language processing (NLP), designed to predict potential diseases and analyze symptom overlap based on user inputs. The Chabot interprets symptoms entered by users and offers a probabilistic diagnosis that outlines the likelihood of multiple diseases, inclusive of health guidance. In the cases above, the results of expert evaluations came up with very high satisfaction regarding the overall performance of the Chabot: most physicians and specialists said that the system gave only accurate, user-friendly, and efficient data for getting reliable diagnostic information. Besides, the Chabot design makes the identification of data faster and provides support for effective diagnostic protocols; thus, a device highly useful for medical diagnostics and epidemic management is developed, reaching an accuracy rate of as much as 97.5% compared to expert assessment.

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1. Introduction

A Chabot is automated software that interacts with humans. The general catboats make use of NLP and ML algorithms for understanding and conversationally responding to user queries. On the other hand, ChatGPT is an AI-driven Chabot dependent on deep learning techniques for information processing. This Chabot was created by OpenAI Inc. of San Francisco, CA, USA, using NLP, which makes text-based answers to users' inputs. It is designed on the generative pre-trained transformer architecture that represents a large-scale language model or LLM capable of performance of various language-related tasks [1].

The conversational agent, popularly known as a Chabot, is a computer program that is designed to simulate human interaction by allowing users to converse with it through voice commands, text-based communication, or both [2, 3]. There are basically two kinds of catboats: the rule-based and AI-based catboats [4]. Rule-based catboats just operate on delivering responses based on the pre-defined sets of rules. These work on "if-then" logic to match the input to the user with corresponding responses; sometimes, even keywords or specific commands need to be used by the users, as is the case in Telegram bots. Their capabilities are rather limited, in that they may not identify variations in spelling, dialects, or inputs that don't fall within their pre-set bounds.

AI chatbots leverage artificial intelligence technologies, including machine learning and natural language processing (NLP), to facilitate interaction with users through natural language communication [5]. Machine learning empowers these chatbots to identify patterns in user inputs, make informed decisions, and improve their performance based on previous conversations. NLP enables chatbots to process and extract structured information from unstructured language inputs, allowing them to mimic human conversational behavior effectively. This capability enables AI chatbots to understand the context of a conversation, even in the presence of spelling errors, allowing users to communicate naturally without strict adherence to predefined commands or keywords [6]. As a result, AI chatbots outperform rule-based models in both versatility and accuracy [7, 8].

Applications of chatbots abound in diverse fields, including intelligent customer e-support and virtual personal assistants, management of financial conversational systems, support of physical health via ECAs, virtual counseling, and pedagogical conversational agents to improve education [9].

Infectious diseases are the products of pathogens that emanate from another individual or animal to penetrate a person's body, causing much damage to individual and social life. These diseases can be very dangerous during their outbreaks because they come with great health risks to human beings [10].

The basic function of the epidemic detection chatbot consists of symptomatology extraction and its interpretation. NLP enables the processing of unstructured text input supplied by the users via such systems. Symptoms initially described are represented in a structured manner to enable further matching with the profiles of various known diseases. Pre-trained language models, such as BERT (Bidirectional Encoder Representations from Transformers) and its biomedical variant BioBERT, proved very effective in the extraction and interpretation of complex medical terminology from free-text input [11]. These models allow a chatbot to identify symptoms correctly and relate them to certain diseases, thus enhancing the capability of a chatbot in detecting the early signs of an epidemic.

With an epidemic, the identification of symptoms must be precise. Most of the early symptoms of infectious diseases, such as fever, coughing, and fatigue, have symptoms that are common for conditions from the seasonal flu to more serious ones like COVID-19 or dengue fever [12]. The NLP algorithms in these chatbots should be so attuned as to be able to tell them apart. Recent studies have illustrated that symptom-based surveillance with chatbots, when complemented by real-time data analysis, can handily enhance outbreak detection through the application of machine learning models to historical and real-time data [1].

The geographic and temporal data analysis is integrated into many chatbot systems to enhance the precision of epidemic detection. Aggregated symptom reports of users in particular regions, when analyzed for temporal trends, may suggest symptom clusters indicative of an outbreak. This method of syndromic surveillance has been demonstrated successfully in applications like COVID-19 detection using online symptom checkers [13]. Although early efforts faced limitations in terms of data quality and algorithm precision, advancements in NLP and machine learning have led to more accurate epidemic detection models.

This paper introduces a Developing a system based on chatbot for detecting Epidemics in educational institution. The structure of this paper is organized as follows: Section 2 discusses the related works, Section 3 describes the contributions of the proposed system, and Section 4 presents an implementation for the proposed system, the last section discusses the Experimental results achieved using various combinations.

2. Related work

Gopi Battineni et al. (2020) conducted a study titled "AI Chatbot Design during an Epidemic like the Novel Coronavirus," addressing the challenges faced by healthcare systems, particularly in remote areas, during the COVID-19 pandemic. With the increase in cases, hospitals and medical professionals struggled to manage patient flow, especially in regions with limited access to specialists. It advocates for an AI-enabled chatbot that can assist patients by promoting precautionary measures, updating them about virus-related matters, and reducing the psychological impact of isolation and fear. Diagnostic assessments can be made possible by this chatbot, which would further advocate immediate action to be taken on behalf of a virus-exposed patient. This chatbot could further be used to assess infections. In this regard, patients could be connected to registered doctors as symptoms heighten. An IBM Watson-based Python chatbot is proposed as an AIML platform. In this research, the point is to showcase how this proposed chatbot will bring about a change in the lives of these patients by virtually communicating with healthcare professionals in adverse pandemics. Additionally, the design of this chatbot would have accommodation for any future pandemic or any healthcare service through API incorporation or datasets. As of now, this project is at the design phase, followed by MVP, then updates after gathering users' feedback for 3 to 4 months [14].

Manal Almalki et al. (2020) conducted a study titled "Health Chatbots for Fighting COVID-19: A Scoping Review," was a review of the literature that had been written about COVID-19-related chatbots in healthcare, characterizing those emerging technologies, and identifying their applications and associated challenges. Based on the framework by Arksey and O'Malley, the authors conducted a scoping review of peer-reviewed literature on databases such as PubMed/ MEDLINE and Google Scholar, among others, using keywords from January to September 2020, which included "COVID* chatbot," "virtual assistant," or "AI enabled platform COVID." Of the 543 articles initially identified, the number was filtered down to 9 for eligibility. In most of the studies, the subjects were the development of chatbots and their architecture, with only three investigating user experience. In the scoping review, five main health applications of chatbots included dissemination of health information, self-triaging and risk assessment, monitoring exposures and notifications, symptom tracking, and health aspects of COVID-19 and management of misinformation. These technologies worked by automatically answering questions, making health records, filling in forms, and generating reports. However, there were certain challenges related to social acceptance, technical design, and usability. The study concludes that though health chatbots for COVID-19 are in their infancy, the comprehension of their design and application can surely support ongoing enhancement to functionality and efficiency in the fight against the pandemic [15].

Anil K. Pandeya et al. (2021) presented a study, "CoronaGo Website Integrated with Chatbot for COVID-19 Tracking," which discusses the challenges brought about by the COVID-19 pandemic. The challenges include problems in medical assistance, awareness, and management of the critical aspects concerning financial support. Among such issues, the authors have tried to contribute by proposing an integrated healthcare chatbot website that can track the situation of COVID-19 and hence providing users with basic information. The lightweight application was the objective of the project in trying to combine different functionalities into it; it was also adapted for an Android mobile app. They gave a note that in future, added improvements might include enhancing the accuracy of chatbots, incorporation of geofencing and deep learning for predictive capabilities of the web application [16].

Eslam Amer et al., (2021) presented a work "A Proposed Chatbot Framework for COVID-19," presenting a smart chatbot system that can interact with users by providing answers to questions posed regarding the pandemic. The proposed framework thereby uses the pre-trained Google BERT language model for the common question-answering task. It is based on a two-stage architecture: the text classification technique on BERT Transformer for classifying text inputs in various categories based on the meaning of words, and the BERT model itself to come up with responses for any queries. The system has been trained and evaluated using the Stanford University SQuAD V2.0 dataset, a popular benchmark for the question-answering task. This work caters to the increasing demand for chatbots handling user queries in the time of pandemics by showing efficiency in integrating advanced language models to enhance the capabilities of chatbots more effectively [17].

Vikhrov et al. (2021), conducted a study titled "Chatbots in Early Detection of COVID-19," in which they discuss the use of chatbots not only in Uzbekistan but also in many other countries for the early detection and differential diagnosis of COVID-19, influenza, and ARVI. The present study, running from June to October 2021, is aimed at creating a chatbot that could contribute to diagnostic processes, alleviate the burden of healthcare professionals, and make reliable information available to the public to avoid congestion in medical facilities and offer optimized prescriptions. This research revealed some of the potential of AI-based chatbot technologies applied in health but underlined that such technologies are still in their early days and that most solutions do not have full operational maturity. These studies also indicated that the United States, Europe, and India were countries with the highest numbers of chatbot users, showing how active a role AI was increasingly playing in digital health worldwide. This study, nevertheless, made it clear that far more development and dissemination of chatbot technologies would be required to support efforts toward public health in general, not only during the time of pandemics [18].

Antony Albites-Tapia et al. (2022) conducted a study titled "Chatbots for the Detection of COVID-19: A Systematic Review of the Literature," aimed to investigate the impact and applications of the chatbots that were designed to diagnose COVID-19, and the area of their application in accordance with the methodology of development and the tool/programming language required in such a system. The review has included 101 papers, selected out of 5701 papers based on the application of exclusion criteria and quality assessments. The authors identified the next sentence prediction as the most implemented methodology in developing chatbots. The highest prevalence of using chatbots was identified in the retail sector, since this sector had the maximum accessibility to consumers. According to the research, the most critical purpose of chatbots in COVID-19 diagnosis is that it provided quick response to the patients; hence, the most fruitful result was derived from patients' satisfaction due to early diagnosis. Moreover, for the development of chatbots, the most significant tool derived was IBM's Watson Assistant as it showed easy integration into various communicative channels. Similarly, the highly used programming language in this regard is Python as it shows easy integration and implementation. Meanwhile, the review has also referred to the trend in COVID-19 diagnosis in the light of the application of chatbots, underlining the use of other AI technologies regarding machine learning and deep learning that will possibly be seen in the future to enhance the precision and speed of diagnostic processes [19].

Parham Amiri et al. (2022) conducted a study titled "Chatbot Use Cases in the COVID-19 Public Health Response" to identify the various applications of chatbots deployed for public health response activities during the COVID-19 pandemic. Of 3334 articles that were initially identified, 61 met the inclusion criteria, finding 61 chatbots deployed in 30 countries. These chatbots were grouped into six primary use cases in the response to public health: risk assessment, dissemination of information, surveillance, post-COVID qualification screening, distributed coordination, and vaccine scheduling. Overall, these chatbots were designed to be simple, leveraging structures of decision trees with pre-enabled response choices to hasten deployment. In summary, the study showed that chatbots present easily scalable, accessible, user-friendly solutions which extend efforts of public health by addressing capacity constraints, enabling social distancing, and mitigating misinformation. The authors further propose exploration of more use cases, embedding more intelligent designs, and finding synergies in the development of chatbots [20].

Shuo Zhou et al. (2023) conducted a study titled "An Artificially Intelligent, Natural Language Processing Chatbot Designed to Promote COVID-19 Vaccination: A Proof-of-Concept Pilot Study," It sought to determine the acceptability of an AI-powered chatbot for enhancing COVID-19 vaccination across a variety of health settings. The methodology involved the design of a chatbot, accessible both via SMS and web-based platforms, developed using communication theories to deliver persuasive messages to the users, addressing questions that they had with respect to COVID-19 and urging them to get vaccinated. It was deployed within U.S. healthcare from April 2021 to March 2022 and recorded several metrics: the total number of users, discussed topics, and response accuracy by matching the user intent. It was found that a total of 2479 users were interacting with the system, exchanging 3994 COVID-19-related messages; the most frequent inquiries regarded booster doses and locations where vaccinations could be made. The accuracy of the system in responding to user queries ranged from 54% to 91.1%, where it was poorer in times of new information and improved during the incorporation of new content. This study, therefore concluded that AI-driven chatbot systems could be a feasible and helpful tool for providing accurate and persuasive health information on infectious diseases [21].

Kurniawan et al. (2024) conducted a study titled "A Systematic Review of Artificial Intelligence-Powered (AI-Powered) Chatbot Intervention for Managing Chronic Illness," which assessed the recent use of AI-powered chatbots in managing chronic diseases and highlighted the importance of communication with patients and tackling the increase in chronic condition burdens. Despite this potential, the effectiveness of such AI chatbot interventions has not yet been reviewed comprehensively in the literature on healthcare. This study will review user satisfaction, the effectiveness of the intervention, and AI architectures of chatbots developed for chronic disease management. After a comprehensive review of databases of literature, eight studies met the eligibility criteria. The key chatbot interventions included health education, behavior change theory, stress management, cognitive behavioral therapy, and self-care. The results indicated a relatively good uptake of the chatbots by the users in self-managing chronic conditions; however, because of the limited technical documentation, it emphasized that future studies should put a stronger focus on patient safety with evidence-based evaluations [22].

McClymont et al. (2024) conducted a study titled "Internet-Based Surveillance Systems and Infectious Diseases Prediction: An Updated Review of the Last 10 Years and Lessons from the COVID-19 Pandemic,". This study aims to determine the role of digital, internet-based infectious disease surveillance in detecting outbreaks of influenza, dengue fever, and COVID-19. The review of scientific literature on improved computational capacity, an increased use of smart devices, and the leveraging of artificial intelligence in disease surveillance was conducted. From these, results indicated a substantial improvement in the early detection and monitoring of infectious diseases using these technologies. Through results, it can be observed that there is indeed an increasing dependence on digital tools to enhance the traditional infectious disease surveillance systems, although challenges in high-precision outbreak predictions remain. The study concluded that the integration of internet-based surveillance with public health infrastructure is highly necessary to be better prepared for any future pandemic situation in the world [23].

3. Proposed System

The present study is based on previously conducted work under the title "Proposing a Mobile Application for Educational Institutions' Support during the Epidemic Crises", which was developed to an intelligent system in the current paper to monitor and manage epidemic outbreaks in institutional environments by incorporating advanced AI technologies. This old architecture worked on the five major stages: symptoms-based diagnosis testing, cough sound detection using AI, X-ray and CT scan image analysis based on CNNs, monitoring of vital signs, and geolocation for COVID-19 positive patient by GPS devices. The system had an accuracy rate of 95% for probable epidemic case identification and turned out to be effective in early identification and quick response ground level in areas with high population density [24].

The work is extended in this paper by incorporating an AI-enabled chatbot system that can utilize the latest NLP techniques; it is based on GPT models for predicting probable diseases and analyzing symptom overlaps based on users' input, and deriving probabilistic diagnosis, with an indication of the likelihood of a range of diseases combined with health guidance. A comparative analysis between the assessments made by experts.

3.1 System Overview

This system is supposed to diagnose diseases from symptoms submitted by its users, using AI-nested capabilities that analyze and interpret health-related input. The core features are built with careful attention to detail, enabling it to perform symptom-based diagnosis correctly, restrict inputs to relevance, tap into advanced NLP, and make preliminary health recommendations. These components put together would improve early detection with heightened accuracy and proactively enable informed responses against impending epidemic outbreaks within institutional settings. The architecture of the system is given in the following steps:

1. **Symptom-Based Diagnosis**

Symptoms reported are matched against the known diseases that are prone to cause epidemics. It further narrows its focus to the m ost common symptoms of infectious diseases to help early response.

2. **Input Restriction Mechanism**

Interactions initiated by the user are confined strictly to symptom-related queries. Non-symptom inputs remind one to do so, further enhancing diagnostic accuracy and ensuring all data is health focused.

3. **ChatGPT-Powered Natural Language Processing**

The system is integrated with ChatGPT to handle complex NLP and thereby interpret symptom descriptions in a much better way. It allows the continuous update of the model with new data on the emergence of infectious diseases.

4. **Preliminary Recommendations and Advisory**

This chatbot will help determine if symptoms indicate a contagious disease and can provide users with first advice, such as self-isolation or a visit to a medical doctor, for them to follow a roadmap that minimizes the risk of contagious spreading.

5. **Symptom Input and Analysis**

The system functions by allowing users to input the symptoms through an interface that then processes against a symptom profile database for various contagious diseases.

6. **Preliminary Diagnosis and Matching**

The symptoms entered are matched against the system's database of disease profiles, and a probabilistic diagnosis is presented to the user, showing potential risks and recommendations based on the symptom identified.

7. **Technical System Modules**:

- **Symptom Collection Module**: Captures user input and processes it for keyword extraction and matching.
- **Symptom Processing and Classification**: Symptoms are preprocessed (tokenization, normalization, tagging) and clustered to match disease profiles.
- **NLP Engine with ChatGPT**: Interprets complex symptom inputs and continuously adapts based on new symptom patterns.
- **Diagnosis and Recommendation Engine**: Provides diagnostic results based on symptom matching scores and issues relevant health recommendations.

Pseudocode for Disease Diagnosis Based on Symptoms
Input: Symptom Text: A string containing the symptoms provided by the user.
Output: DBA: A list of diseases with their associated probabilities {Disease: Probability}.

Process
1. Import Libraries
Import re From Python Standard Library // For text cleaning
Import nltk from nltk // For tokenization and stopwords
Import AutoTokenizer From transformers // For text tokenization
Import AutoModel From transformers // For extracting embeddings
Import numpy from numpy // For numerical computations
Import softmax From scipy.special // For converting logits to probabilities
 	
2. Preprocess Symptoms
Define Function: preprocess_symptoms(symptoms_text)
//Purpose: Clean and prepare the symptom text for processing.
if langdetect.detect(symptoms_text) == "ar":
    Apply translator.translate(symptoms_text, src='ar', dest='en').text
Apply re.sub to Remove special characters and numbers.
Apply lower to Convert text to lowercase.
Apply nltk.word_tokenize to Tokenize text into individual words.
Apply nltk.corpus.stopwords to Remove stopwords from the text.
Return preprocessed_text() //the cleaned and tokenized text.

3. Feature Extraction

Define Function: extract_features(preprocessed_text)

//Purpose: Convert the cleaned text into numerical embeddings for modeling.

Load AutoTokenizer and AutoModel from Transformers library.

Apply tokenizer to Convert the preprocessed text into numerical tokens.

Apply model to Pass tokens through the model to generate embeddings.

Apply mean on the Last Hidden Layer to get a single vector representation.

Return the numerical features (embeddings).

4. Predict Diseases

Define Function: predict_diseases(features, disease_model)

//Purpose: Predict diseases using the features and model.

Apply disease_model(features) to Generate raw scores (logits).

Apply softmax to Convert logits into probabilities.

Return DPA // List of diseases with their probabilities.

The steps of the proposed system are summarized in Figure 1.

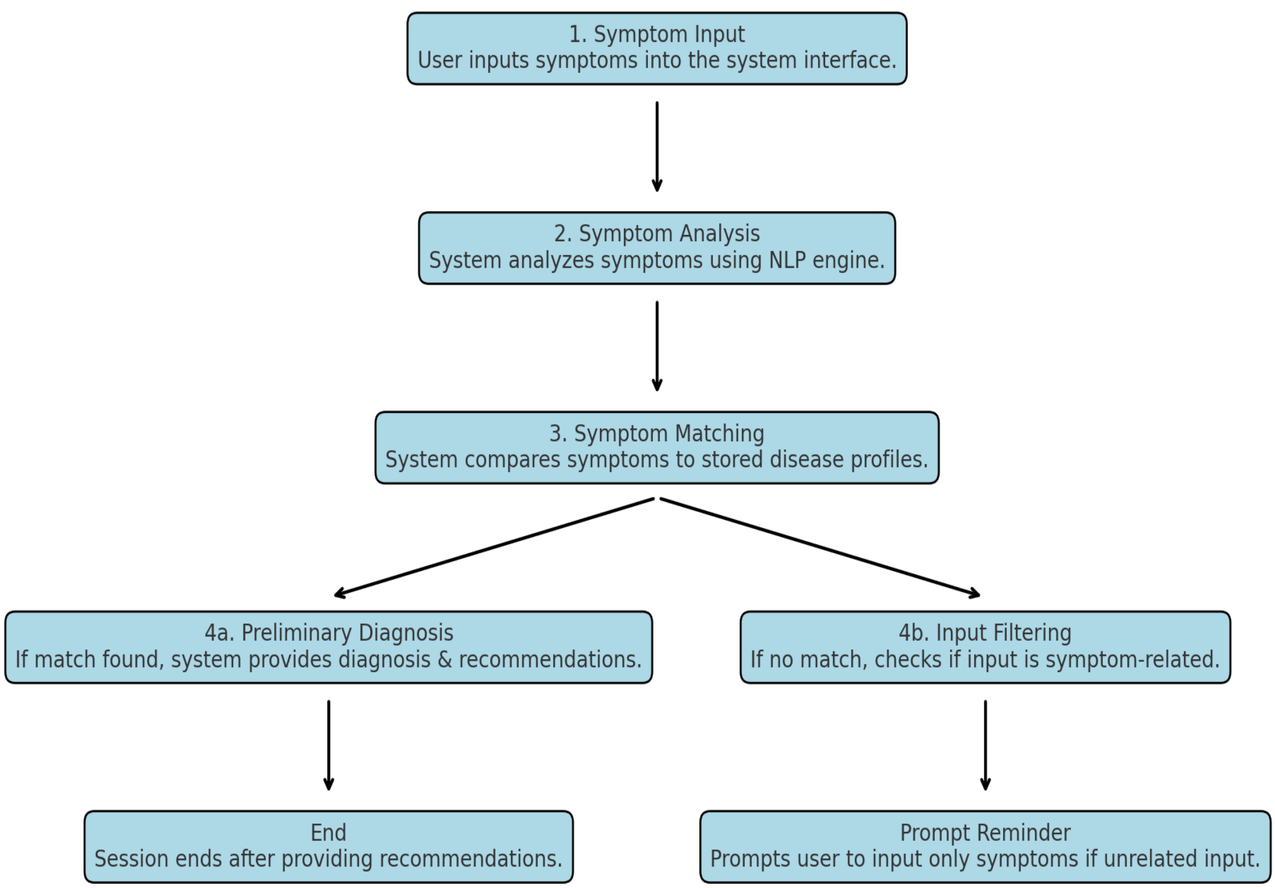

Figure 1. Diagram indicates the steps of the proposed system

3.2 System Procedures

The system consists of a set of procedures, as follows:

1. Symptom Input:

The user begins by entering symptoms into the system interface. This step allows the system to receive initial data directly from the user for analysis.

2. Symptom Analysis:

The symptoms entered are processed through an NLP engine. The relevant keywords were extracted in this step, and the meaning of the symptoms described by the user was understood. Symptom Matching:

The symptoms are then matched against the stored disease profiles, and this matching will describe whether the reported symptoms relate to any known epidemic-prone or contagious diseases.

3. Preliminary Diagnosis (if match found):

If there is a match, the system gives a tentative diagnosis and recommends next steps, either isolation or consultation with a doctor. This ensures that any advice given to the user is actionable in terms of any possible health risks.

4. Input Filtering (if no match found):

If there is no matching disease profile, then the system verifies whether the input provided by the user is symptom related. In essence, it filters the queries so that only those yielding symptoms are passed to the system for accuracy.

5. End (following recommendations):

Once recommendations are given-or there is no symptom-related input-a session ends. The foregoing is the last step that enables the user to close the interaction or re-input relevant information if so desired.

6. Prompt Reminder (if unrelated input):

In this case, if the input does not match the symptom-based information required, it would remind the user to enter health-related symptoms only. This prompt makes sure that interaction remains focused on diagnostic accuracy.

3.3. System Implementation

The proposed epidemic detection chatbot works on the symptoms entered by the user. Further, the system analyzes the entered symptoms and then presents the possibility of related epidemic diseases.

It is to be noted that the system is designed to interact only with symptom-related entries and will not recognize any other type of entry.

1. **Input Symptoms Screen**: This interface displays a prompt for the user to enter the symptoms they are experiencing. The user can type their symptoms in the designated input area and submit them to the chatbot for analysis.

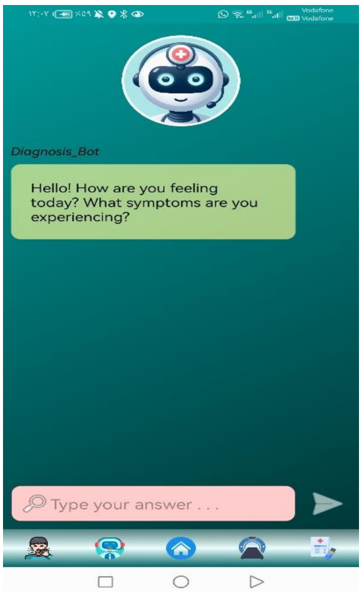

Figure 2. Input Symptoms Screen

2. **Chatbot Diagnosis Response Screen:** This screen displays the Chabot's diagnostic output, presenting potential diagnoses based on the symptoms entered, along with the probabilities that these symptoms may indicate various other diseases.

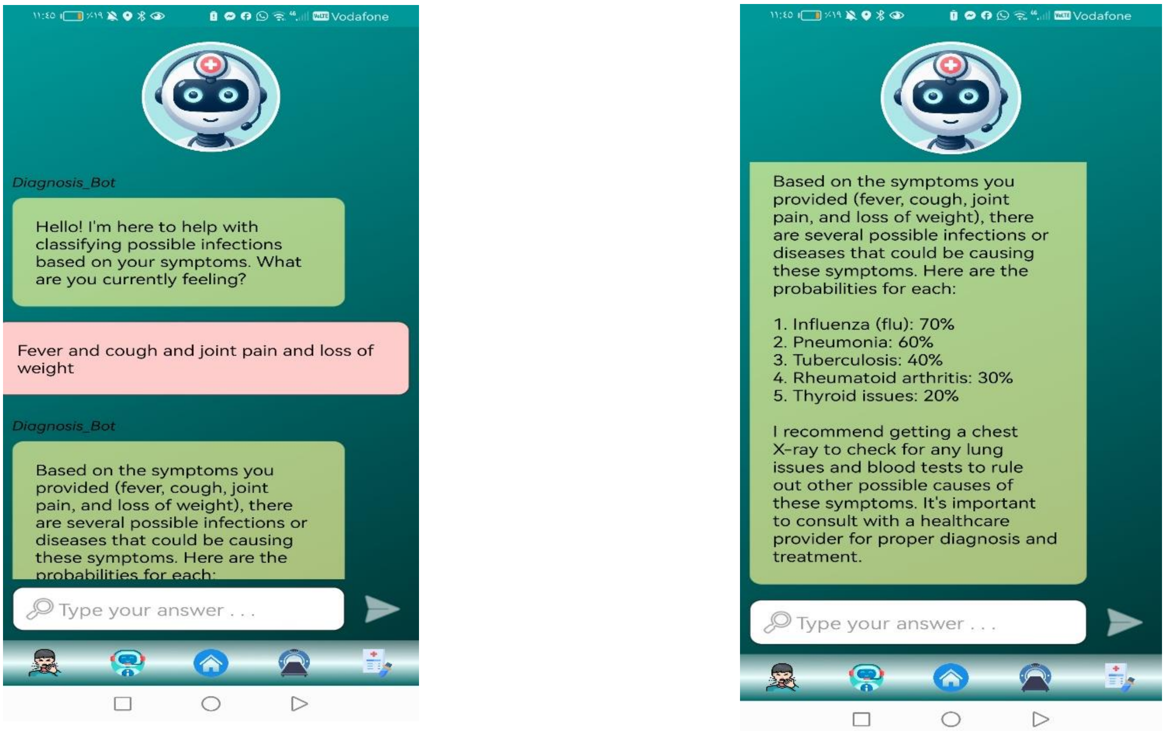

Figure 3. Chatbot Diagnosis Response Screens

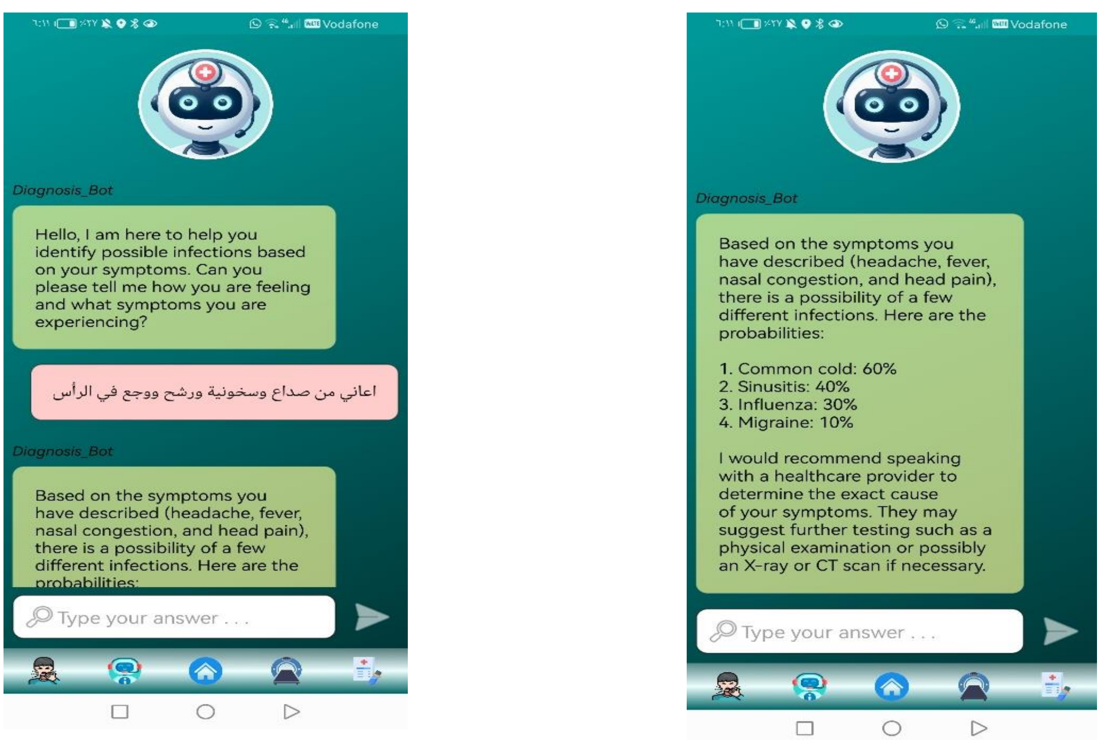

Figure 4. Chatbot Diagnosis Response for Arabic language Screens

3. **Invalid Input Warning Screen**: This screen displays the chatbot's response when the user enters information unrelated to symptoms. It provides a clear notification that such entries are not accepted, reinforcing the chatbot's focus on collecting relevant medical data.

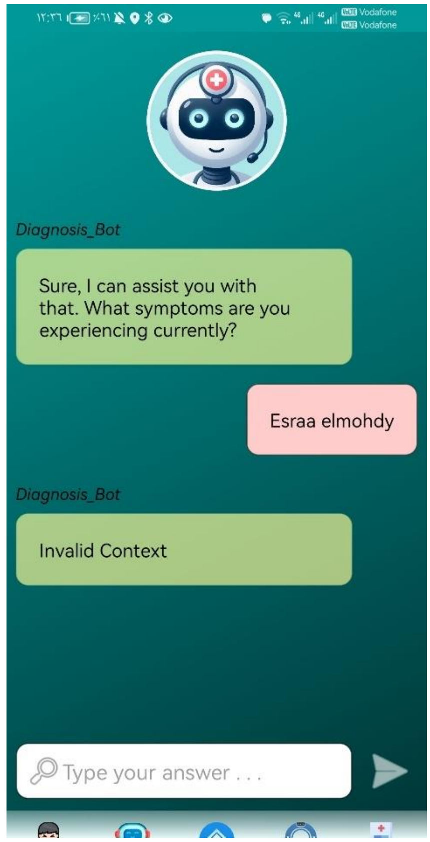

Figure 5. Invalid Input Warning Screen

4. Experimental Results

This study introduces an AI-driven chatbot system utilizing GPT-based natural language processing to predict diseases based on user-reported symptoms and provide initial diagnostic support. The chatbot employs a probabilistic model to assign likelihood percentages to potential conditions, such as 60% for meningitis, 30% for Migrain, and 10% for influenza, effectively capturing overlapping symptoms across similar diseases. The model was tested on an extensive dataset that ranged over a wide range of diseases with overlapping symptoms to assess the model's accuracy and diagnostic effectiveness. Comparing the outputs with expert evaluations. Accuracy below was computed as:

Accuracy=$\frac{Number\ of\ Correct\ Diagnoses}{Total\ Diagnoses}$ ×100% ……..[26]

The chatbot tested it with a dataset comprising 40 diseases and their respective symptoms. It came up with correct diagnoses for 39 of them, indicating a very good diagnostic efficiency in identifying diseases from symptoms. The following figure illustrates some of these cases.

Table 1: Screenshot of diseases, symptoms, and results generated by the chatbot

Symptoms	**Diagnosis**	**Chatbot Diagnosis**
Fever, cough, and shortness of breath	COVID-19, Influenza	pneumonia 60% bronchitis 30% covid-19 10%
Headache, nausea, and sensitivity to light	Migrain	meningitis 60% Migrain 30% Influenza 10%
Abdominal pain, diarrhea, and fever	Gastroenteritis, Appendicitis	Gastroenteritis 70% food poisoning 20% appendicitis 10%
Joint pain, rash, and fever	Rheumatoid Arthritis, Lupus	Rheumatoid Arthritis50 % Lyme disease 30% viral infection 20%
Sore throat, fever, and swollen glands	Strep Throat, Mononucleosis	streptococcal pharyngitis(strep Throat) 70 % mononucleosis(Epstein-barr viruse)20% influenza (flu) 10%
Persistent cough, weight loss, and night sweats	Tuberculosis, Lung Cancer	,pneumonia ,cancers like lymphoma
Nausea, vomiting, and right upper quadrant pain	Hepatitis, Cholecystitis	Cholecystitis 80%
Fatigue, frequent urination, and excessive thirst	Diabetes Mellitus	Diabetes Mellitus 95%
Chest pain, difficulty breathing, and fatigue	Heart Attack, Pulmonary Embolism	pneumonia or bronchitis 70%
Persistent cough and wheezing	Asthma	respiratory infection 90% (bronchitis or asthma exacerbation)
Chest pain and palpitations	Angina or Heart Attack	cardiac condition 50% (Angina or arrhythmia)
Abdominal cramps and bloating	Irritable Bowel Syndrome (IBS)	Irritable Bowel Syndrome (IBS) 60% (gastroenteritis)
Joint pain and swelling	Rheumatoid Arthritis or Gout	rheumatologic condition 70% (Rheumatoid Arthritis or an infectiouse arthritis)
Skin rash and fever	Chickenpox or Measles	infection disease 80% (Chickenpox , Measles or a viral or bacterial infection)

Table (1) describes physicians' evaluation of the chatbot. They highly valued the system; according to them, it is easy to use, fast, and simple to operate, making it straightforward and user-friendly. The chatbot also showed high accuracy in response, enabling the physician to have full trust in the chatbot to provide effective and proper solutions. Most physicians were very satisfied with the system; they found it an innovative tool which meets their needs highly effectively. Agreement among the experts and raters was calculated using the following equation:

Maximum score of each item= highest score of the item * number of raters

Agreement percentage= $\frac{total\ score\ of\ the\ item}{maximum\ score} * 100$ …… [27]

Table 2: Percentage distribution of physicians' evaluation of the epidemic diagnosis chatbot usage

A - General evaluation of chatbot operation					
Item	**Completely agree**	**Agree**	**Indifferent**	**Disagree**	**Completely Disagree**
1- The chatbot is easy to use	Count: 19	95.0 %	Count: 1	5.0 %	Count: 0
2- The chatbot operates efficiently	Count: 20	100.0 %	Count: 0	0.0%	Count: 0
3- The chatbot’s response speed is satisfactory	Count: 18	90.0 %	Count: 2	10.0 %	Count: 0
4- The chatbot has minimal downtime	Count: 18	90.0 %	Count: 2	10.0 %	Count: 0
B - Evaluation of information provided by the chatbot					
5- The chatbot makes it easy to input symptoms	Count: 20	100.0 %	Count: 0	0.0%	Count: 0
6- Information is organized in a coherent manner	Count: 19	95.0%	Count: 1	5.0%	Count: 0
7- The chatbot provides clear information	Count: 20	100.0 %	Count: 0	0.0%	Count: 0
8- The chatbot provides reliable diagnostic information	Count: 18	90.0%	Count: 2	10.0%	Count: 0
9- The chatbot provides useful recommendations	Count: 19	95.0%	Count: 1	5.0%	Count: 0

10- The chatbot provides comprehensive details	Count: 20	90.0%	Count: 2	10.0%	Count: 0
C - Evaluation of chatbot interface					
11- The chatbot provides easy access to diagnostic records	Count: 19	95.0%	Count: 1	5.0%	Count: 0
12- Eliminates the need for manual diagnostic tracking	Count: 18	90.0%	Count: 2	10.0%	Count: 0
13- Enables fast and reliable data retrieval for epidemiological research	Count: 19	95.0%	Count: 1	5.0%	Count: 0
D - General evaluation of the chatbot system					
14- The chatbot provides rapid diagnostics	Count: 20	100.0 %	Count: 0	0.0%	Count: 0
15- Diagnostic results are useful	Count: 19	95.0%	Count: 1	5.0%	Count: 0
16- Diagnostics provide up-to-date information	Count: 20	100.0 %	Count: 0	0.0%	Count: 0
17- Chatbot configuration is easy	Count: 19	95.0%	Count: 1	5.0%	Count: 0
18- Diagnostic data is presented in an appropriate format	Count: 18	90.0%	Count: 2	10.0%	Count: 0

Table 1 shows that the results of the assessment prove high satisfaction from the experts about the performance of the chatbot on epidemic diagnosis. Most physicians and specialists complained that the system was efficient, easy to use, and required a high degree of accuracy with reliable diagnostic information. The design allows this chatbot to respond quickly and support whatever procedures are possible for diagnosis, underlining its potential both as a medical diagnostic tool and in the management of epidemic outbreaks.

This high success rate justifies the system as a model to be used for support in first diagnostic reviews and clarity for professional healthcare workers and the users themselves when symptoms overlap. Further development should add more symptoms in this system, updating the medical knowledge in real time so that it continuously evolves to fit health predictions and advice.

5. Conclusion

This study proposes an AI-powered chatbot system powered with GPT-based natural language processing that will help support preliminary diagnostic assessments to improve accessibility to healthcare through the prediction of diseases based on symptoms described by a user. The chatbot uses a probabilistic model, which assigns the percentage likelihood of various conditions, hence giving a nuanced analysis of how symptoms of similar diseases may overlap. The system may mark, for instance, a probability of 70% relevant to COVID-19, 50% probability relevant to pneumonia, and 30% probability regarding influenza for defined symptom combinations. This would help explain possible diagnoses but also indicate symptomatic crossings. Expert opinions were very positive about the accuracy, ease of use, and efficiency of the system, with even a high of 97.5% accuracy in concert with medical diagnosis. This reliability points out the value the chatbot bears as a supportive tool in initial health assessments, either for medical professionals or users who want to get some quick, preliminary guidance. Further development may relate to expanding the range of symptoms included, updating the system in real-time with new medical research, and adjusting to new emerging health challenges, thus enabling further improvement of the system as a full-fledged resource for health prediction and user guidance.

6. Future Work

To further develop the current study, additional improvements can be implemented, including, for example:

1. **Integration with Wearable Health Technology** Future enhancements to the system are expected to be able to incorporate information derived from wearable health gadgets such as temperature sensors and heart rate monitors to further enhance its diagnostic capabilities. This adds other objective parameters of health, which will make the chatbot even more precise in detecting probable epidemic symptoms.
2. **Disease Progression Tracking**: integrating the ability for tracking symptoms over time can achieve the differentiation of self-limiting conditions from those with epidemic potential. This might be done by monitoring recurring symptoms, the duration over which these symptoms occur, and a rise in severity to give more actionable insight into users and institutions.
3. **Enhanced Privacy and Data Security**: Thus, with the help of this software, all the health data will be kept confidential and secured for users to trust the invention and to protect the invention against any kind of regulatory compliance threat. In future versions, the system could use more sophisticated encryption techniques and anonymization protocols that may completely protect users' privacy while maintaining data integrity.
4. **Adaptability to Multiple Languages and Cultural Contexts**: To further ensure accessibility, the system could be extended to various languages and be sensitive to cultural differences in symptom reporting. This will make it even more useful in a variety of educational settings and foster inclusion.

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“I will pay the APC in case of final acceptance of my paper”.

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