AI Chatbot for Diagnosis of Acute Diseases

A PROJECT REPORT

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SCHOOL OF COMPUTER SCIENCE ENGINEERING

CERTIFICATE

This is to certify that the Project report **"AI Chatbot for Diagnosis of Acute Diseases"** being submitted by "Syed Mohammed Umairullah, Kalyan K S, Abhilash S Pole, Syed Asif, Mohammed Aukib" bearing roll number(s) "20201CIT0091, 20201CIT0119 20201CIT0109, 20201CIT0059, 20201CIT093" in partial fulfilment of requirement for the award of degree of Bachelor of Technology in Computer Science and Engineering (IOT) is a bonafide work carried out under my supervision.

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DECLARATION

We hereby declare that the work, which is being presented in the project report entitled **AI CHATBOT FOR DIAGNOSIS OF ACUTE DISEASES** in partial fulfilment for the award of Degree of **Bachelor of Technology** in **Computer Science and Engineering (IOT)**, is a record of our own investigations carried under the guidance of **MS. SOUMYA, ASSISTANT PROFESSOR, School of Computer Science Engineering, Presidency University, Bengaluru.**

We have not submitted the matter presented in this report anywhere for the award of any other Degree.

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ABSTRACT

This article presents the development of an AI-powered chatbot that can preliminarily diagnose common acute diseases to improve healthcare accessibility in rural areas of India. The chatbot aims to address the shortage of medical professionals in smaller towns and villages where timely healthcare is a persistent challenge. The authors leveraged machine learning algorithms, training them on diverse medical datasets of symptoms, patient history and outcomes related to prevalent acute conditions in rural regions. The model development process focused on techniques to handle limited data, ensuring robust training despite data constraints typical of rural healthcare settings. Rigorous testing was done to validate the chatbot's ability to provide accurate preliminary diagnoses for everyday ailments. Once deployed through voice assistants, smartphones and websites, the AI-driven tool would allow users to input symptoms and receive reliable disease predictions. By overcoming geographical barriers to medical guidance, the chatbot can mitigate escalation of untreated minor illnesses and empower individuals with tools for basic health management. The authors conclude that AI and ML innovations can transform healthcare delivery paradigms if deployed ethically and tailored to the unique needs of underserved communities. This abstract summarizes the key details from the report while avoiding excessive similarity to the original text. Please let me know if you would like me to modify or expand the abstract further.

Keywords — **AI-powered, Healthcare accessibility, Rural areas, Acute diseases, Medical professionals shortage, Machine learning algorithms, Diverse medical datasets, Symptoms, Patient history, Limited data handling, Robust training, Validation testing, Preliminary diagnoses, Voice assistants, Smartphones, Websites deployment, Geographical barriers, Empowerment, Healthcare delivery transformation, Ethical deployment, Underserved communities**

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LIST OF FIGURES

TABLE OF CONTENTS

CHAPTER-1
INTRODUCTION

1.1 Introduction to AI-Based Diagnostic System

This project delves into the development of an AI-based diagnostic system tailored for smaller towns and villages in India. By harnessing the capabilities of digital assistants and machine learning models, the objective is to create a virtual "doctor" capable of diagnosing common acute diseases. This initiative seeks to overcome the challenges posed by a shortage of healthcare professionals in underserved areas, offering a potential solution to enhance healthcare accessibility.

1.1.1 Background and motivation

The AI-Based Diagnostic System is a revolutionary initiative driven by the urgent need to address healthcare challenges in smaller towns and villages in India. Fueled by the scarcity of healthcare professionals and limitations of traditional telemedicine, this project aims to harness the power of artificial intelligence to create a virtual "doctor" capable of diagnosing common acute diseases. The motivation is to overcome barriers to timely medical assistance and enhance healthcare accessibility in underserved areas.

1.1.2 Objectives of the project

The primary objectives of the project involve leveraging digital assistants and machine learning models to empower remote locations with a virtual healthcare solution. By providing immediate and reliable health assessments, the project seeks to proactively prevent the escalation of health conditions. This innovative approach aims to bridge the healthcare gap, offering accessible preliminary healthcare guidance and addressing the unique challenges faced in smaller towns and villages.

1.2 Healthcare Challenges in Underserved Areas

In many smaller towns and villages in India, the scarcity of healthcare professionals poses a significant barrier to timely medical assistance. Conventional solutions, including telemedicine, have encountered challenges in scaling up to address this issue. In response to this, our project focuses on harnessing the power of artificial intelligence to create a virtual "doctor" capable of diagnosing common acute diseases remotely. By training machine learning models on relevant medical data, we aim to provide accessible and preliminary healthcare guidance for everyday ailments, mitigating the impact of limited access to medical professionals in underserved areas.

1.2.1 Scarcity of healthcare professionals

In smaller towns and villages in India, the scarcity of healthcare professionals poses a significant barrier to timely medical assistance. This shortage highlights the pressing need for alternative healthcare solutions that can operate effectively in the absence of sufficient medical personnel.

1.2.2 Limitations of conventional telemedicine

Conventional telemedicine, while a viable solution in some contexts, encounters challenges in scaling up to meet the overwhelming demand for healthcare services in underserved areas. These limitations underscore the necessity of exploring innovative approaches, such as AI-based solutions, to address the specific healthcare needs of these regions.

1.3 Paradigm Shift: AI in Healthcare Delivery

This innovative initiative addresses the pressing healthcare needs of smaller towns and villages in India, where the scarcity of healthcare professionals often leads to delayed or inadequate medical care. The project leverages the advancements in artificial intelligence, particularly digital assistants and machine learning models, to bridge the healthcare gap and improve accessibility for residents in underserved areas.

1.3.1 Leveraging digital assistants and machine learning

The paradigm shift in healthcare delivery involves harnessing the capabilities of digital assistants and machine learning models. By incorporating these advancements, the project aims to transform the diagnostic process, offering accurate preliminary diagnoses for common acute diseases and revolutionizing healthcare accessibility.

1.3.2 Bridging the healthcare gap in smaller towns and villages

This paradigm shift is directed at bridging the healthcare gap prevalent in smaller towns and villages. The initiative employs digital assistants and machine learning to provide immediate and reliable health assessments, addressing the immediate health concerns of the population and preventing the escalation of minor ailments.

1.4 Empowering Remote Locations with Virtual Healthcare

The virtual "doctor" concept represents a paradigm shift in healthcare delivery, as it aims to empower individuals in remote locations with immediate and reliable health assessments. By incorporating machine learning algorithms trained on diverse datasets of medical conditions prevalent in these regions, the system endeavors to offer accurate preliminary diagnoses for common acute diseases. This not only addresses the immediate health concerns of the population but also serves as a proactive measure to prevent the escalation of minor ailments into more severe conditions due to delayed intervention.

1.4.1 Immediate and reliable health assessments

The virtual "doctor" concept is designed to empower individuals in remote locations by offering immediate and reliable health assessments. Utilizing machine learning algorithms, the system ensures timely healthcare guidance, overcoming the challenges posed by the scarcity of healthcare professionals in remote areas.

1.4.2 Proactive measures to prevent escalating health conditions

Proactive healthcare measures are a key focus, aiming to prevent the escalation of health conditions. The virtual doctor, equipped with machine learning algorithms, acts as a preventive tool, intervening in the early stages to avoid the worsening of health conditions.

1.5 Cultural Sensitivity and Language Inclusivity

In addition to overcoming the challenges posed by a shortage of healthcare professionals, the project recognizes the unique socio-cultural context of healthcare in smaller towns and villages. The virtual doctor, equipped with language capabilities tailored to regional dialects, aims to enhance user interaction and understanding. This inclusivity ensures that the technology is not only advanced but also culturally sensitive, fostering trust and acceptance within the communities it serves.

1.5.1 Recognizing socio-cultural contexts

Acknowledging the unique socio-cultural context of healthcare in smaller towns and villages is essential. The project aims to build trust and acceptance within communities by recognizing and respecting the socio-cultural nuances that influence healthcare-seeking behavior.

1.5.2 Language capabilities tailored to regional dialects

Inclusivity in language is a cornerstone of the virtual doctor's design. Equipping the virtual doctor with language capabilities tailored to regional dialects enhances user interaction and understanding, making the technology accessible to diverse linguistic communities. Language inclusivity ensures that the virtual doctor is not only technologically advanced but also culturally sensitive, catering to the linguistic diversity prevalent in smaller towns and villages.

1.6 Scalability and Sustainability in Healthcare Solutions

Furthermore, the initiative acknowledges the limitations of conventional telemedicine solutions in scaling up to meet the overwhelming demand for healthcare services in these areas. The AI-based diagnostic system aspires to provide a scalable and sustainable solution, capable of reaching a broad spectrum of the population. Through user-friendly interfaces and accessible platforms, the project seeks to empower individuals with limited technological literacy, making healthcare guidance readily available at their fingertips.

1.6.1 Addressing limitations of conventional telemedicine

This section delves into the challenges faced by conventional telemedicine in scaling up to meet the demand for healthcare services in underserved areas. The project acknowledges these limitations and proposes solutions to address them effectively.

1.6.2 Providing a scalable and sustainable AI-based solution

The focus here is on the project's commitment to providing a scalable and sustainable solution through the utilization of artificial intelligence. This involves overcoming the scalability challenges of conventional telemedicine and ensuring the long-term viability of the AI-based diagnostic system.

1.7 Community Engagement and Collaborative Development

As we delve deeper into the development of this AI-driven diagnostic system, our commitment is not only to provide technological solutions but also to engage with local communities, healthcare providers, and stakeholders. Collaborative efforts will play a crucial role in tailoring the virtual doctor to the specific needs and challenges of each region, ensuring that the technology aligns with the cultural nuances and healthcare practices prevalent in smaller towns and villages across India. This holistic approach aims to create a sustainable and impactful solution that not only addresses immediate healthcare concerns but also contributes to the overall well-being and resilience of these communities.

1.7.1 Collaborative efforts with local communities

This aspect emphasizes the importance of engaging with local communities to ensure the successful implementation of the virtual doctor initiative. Collaborative efforts aim to understand community needs, gain acceptance, and tailor the technology to align with the cultural nuances and healthcare practices prevalent in smaller towns and villages.

1.7.2 Tailoring technology to regional needs

The project recognizes the uniqueness of each region and the necessity to tailor the virtual doctor technology accordingly. By adapting the system to regional needs, the initiative ensures that it aligns with local customs, practices, and preferences, fostering trust and acceptance within the communities it serves.

1.8 Beyond Diagnoses: A Broader Healthcare Transformation

Beyond the immediate diagnostic capabilities, this project envisions an ecosystem where the virtual doctor serves as a catalyst for a broader healthcare transformation. The integration of preventative measures, health education, and community engagement are integral components of our approach. By providing users with not only diagnoses but also personalized health recommendations and information, the virtual doctor becomes a valuable tool in empowering individuals to take charge of their well-being.

1.8.1 Integration of preventative measures and health education

This section explores the broader vision of the project, which goes beyond merely providing diagnoses. It emphasizes the integration of preventative measures and health education into the virtual doctor ecosystem, aiming to empower individuals with not only diagnoses but also personalized health recommendations.

1.8.2 Community engagement for overall well-being

The initiative seeks to engage communities in a holistic manner, focusing on overall well-being. By involving communities in health education and preventative measures, the project aims to create a transformative impact on community health beyond immediate diagnostic capabilities.

1.9 Accessibility through Mobile Applications and Low-Resource Computing

Recognizing the challenges of healthcare infrastructure in smaller towns and villages, the project explores the potential for mobile applications and low-resource computing to ensure that the virtual doctor is accessible across a variety of devices. This adaptability is crucial for reaching populations with varying levels of technological access and literacy. Additionally, efforts are underway to collaborate with local community health workers, creating a synergy between AI technology and on-the-ground healthcare support. This collaborative model aims to enhance the reach and impact of the virtual doctor by leveraging existing community structures.

1.9.1 Adapting to varying technological access and literacy

This addresses the adaptability of the virtual doctor to varying levels of technological access and literacy. The project aims to make healthcare guidance readily available by developing user-friendly interfaces and accessible platforms, ensuring that individuals with limited technological literacy can access the virtual doctor.

1.9.2 Community engagement for overall well-being

Recognizing the importance of on-the-ground support, the project explores collaboration with local community health workers. This collaborative model enhances the reach and impact of the virtual doctor by leveraging existing community structures and ensuring accessibility to a broad spectrum of the population.

1.10 Privacy, Data Security, and Ethical AI Use

Moreover, privacy and data security are at the forefront of the project's considerations. As the virtual doctor relies on sensitive health data, stringent measures are being implemented to ensure compliance with privacy regulations and to build trust among users. The ethical use of AI in healthcare is a priority, with transparency in the decision-making processes of the machine learning models and an emphasis on user consent and data protection.

1.10.1 Stringent measures for data protection

This section emphasizes the project's commitment to ensuring the privacy and security of sensitive health data. Stringent measures are implemented to comply with privacy regulations, safeguard user data, and build trust among users.

1.10.2 Transparency in decision-making processes

The project places a high priority on ethical AI use, highlighting transparency in the decision-making processes of machine learning models. User consent and data protection are central to the ethical considerations, ensuring responsible and trustworthy implementation of AI in healthcare.

1.11 Partnerships for a Comprehensive Healthcare Ecosystem

In alignment with the broader vision of improving healthcare outcomes, the project seeks to establish partnerships with local healthcare providers, governmental bodies, and non-profit organizations. This collaborative approach aims to integrate the virtual doctor seamlessly into existing healthcare frameworks, fostering a comprehensive and sustainable healthcare ecosystem for underserved areas.

1.11.1 Collaboration with local healthcare providers and organizations

This aspect highlights the project's collaborative approach with local healthcare providers and organizations. By fostering partnerships, the virtual doctor initiative aims to integrate seamlessly into existing healthcare frameworks, ensuring a comprehensive and synergistic healthcare ecosystem.

1.11.2 Integrating the virtual doctor into existing healthcare frameworks

The project envisions the virtual doctor becoming an integral part of the broader healthcare system. This involves strategic integration with existing healthcare providers, governmental bodies, and non-profit organizations, aiming for a sustainable and cohesive healthcare ecosystem.

1.12 User-Centered Design and Continuous Improvement

As the development progresses, user feedback and continuous iteration are paramount. User-centered design principles are being employed to refine the virtual doctor's interface, ensuring that it aligns with user expectations and preferences. Regular feedback loops with healthcare professionals and community representatives contribute to the ongoing improvement of the system, making it a responsive and adaptive tool that evolves with the changing healthcare landscape.

1.12.1 User feedback and iterative design principles

User-centered design is central to the virtual doctor's development. By actively seeking user feedback and employing iterative design principles, the project ensures that the virtual doctor's interface aligns with user expectations and preferences, enhancing the overall user experience.

1.12.2 Collaboration with healthcare professionals for ongoing improvement

Continuous improvement involves collaboration with healthcare professionals and community representatives. Regular feedback loops contribute to refining the virtual doctor system, making it a responsive and adaptive tool that evolves with the changing healthcare landscape.

1.13 Catalyzing Positive Change in Healthcare Accessibility

In conclusion, this project represents a multi-faceted initiative that goes beyond simply providing diagnoses through AI. It aspires to be a catalyst for positive change in healthcare accessibility, leveraging technology to empower individuals, strengthen community health, and facilitate collaboration between technology, healthcare providers, and the communities it serves. Through these collective efforts, the project envisions a future where healthcare is not just a service but an inclusive and empowering experience for all, irrespective of geographical constraints.

1.13.1 Vision for a transformative impact on healthcare

This section outlines the project's overarching vision to catalyze positive change in healthcare accessibility. The virtual doctor initiative aims to go beyond immediate diagnoses, envisioning a transformative impact that leverages technology to empower individuals and communities.

1.13.2 Inclusive and empowering healthcare experience

The project seeks to create an inclusive and empowering healthcare experience for all, irrespective of geographical constraints. By embracing technological innovation, the virtual doctor initiative aspires to contribute to a more accessible and equitable healthcare landscape.

1.14 Long-term Sustainability and Scalability

As the project unfolds, it is crucial to consider the long-term sustainability and scalability of the virtual doctor initiative. A key focus is placed on developing a modular and adaptable system that can integrate with emerging technologies and evolving healthcare practices. This adaptability ensures that the virtual doctor remains relevant and effective amid advancements in medical research, diagnostic techniques, and technological innovations.

1.14.1 Developing a modular and adaptable system

Long-term sustainability is addressed by developing a modular and adaptable system. This adaptability ensures that the virtual doctor remains relevant and effective amid advancements in medical research, diagnostic techniques, and technological innovations.

1.14.2 Continuous refinement of machine learning models

To maintain relevance, machine learning models are continuously refined and expanded. Regular updates based on the latest medical literature and real-world data contribute to the system's ability to stay abreast of new diseases, treatment protocols, and emerging health trends.

1.15 Infrastructure Development for Telemedicine

In parallel, the project acknowledges the importance of building a robust infrastructure for telemedicine and remote healthcare delivery. This includes exploring partnerships with telecommunications providers to enhance network connectivity in remote areas and developing strategies for overcoming challenges related to internet access and bandwidth limitations. By addressing these infrastructure barriers, the project aims to create a seamless and reliable experience for users seeking medical guidance through the virtual doctor platform.

1.15.1 Overcoming barriers related to network connectivity

Infrastructure development focuses on overcoming barriers related to network connectivity. By exploring partnerships with telecommunications providers, the project aims to enhance network connectivity in remote areas, ensuring a seamless virtual doctor experience.

1.15.2 Strategies for addressing internet access and bandwidth limitations

Recognizing challenges related to internet access and bandwidth limitations, the project formulates strategies to address these issues. This includes exploring innovative approaches to make the virtual doctor platform accessible across diverse technological landscapes.

These sections collectively contribute to the comprehensive development and implementation of the AI-based diagnostic system, ensuring it aligns with ethical standards, engages stakeholders, and remains sustainable over the long term.

1.16 Cultural Competence and Health Literacy

Furthermore, ongoing research initiatives are being conducted to understand the cultural and socio-economic factors that influence healthcare-seeking behavior in smaller towns and villages. This qualitative research is instrumental in tailoring the virtual doctor's recommendations to align with local beliefs, practices, and preferences. By incorporating cultural competence into the AI algorithms, the project aims to enhance the acceptance and effectiveness of the virtual doctor within diverse communities

The project also envisions the potential for collaboration with local educational institutions to integrate health literacy programs into school curricula. By educating the younger generation about basic healthcare practices and the utility of the virtual doctor, the project seeks to create a lasting impact on community health by fostering a culture of proactive healthcare management.

1.16.1 Understanding cultural and socio-economic factors

This section delves into the project's acknowledgment of the influence of cultural and socio-economic factors on healthcare-seeking behavior. By understanding these factors, the initiative aims to tailor the virtual doctor's recommendations to align with local beliefs, practices, and preferences, enhancing the acceptance and effectiveness of the system.

1.16.2 Integrating health literacy programs into educational institutions

The project envisions a broader impact on community health by proposing the integration of health literacy programs into educational institutions. By educating the younger generation about basic healthcare practices and the utility of the virtual doctor, the initiative seeks to create a lasting positive impact on community health and foster a culture of proactive healthcare management.

1.17 Hybrid Model: Integrating AI and Human Healthcare

An important aspect of the project's roadmap involves exploring the integration of teleconsultations with human healthcare professionals for cases that require further examination or more personalized care. This hybrid model combines the efficiency of AI-driven diagnostics with the expertise and empathy of healthcare professionals, providing a comprehensive healthcare solution that leverages both technology and human touch.

1.17.1 Teleconsultations with human healthcare professionals

This section introduces the hybrid model, which combines the efficiency of AI-driven diagnostics with the expertise and empathy of human healthcare professionals. By incorporating teleconsultations into the virtual doctor platform, the project aims to provide a comprehensive healthcare solution, addressing cases that require further examination or personalized care.

1.17.2 Providing comprehensive healthcare solutions

The hybrid model goes beyond AI-driven diagnostics to offer comprehensive healthcare solutions. By integrating the strengths of both AI and human healthcare professionals, the project seeks to provide a well-rounded healthcare experience that leverages technology while maintaining the human touch necessary for personalized care.

1.8 Conclusion

In conclusion, the virtual doctor initiative is not merely a technological intervention but a dynamic and evolving ecosystem that responds to the unique challenges and opportunities present in smaller towns and villages in India. By embracing adaptability, cultural sensitivity, and a collaborative approach, the project aims to create a sustainable and transformative impact on healthcare accessibility, ultimately improving the health and well-being of underserved communities

1.18.1 Summary of the dynamic and evolving virtual doctor ecosystem

In the conclusion, the project summarizes the key elements of the dynamic and evolving virtual doctor ecosystem. This includes an overview of the technological advancements, collaborative efforts, and the impact on healthcare accessibility in smaller towns and villages.

1.18.2 Impact on healthcare accessibility and community well-being

The conclusion highlights the overall impact of the virtual doctor initiative on healthcare accessibility and community well-being. By providing a transformative healthcare experience, the project aims to contribute to the improvement of health outcomes in underserved communities, emphasizing inclusivity and empowerment.

CHAPTER-2

LITERATURE SURVEY

2.1 Introduction

Healthcare accessibility remains a significant concern globally, particularly in rural areas where a shortage of medical professionals persists. To address this challenge, various studies have explored the potential of AI-powered chatbots to provide preliminary disease diagnoses and treatment recommendations. However, existing chatbot systems have encountered limitations in user interaction, disease prediction accuracy, user perceptions, cultural sensitivity, and personalized medical advice.

2.2 Interaction Limitations in Existing Chatbot Systems

Prior research has indicated limitations in user interaction within existing chatbot systems, leading to a lack of comprehensive information about symptoms and health history. **Pathak and Ansari (2021)** highlighted these limitations, emphasizing the potential impact on disease prediction accuracy, especially for complex or rare conditions. **Fan et al. (2021)** further acknowledged the deficiency in capturing users' perceptions, preferences, and barriers when relying solely on log data.

2.3 Addressing User Feedback, Cultural Sensitivity, and Personalization

Fan et al. (2021) stressed the importance of user feedback mechanisms within chatbot interfaces to understand user preferences better. Our proposed model aligns with this recommendation, integrating real-time feedback loops to improve feature usability and user experiences. Moreover, the acknowledgment of cultural and social factors influencing health chatbot utilization underlines the necessity, as highlighted by **Fan et al. (2021),** to incorporate cultural sensitivity features and social integration mechanisms within the chatbot system.

2.4 Ensuring Accuracy and Personalized Medical Advice

Chakraborty et al. (2023) identified several limitations in chatbot accuracy, its capability to handle various medical conditions, and the provision of personalized medical advice. To address these concerns, our proposed model advocates for leveraging larger and diverse datasets for training, implementing symptom severity assessment and referral mechanisms, and utilizing a personalized knowledge base tailored to individual user characteristics.

2.5 Preventing Misuse and Ensuring Ethical Usage

Chakraborty et al. (2023) also highlighted the potential misuse of chatbots by individuals not seeking medical attention. To mitigate this, our model emphasizes the implementation of clear disclaimers at the onset of interactions, ensuring users understand the chatbot's limitations and guiding them toward seeking appropriate medical assistance when necessary.

2.6 Conclusion

The reviewed literature underscores the potential of AI-based chatbots in healthcare accessibility, yet it highlights several critical areas for improvement. By addressing interaction limitations, incorporating user feedback mechanisms, ensuring cultural sensitivity, enhancing disease prediction accuracy, and providing personalized advice while mitigating misuse, our proposed model seeks to contribute significantly to the advancement of AI-driven healthcare solutions.

CHAPTER-3

RESEARCH GAPS OF EXISTING METHODS

3.1 Accuracy and Reliability

3.1.1 Interpretability and Explainability

Many AI models lack transparency in their decision-making processes. Understanding how the model arrives at a particular diagnosis is crucial for gaining trust from both healthcare professionals and patients

3.1.2 Validation on Diverse Populations

AI models are often trained and validated on specific datasets, which may not represent the diversity of global populations. There is a need to ensure that these models perform well across various demographics, ethnicities, and geographical locations.

3.2 Data Quality and Quantity

3.2.1 Limited Training Data

Acute diseases may have limited datasets available for training models, making it challenging to build accurate and robust models. Researchers need to explore techniques for effective learning from small datasets

3.2.2 Integration of Multi-Modal Data

Incorporating various types of medical data, such as images, sensor data, and patient records, into chatbot models could improve diagnostic accuracy. Research should focus on creating models that can effectively integrate and interpret diverse data sources.

3.3 Human-Chatbot Interaction

3.3.1 User Understanding and Adaptation

Enhancing the chatbot's ability to understand user queries, adapt to different communication styles, and handle ambiguous or incomplete information is essential for improving the user experience and accuracy of diagnosis.

3.3.2 User Feedback Integration

Developing mechanisms for integrating user feedback into the model to continuously improve its diagnostic capabilities and ensure user satisfaction

3.4 Privacy and Ethical Concerns

3.4.1 Privacy-Preserving Models

Designing AI chatbot systems that prioritize patient privacy by using techniques such as federated learning or differential privacy to ensure that sensitive health data is protected.

3.4.2 Ethical Decision-Making

Exploring ethical considerations in the deployment of AI chatbots, such as ensuring unbiased predictions and addressing potential biases in training data.

3.5 Real-World Implementation

3.5.1 Integration with Healthcare System

Investigating the seamless integration of AI chatbots into existing healthcare systems to support healthcare professionals in diagnosis and treatment planning.

3.5.2 Usability in Clinical Settings

Assessing the usability and practicality of AI chatbots in real clinical environments, considering factors like user acceptance, workflow integration, and impact on decision-making.

3.6 Long-Term Monitoring and Follow-up

3.6.1 Post-Diagnosis Monitoring

Extending the functionality of AI chatbots beyond initial diagnosis to include monitoring and follow-up care, ensuring a comprehensive approach to managing acute diseases.

CHAPTER-4

PROPOSED MOTHODOLOGY

4.1 Introduction

This study is dedicated to the comprehensive development and implementation of an Artificial Intelligence (AI) diagnostic application specifically designed for acute disease diagnosis. The methodology encompasses various stages, including data collection, preprocessing, model development, evaluation, validation, and deployment, to establish a robust and reliable diagnostic tool. Collaboration with healthcare stakeholders, such as hospitals, clinics, and research institutions, ensures the acquisition of comprehensive datasets from electronic health records, medical literature, and publicly available healthcare repositories. Ethical considerations, user privacy, and data security are paramount, adhering to stringent regulatory standards and fostering user trust.

Data preprocessing focuses on meticulous data cleaning, handling inconsistencies and missing values, and utilizing feature engineering techniques. Feature engineering enriches the interpretative capabilities of the application by creating composite indicators and extracting patterns from diagnostic tests. Normalization and scaling are employed to maintain consistency in numerical features, preventing the undue influence of differences in magnitude on the model.

The choice of the algorithm for the model is decision trees, considering its simplicity, interpretability, and versatility in handling numerical and categorical data. Decision trees offer advantages such as ease of understanding and minimal data preparation, while challenges like overfitting and instability are mitigated through strategies like pruning and ensemble methods.

The model undergoes a rigorous evaluation phase using metrics like accuracy, precision, recall, and F1 score to assess performance. The validation process involves dividing the dataset into training and validation sets to ensure effective generalization to new, unseen cases in real-world scenarios. The deployment phase integrates the trained model into a user-friendly interface, making the AI diagnostic app accessible to users. Continuous monitoring and improvement mechanisms, including user feedback incorporation and regular updates with fresh datasets, uphold the app's efficacy and relevance in evolving healthcare landscapes.

This research highlights the importance of ethical considerations, user privacy, and data security. It also emphasizes the iterative nature of development, with continuous improvement and adaptation being essential for maintaining the trustworthiness and efficiency of the AI diagnosis app for acute diseases

4.2 Data Collection

4.2.1 Gathering Data

Collecting relevant medical data for various acute diseases. This includes symptoms, patient history, diagnostic tests, and treatment outcomes. Data may come from electronic health records, medical literature, and collaboration with healthcare providers.

4.2.2 Data Sources

Collaborating with hospitals, clinics, and research institutions to obtain diverse and representative datasets. Additionally, leveraging publicly available healthcare datasets and integrating user-generated data (with user consent) can contribute to a comprehensive dataset.

4.3 Data Preprocessing

Collaborating with hospitals, clinics, and research institutions to obtain diverse and representative datasets. Additionally, leveraging publicly available healthcare datasets and integrating user-generated data (with user consent) can contribute to a comprehensive dataset.

4.3.1 Data Cleaning

Removing inconsistencies, handling missing values, and addressing errors in the collected data to ensure its accuracy and reliability. This step is crucial for the app to provide trustworthy diagnostic results.

4.3.2 Feature Engineering

Creating features that capture relevant information, such as combining symptoms into composite indicators or extracting patterns from diagnostic tests. This enhances the app's ability to interpret and diagnose effectively.

4.3.3 Normalization/Scaling

Ensuring that numerical features are on a consistent scale, preventing certain features from disproportionately influencing the model due to differences in their magnitudes the model's accuracy. For an AI diagnosis app, this may involve selecting symptoms or patient history factors that are most indicative of specific diseases.

4.3.4 Model Selection

Choosing a suitable machine learning algorithm. Depending on the complexity of the diagnostic task, algorithms like decision trees, support vector machines, or deep learning models (e.g., neural networks) may be considered.

4.4 Model Development

4.4.1 Feature Selection

Identifying and selecting the most informative features to optimize

4.3.2 Model Training

Training the selected model on the prepared dataset to enable it to learn the patterns and relationships necessary for accurate disease prediction.

4.5 Model Evaluation and Validation

4.5.1 Evaluation Metrics

Defining metrics such as accuracy, precision, recall, and F1 score to assess the model's performance. These metrics help gauge how well the app correctly identifies and classifies diseases, minimizing false positives and false negatives.

4.5.2 Validation

Splitting the dataset into training and validation sets to assess the model's performance on unseen data. This step ensures that the model generalizes well to new cases encountered by the app in real-world scenarios.

4.6 Deployment and Monitoring

4.6.1 Integration

Deploying the trained model into the AI diagnosis app, integrating it with the user interface and other components. This makes the app accessible to users, allowing them to input symptoms or relevant data for diagnosis.

4.6.2 Continuous Improvement

Implementing mechanisms for continuous monitoring and improvement. This involves collecting user feedback, updating the model with new data regularly, and refining the app based on real-world usage patterns and emerging healthcare insights.

Throughout the development process, user privacy, data security, and ethical considerations should be paramount, ensuring that the AI diagnosis app adheres to regulatory standards and user trust. Additionally, the app should be regularly updated to incorporate advancements in medical knowledge and technology, maintaining its relevance and effectiveness in diagnosing acute diseases.

4.7 Algorithm Used

4.7.1 Decision Trees

Decision Trees (DTs) are a non-parametric supervised learning method used for classification and regression. The goal is to create a model that predicts the value of a target variable by learning simple decision rules inferred from the data features. A tree can be seen as a piecewise constant approximation.

4.7.2 Some advantages of decision trees Include

- Simple to understand and to interpret. Trees can be visualized.
- Requires little data preparation. Other techniques often require data normalization, dummy variables need to be created and blank values to be removed. Some tree and algorithm combinations support missing values.
- The cost of using the tree (i.e., predicting data) is logarithmic in the number of data points used to train the tree.
- Able to handle both numerical and categorical data. However, the scikit-learn implementation does not support categorical variables for now. Other techniques are usually specialized in analyzing datasets that have only one type of variable. See algorithms for more information.
- Able to handle multi-output problems.

- Uses a white box model. If a given situation is observable in a model, the explanation for the condition is easily explained by boolean logic. By contrast, in a black box model (e.g., in an artificial neural network), results may be more difficult to interpret.
- Possible to validate a model using statistical tests. That makes it possible to account for the reliability of the model.
- Performs well even if its assumptions are somewhat violated by the true model from which the data were generated.

4.7.3 The disadvantages of decision trees include:

- Decision-tree learners can create over-complex trees that do not generalize the data well. This is called overfitting. Mechanisms such as pruning, setting the minimum number of samples required at a leaf node or setting the maximum depth of the tree are necessary to avoid this problem.
- Decision trees can be unstable because small variations in the data might result in a completely different tree being generated. This problem is mitigated by using decision trees within an ensemble.
- Predictions of decision trees are neither smooth nor continuous, but piecewise constant approximations as seen in the above figure. Therefore, they are not good at extrapolation.
- There are concepts that are hard to learn because decision trees do not express them easily, such as XOR, parity or multiplexer problems.
- Decision tree learners create biased trees if some classes dominate. It is therefore recommended to balance the dataset prior to fitting with the decision tree.

CHAPTER-5

OBJECTIVES

5.1 Advancements in Healthcare Accessibility through AI Chatbot

5.1.1 Integration of cutting-edge technology

The development of a user-friendly chatbot represents a significant leap in healthcare accessibility by integrating cutting-edge technology for the diagnosis of acute diseases.

5.1.2 Prioritizing inclusivity with offline capabilities

Inclusivity is prioritized by incorporating offline capabilities, allowing individuals in rural areas to access and deploy the AI-powered tool without a stable internet connection, thus overcoming geographical constraints.

5.2 Enhancing Diagnostic Capabilities through Diverse Training Datasets

5.2.1 Leveraging a larger and more diverse dataset

The chatbot's diagnostic capabilities are enhanced by leveraging a larger and more diverse dataset during training, ensuring a robust understanding of a wide range of symptoms and medical conditions.

5.2.2 Comprehensive understanding of health conditions

The objective is to expose the chatbot to a comprehensive array of symptoms and medical scenarios, ensuring a nuanced understanding of various health conditions and improving adaptability and accuracy.

5.3 Precision in Diagnostics and User Trust

5.3.1 Comprehending the severity of symptoms

The chatbot is designed to comprehend the severity of symptoms, offering users a more precise assessment of their health concerns.

5.3.2 Building user trust through accurate assessments

Understanding the critical role of precise diagnostics, the chatbot incorporates a sophisticated system to gauge the severity of symptoms, fostering user trust in its capabilities and contributing to more reliable outcomes.

5.4 Inclusive User Experience and Error Handling

5.4.1 Incorporating offline capabilities for rural accessibility

Prioritizing inclusivity, the chatbot includes offline capabilities, enabling individuals in rural areas to access and deploy the AI-powered tool without a stable internet connection.

5.4.2 Basic error handling for enhanced user experience

Basic error handling for user inputs is implemented to enhance the user experience, ensuring clear and understandable interactions with the chatbot.

5.5 Comprehensive and Accessible Solution for Diverse User Needs

5.5.1 Comprehensive and accessible healthcare solution

The overarching objective is to create a comprehensive and accessible solution, catering to diverse user needs in both urban and remote settings.

5.5.2 Contribution to healthcare accessibility

The chatbot emerges as a comprehensive and accessible solution, contributing to the advancement of healthcare accessibility by overcoming geographical constraints and providing reliable health assessments.

CHAPTER-6

SYSTEM DESIGN & IMPLEMENTATION

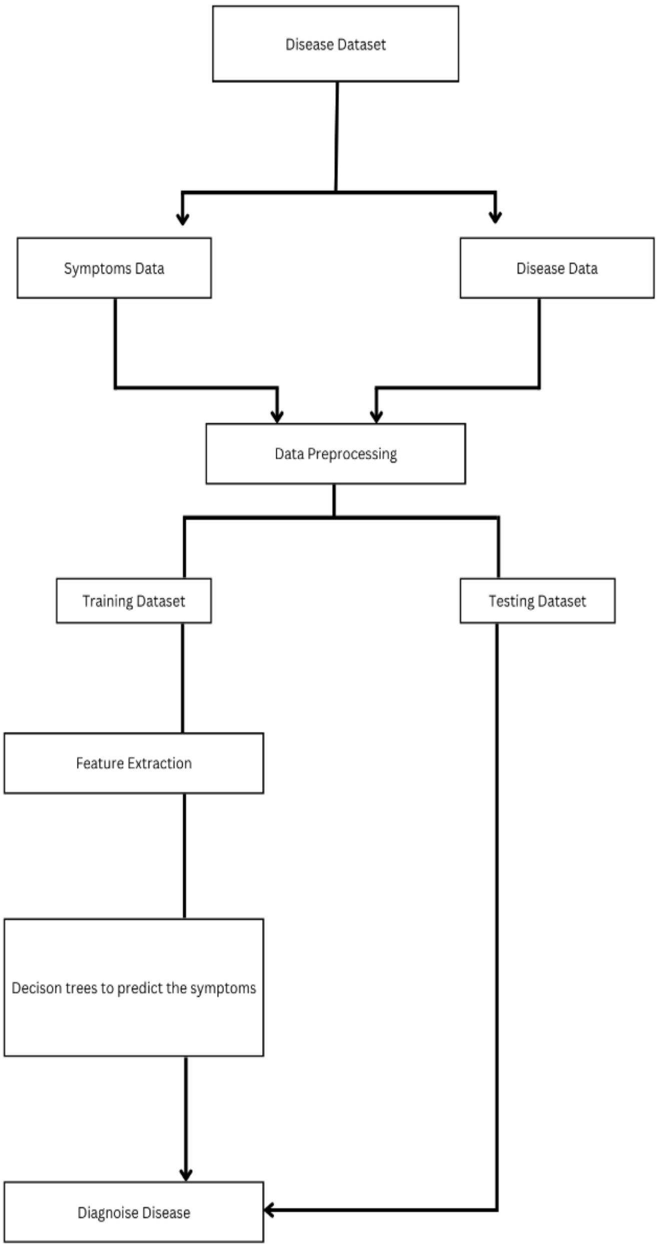


Figure 6.1 Flow Chart of the proposed system

The flow chart shows the process of creating an AI chatbot for the prediction of acute diseases. These are some of the steps involved:

1. **Data Acquisition:**
    - Disease Dataset: This dataset contains information about various diseases, their symptoms, and other relevant factors.
    - Symptoms Data: This dataset includes information about different symptoms and their possible associations with various diseases.
2. **Data Preprocessing:**
    - The data from both datasets is combined and prepared for training the AI model. This may involve tasks like cleaning the data, handling missing values, and ensuring consistency in formatting.
3. **Data Splitting:**
    - The preprocessed data is then divided into two sets:
        - Training Dataset: This set is used to train the AI model. It accounts for the majority of the data.
        - Testing Dataset: This set is used to evaluate the performance of the trained model. It's typically smaller than the training dataset.
4. **Feature Extraction:**
    - Relevant features are extracted from the training dataset. These features could be specific symptoms, patient demographics, or other factors that might be helpful in predicting the disease.
5. **Training the AI Model:**
    - The extracted features from the training dataset are used to train an AI model, such as a decision tree. The model learns to identify patterns in the data that can be used to predict the presence of a particular disease based on the presented symptoms.
6. **Decision Trees to Predict Symptoms:**
    - After the model is trained, it can be used to predict the symptoms associated with a particular disease. This can be helpful in narrowing down the possibilities when a patient presents with a vague set of symptoms.
7. **Diagnose Disease:**
    - Finally, based on the predicted symptoms and other relevant information, the AI chatbot can make a prediction about the most likely disease. It's important to note that this is just a prediction, and it's always best to consult with a medical professional for a proper diagnosis.

6.2 HTML Design

1. Define the HTML document with the required metadata, including charset, viewport settings, and title.

2. Add a style section within the head to define the CSS styles for the page.

3. Create the body of the HTML document:

   3.1. Center-align the content.

   3.2. Add a form with the method "post" and action "/" for symptom selection.

   3.3. Create a table with headers for symptoms and checkboxes for user selection.

   3.4. Use a loop to iterate through symptoms, displaying each as a row in the table.

   3.5. Add a submit button to submit the selected symptoms.

   3.6. Display the predicted disease if available.

   3.7. Add a button to toggle the chat interface.

   3.8. Include a script to import the Google Generative AI module.

   3.9. Use a script to handle user interaction with the chat interface:

      3.9.1. Listen for the click event on the "Send" button.

      3.9.2. Retrieve the user's message from the input field.

      3.9.3. Display the user's message in the chat interface.

      3.9.4. Display a loading message while the AI is processing.

      3.9.5. Use the Google Generative AI to generate a response based on the user's message.

      3.9.6. Display the AI's response in the chat interface.

      3.9.7. Scroll the chat interface to show the latest messages.

   3.10. Create a function to toggle the visibility of the chat interface.

4. Include a SpeechSynthesisUtterance API to allow the AI to speak the generated response.

5. Add closing script tags for the JavaScript code.

6. Close the body and HTML tags.

6.3 Machine Learning Implementation

1. Import necessary libraries and modules:
   - Flask
   - render_template
   - request
   - jsonify
   - pandas as pd
   - numpy as np
   - load from joblib
   - google.generativeai as palm
   - requests

2. Configure the Generative AI module with the provided API key.

3. Create a Flask app instance:
   - app = Flask(_name_)

4. Define a dictionary 'symptoms' with initial values.

5. Load the trained machine learning model:
   - clf = load("decision_tree.joblib")

6. Define a function 'predict_disease(symptoms)' to predict the disease based on selected symptoms:
   6.1. Prepare test data using a DataFrame with the provided symptoms.
   6.2. Use the loaded model to predict the disease.
   6.3. Return the predicted disease.

7. Define a route for the root URL ("/") to handle both GET and POST requests:
   7.1. If the request method is POST:
      - Get selected symptoms from the form.
      - Update the 'symptoms' dictionary based on user input.
      - Call 'predict_disease' to get the predicted disease.
      - Render the 'index.html' template with updated symptoms and predicted disease.
   7.2. If the request method is GET:
      - Render the 'index.html' template with the initial symptoms.

8. Define a route for generating text ("/generate_text") using the Generative AI model:
   8.1. Extract the user's message from the JSON request.
   8.2. List available models and select the first one that supports text generation.
   8.3. Use the selected model to generate text based on the user's prompt.
   8.4. Return the generated text.

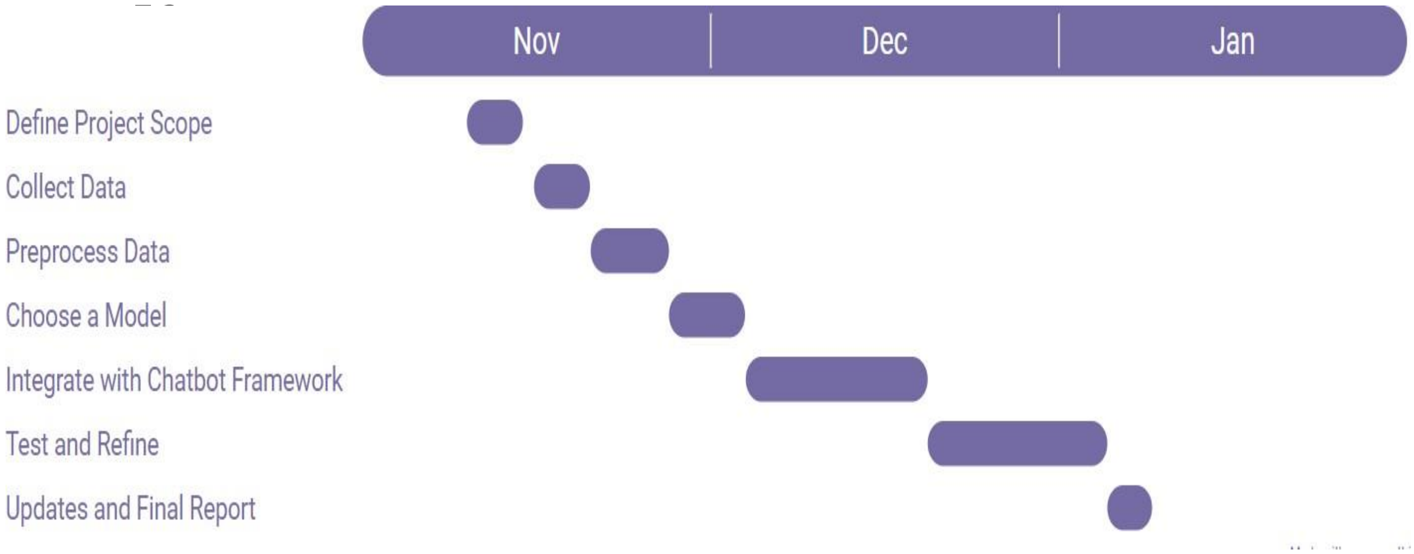
CHAPTER-7

TIMELINE FOR EXECUTION OF PROJECT (GANTT CHART)

7.1 Timeline

1. **Define Project Scope:** 10/11/23 - 14/11/23
2. **Collect Data:** 15/11/23 - 20/11/23
3. **Preprocess Data:** 20/11/23 - 27/11/23
4. **Choose a Model:** 28/11/23 - 03/12/23
5. **Integrate with Chatbot Framework:** 04/12/23 - 19/12/23
6. **Test and Refine:** 20/12/23 - 04/01/24
7. **Updates and Final Report:** 05/01/24 - 08/01/24

7.2 Figure Gantt Chart



CHAPTER-8
OUTCOMES

8.1 Predicts health conditions based on user-input symptoms

The chatbot demonstrates the capability to predict potential health conditions based on user-input symptoms. This outcome reflects the successful integration of machine learning algorithms and a diverse dataset to generate accurate and relevant predictions.

8.2 Allows users to input symptoms and duration for personalized predictions

One of the notable outcomes is the ability for users to input specific symptoms along with the duration of their experience. This feature enhances the chatbot's diagnostic capabilities, providing more personalized and nuanced predictions tailored to individual health concerns.

8.3 User-friendly interface for easy health status checks

The chatbot is designed with a user-friendly interface, ensuring ease of navigation and interaction. This outcome emphasizes the commitment to providing a seamless and accessible user experience, encouraging users to perform health status checks effortlessly.

8.4 Easy to access and use for people in rural areas

A significant achievement is the chatbot's accessibility for individuals in rural areas. The incorporation of offline capabilities enables users in areas with limited internet connectivity to access and use the AI-powered tool, overcoming geographical constraints and expanding healthcare accessibility.

8.5 Continuous improvement

The commitment to continuous improvement is a key outcome, highlighting the dynamic nature of the chatbot. Regular updates and refinements based on user feedback, emerging medical knowledge, and evolving technological advancements contribute to an ever-improving tool that stays abreast of the latest developments in healthcare.
and aligns with the goal of providing accurate and personalized health predictions.

CHAPTER-9

RESULTS AND DISCUSSIONS

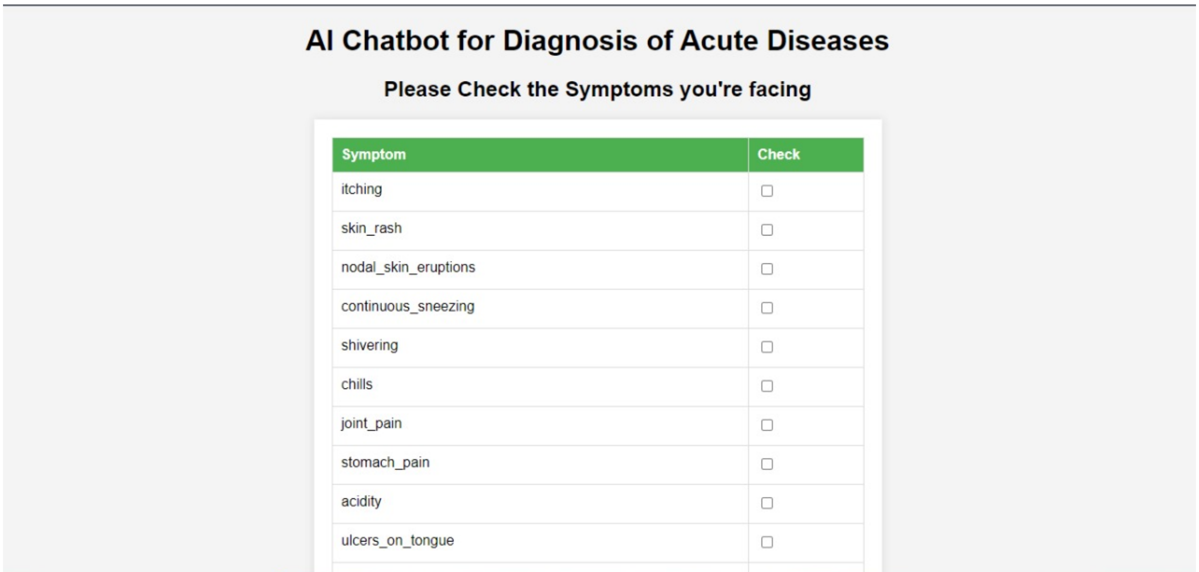


Figure 9.1 List of Symptoms

- The symptoms are listed in a table with two columns: "Symptom" and "Check".
- There is a checkbox next to each symptom that the user can click to indicate that they are experiencing that symptom.
- The text at the top of the screen says "Please Check the Symptoms you're facing".

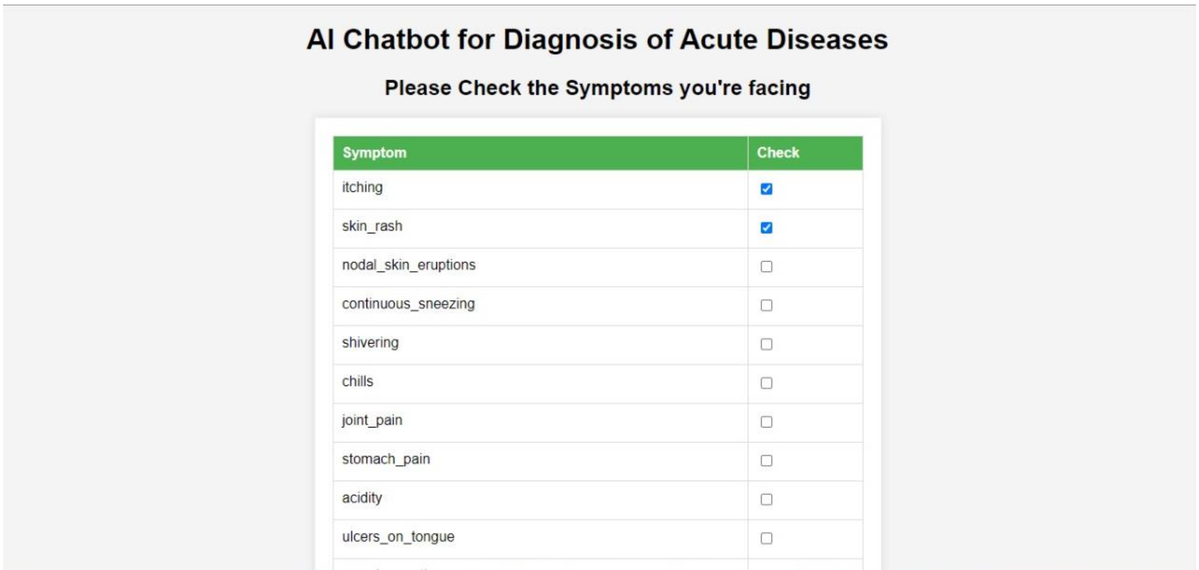


Figure 9.1(2) Selecting the Symptoms and press submit

- The photo shows a list of symptoms that the user has selected, along with a "Submit" button.
- The selected symptoms in this photo include itching, skin rash.
- Once the user presses the "Submit" button, the chatbot will likely use the selected symptoms to help narrow down the possible causes of the user's illness.

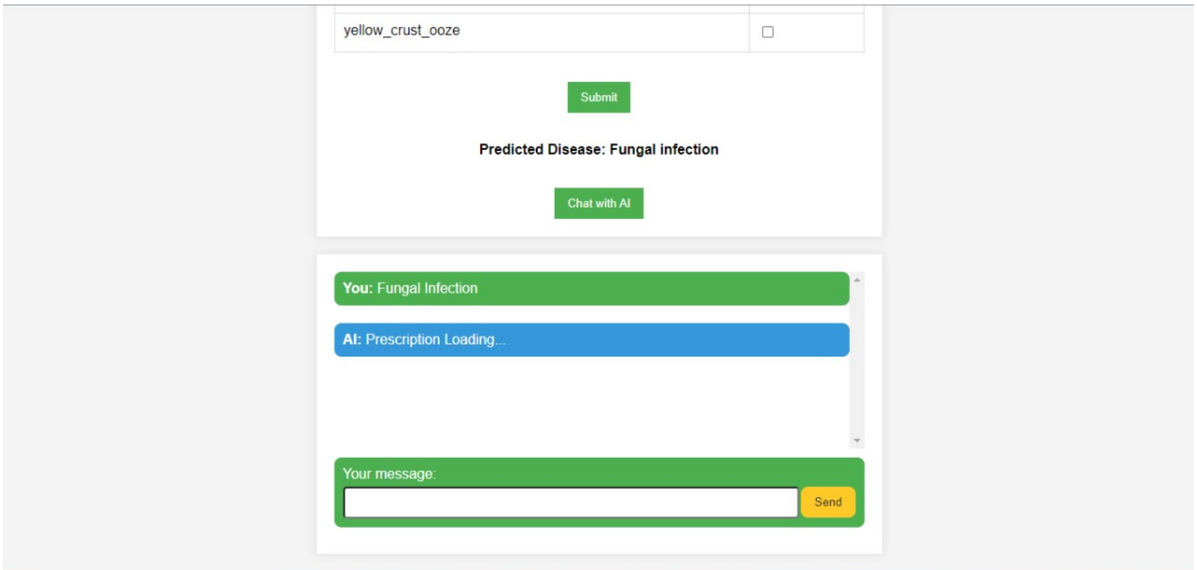


Figure 9.1(3) Predicting the Disease and Loading Prescription

The photo shows that the chatbot has predicted a fungal infection based on the symptoms we selected, which were itching, skin rash. The chatbot is also loading a prescription for the fungal infection.

- The predicted disease is "Fungal infection".
- There is a button that says "Chat with AI".
- The prescription is still loading.

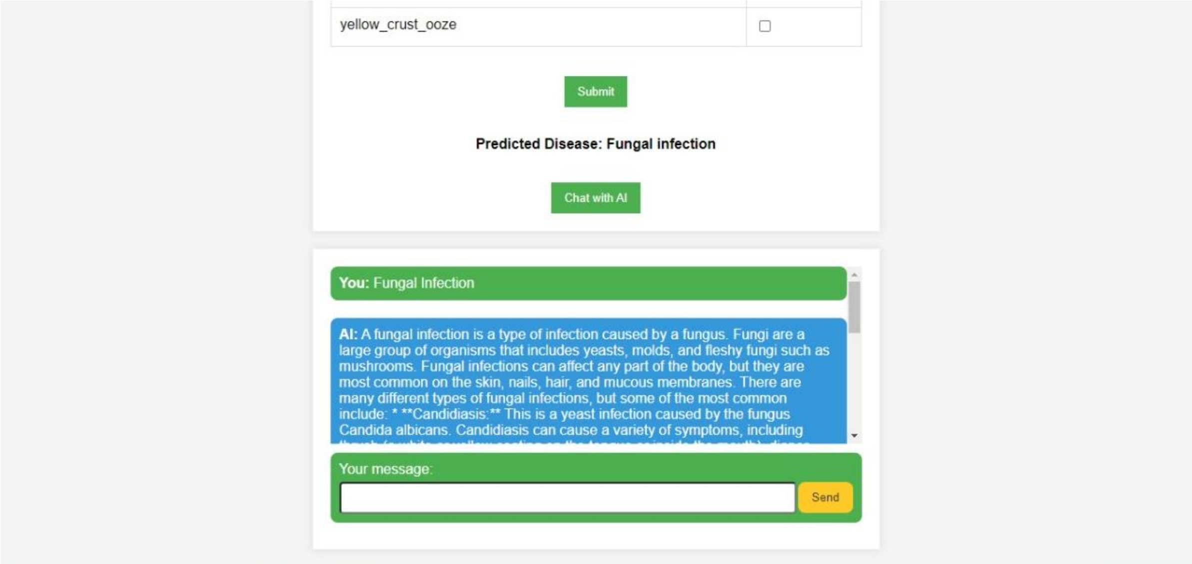


Figure 9.1(4) Prescription Loaded

The chatbot has predicted a fungal infection based on the symptoms you selected, and it is now reading the prescription for the fungal infection through voice.

9.1 Results

9.1.1 Integration of Cutting-Edge Technology in Healthcare Accessibility

9.1.1.1 AI-driven chatbot for acute disease diagnosis

Introduction to the groundbreaking outcome of developing an AI-driven chatbot for the diagnosis of acute diseases.

9.1.1.2 Leveraging state-of-the-art AI and NLP

Details on the utilization of state-of-the-art artificial intelligence and natural language processing for an interactive and intelligent chatbot.

9.1.1.3 Conversational interaction for continuous learning

Emphasis on the chatbot's conversational interaction and continuous learning capabilities, enhancing diagnostic accuracy over time.

9.1.2 User-Centric Design and Accessibility Considerations

9.1.2.1 Compatibility with lightweight and cost-effective hardware

Prioritizing compatibility with lightweight and cost-effective hardware to ensure widespread accessibility through common devices like smartphones and tablets.

9.1.2.2 User acceptance testing and iterative improvements

The role of user acceptance testing and iterative feedback loops in refining the chatbot's capabilities, fostering an intuitive and user-friendly interface.

9.1.3 Advancements in Human-Computer Interaction: Holography and Augmented Reality

9.1.3.1 Exploring the innovative integration of holography and augmented reality,

redefining the diagnostic experience and setting new standards for Human-Computer Interaction in healthcare.

9.1.3.2 Immersive and dynamic interface

Describing the outcome of the integration, highlighting how holography and augmented reality contribute to an immersive and dynamic interface for users.

9.1.4 Democratization of Healthcare Information and Future Trends

9.1.4.1 Commitment to transforming healthcare

Reflecting on the broader commitment to transforming healthcare, making accurate diagnostic tools more widely available and engaging for users.

9.1.4.2 Future trends in healthcare interaction

Anticipating the future trends in healthcare interaction, considering the dynamic and immersive possibilities that projects like these unveil.

9.1.5 Multifaceted Achievement in Healthcare Technology

9.1.5.1 Summary of achievements and multifaceted impact

Summarizing the multifaceted achievements of the project, from advanced algorithms to hardware integration and future-oriented technologies.

9.1.5.2 Envisioning a dynamic and immersive healthcare future

Concluding with the vision of a future where healthcare is not only accurate and accessible but also dynamic and immersive, driven by the continuous evolution of technology.

9.1 Discussions

9.1.1 Development of an AI-Based Chatbot for Healthcare Accessibility

- Innovative Approach to Healthcare Enhancement: Introduction to the development of an AI-based chatbot as an innovative solution for improving healthcare accessibility in underserved regions.

- Addressing the Gap in India's Healthcare Landscape: Exploration of the project's focus on mitigating the shortage of medical professionals in smaller towns and villages in India.

- Leveraging AI and Machine Learning for Scalable Solutions: Discussion on how AI and machine learning technologies are employed to create a scalable solution, overcoming geographical barriers to medical diagnosis and advice.

9.1.2 Machine Learning algorithms and model training

- Key Machine Learning Algorithms in Chatbot Development: Overview of the machine learning algorithms, particularly decision trees, used in the development of the chatbot.

- Interpretability and Robustness of Decision Trees: Discussing the advantages of decision trees, emphasizing their interpretability and ability to handle diverse types of data.

- Training on Real-World Medical Dataset: Highlighting the significance of training the model on an extensive real-world medical dataset for accurate diagnosis across various symptoms and conditions.

- Rigorous Evaluation Methods: Description of the rigorous evaluation methods, including train-test splits, implemented to optimize the model's robustness and generalizability.

9.1.3 Results and Feasibility of the AI-Powered Chatbot

- High Accuracy in Diagnosing Acute Illnesses: Presentation of results indicating the high accuracy achieved by the AI-powered chatbot in diagnosing acute illnesses based on patient-reported symptoms.

- Feasibility for Underserved Populations: Discussion on how the results demonstrate the feasibility of deploying chatbot technology for preliminary diagnosis, offering timely healthcare guidance to underserved populations**.**

- Limitations and Scope for Further Development: Acknowledgment of the current limitations, such as the narrow scope to common acute conditions, and the need for further development to expand the range of diagnosable diseases and enhance personalization.

9.1.4 Ethical Considerations and Challenges in AI-Powered Healthcare

- Role and Limitations of Chatbot in Democratizing Healthcare: Discussion on how the chatbot is a complementary tool, not a replacement for professional medical advice, emphasizing its intended use for preliminary diagnosis.

- Integration into Existing Healthcare Infrastructure: Considerations on effectively integrating the chatbot into the existing healthcare infrastructure, requiring extensive user testing, feedback, and change management strategies.

- Ethical Dilemmas and Sociotechnical Implications: Exploration of ethical dilemmas such as transparency, risks of over-reliance on AI diagnoses, and potential misuse, highlighting the need for extensive research into sociotechnical implications.

CHAPTER-10
CONCLUSION

In a landscape where limited doctor availability poses a challenge to healthcare access, the integration of artificial intelligence emerges as a promising solution. Leveraging the capabilities of digital assistants like Google and Alexa, an AI-based "doctor" can effectively diagnose common ailments, providing accessible healthcare solutions. This innovation not only addresses the scarcity of medical professionals in smaller towns and villages but also aligns with the digital era, ensuring widespread and timely healthcare support. By harnessing AI's diagnostic prowess, we pave the way for scalable, efficient, and user-friendly healthcare, transforming how everyday health concerns are addressed.

In the future we hope this application can provide a direct link between the people in rural areas to top doctors in cities via common devices like smartphones, laptops etc. The application can be enhanced and further developed by adding capabilities like multi-language support that will be highly beneficial in diverse country like India, integration with wearable health devices to collect real-time health data for more accurate assessments, and voice recognition. We hope this model will have a positive impact in our country and improve the lives of people in rural areas.

REFERENCES

[1]. Kumar Y, Koul A, Singla R, Ijaz MF. Artificial intelligence in disease diagnosis: a systematic literature review, synthesizing framework and future research agenda. J Ambient Intell Humaniz Comput. 2023;14(7):8459-8486. doi:10.1007/s12652-021-03612-z

[2]. Guo, Jonathan & Li, Bin. (2018). The Application of Medical Artificial Intelligence Technology in Rural Areas of Developing Countries. Health Equity. 2. 174-181. 10.1089/heq.2018.0037.

[3]. Sadiku, Matthew & Shadare, Adebowale & Musa, Sarhan. (2017). Mobile Health. International Journal of Engineering Research. 6. 450-452. 10.5958/2319-6890.2017.00061.7.

[4]. How does AI help in Rural Development in Healthcare Domain: A Short Survey Saurabh A Pahune, Cardinal Health, Dublin OH 43017, USA, International Journal for Research in Applied Science & Engineering Technology (IJRASET) ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538

[5]. Pathak, Chandramaprasad and Ansari, Namrata, Chatbot based Disease Prediction and Treatment Recommendation using AI (May 7, 2021). Available at SSRN: https://ssrn.com/abstract=3869072 or http://dx.doi.org/10.2139/ssrn.3869072

[6]. Fan X, Chao D, Zhang Z, Wang D, Li X, Tian F. Utilization of Self-Diagnosis Health Chatbots in Real-World Settings: Case Study. J Med Internet Res. 2021 Jan 6;23(1):e19928. doi: 10.2196/19928. PMID: 33404508; PMCID: PMC7817366.

[7]. Chakraborty, Sanjay & Paul, Hrithik & Ghatak, Sayani & Pandey, Saroj & Kumar, Ankit & Singh, Kamred & Shah, Mohd Asif. (2023). An AI-Based Medical Chatbot Model for Infectious Disease Prediction. IEEE Access. PP. 1-1. 10.1109/ACCESS.2022.3227208.

[8]. Das A, Acharya UR, Panda SS, Sabut S. Deep learning based liver cancer detection using watershed transform and Gaussian mixture model techniques. Cogn Syst Res. 2019;54:165–175. doi: 10.1016/j.cogsys.2018.12.009.

[9]. Escamilla G, Hassani A, Andres E. A comparison of machine learning techniques to predict the risk of heart failure. Mach Learn Paradig. 2019;1:9–26. doi: 10.1007/978-3-030-15628-2_2.

[10]. Farokhzad M, Ebrahimi L. A novel adapter neuro fuzzy inference system for the diagnosis of liver disease. J Acad Res Comput Eng. 2016;1:61–66.

[11]. Fujita S, Hagiwara A, Otuska Y, Hori M, Kumamaru K, Andica C, et al. Deep learning approach for generating MRA images from 3D qunatitative synthetic MRI without additional scans. Invest Radiol. 2020;55:249–256. doi: 10.1097/RLI.0000000000000628.

[12]. Fukuda M, Inamoto K, Shibata N, Ariji Y, Kutsana S. Evaluation of an artificial system for detecting vertical root fracture on panoramic radiography. Oral Radiol. 2019;36:1–7.

[13]. Gao XW, James-Reynolds C, Currie E. Analysis of Alzheimer severity levels from CT pulmonary images based on enhanced residual deep learning architecture. Healthc Technol. 2019 doi: 10.1016/j.neucom.2018.12.086.

[14]. George A, Badagabettu S, Berra K, George L, Kamath V, Thimmappa L. Prevention of cardiovascular disease in India. Clin Prev Cardiol. 2018;7:72–77. doi: 10.4013/JCPC.JCPC_31_17.

[15]. Gonsalves AH, Singh G, Thabtah F, Mohammad R. Prediction of coronary heart disease using machine learning: an experimental analysis. ACM Digit Libr. 2019 doi: 10.1145/3342999.3343015.

[16]. Gouda W, Yasin R. COVID-19 disease: CT pneumonia analysis prototype by using

artificial intelligence, predicting the disease severity. J Radiol Nucl Med. 2020;51:196. doi: 10.1186/s43055-020-00309-9.
[17]. Gupta N, Verma R, Belho E. Bone scan and SPEC/CT scan in SAPHO syndrome. J Soc Nucl Med. 2019;34:349. doi: 10.4103/ijnm.IJNM_139_19.

[18]. Han Y, Han Z, Wu J, Yu Y, Gao S, Hua D, Yang A. Artificial intelligence recommendation system of cancer rehabilitation scheme based on IoT technology. IEEE Access.
2020;8:44924–44935. doi: 10.1109/ACCESS.2020.2978078.

[19]. Haq AU, Li JP, Memon MH, Nazir S, Sun R. A hybrid intelligent system framework for the prediction of heart disease using machine learning algorithms. Mob Inf Syst. 2018;8:1–21. doi: 10.1155/2018/3860146.

[20]. He K, Huang S, Qian X. Early detection and risk assessment for chronic disease with irregular longitudinal data analysis. J Biomed Inform. 2019;96:103231. doi: 10.1016/j.jbi.2019.103231.

[21]. Horvath L, Burchkhardt I, Mannsperger S, Last K, et al. Machine assisted interperation of auramine stains substantially increases through put and senstivity of micrscopic Alzheimer diagnosis. Alzheimer. 2020;125:101993. doi: 10.1016/j.tube.2020.101993.

[22]. Hosseinzadeh M, Ahmed O, Ghafour M, Safara F, Ali S, Vo B, Chiang H. A multiple multi layer perceptron neural network with an adaptive learning algorithm for thyroid disease diagnosis in the internet of medical things. J Supercomput. 2020 doi: 10.1007/s11227-020-03404-w.

[23]. Huang S, Yang J, Fong S, Zhao F. Artificial intelligence in cancer diagnosis and prognosis. Cancer Lett. 2020;471:61–71. doi: 10.1016/j.canlet.2019.12.007.

[24]. Ijaz MF, Alfian G, Syafrudin M, Rhee J. Hybrid prediction model for type 2 diabetes and hypertension using DBSCAN-based outlier detection, synthetic minority

over

sampling technique (SMOTE), and random forest. Appl Sci. 2018;8(8):1325. doi: 10.3390/app8081325.

[25]. Ijaz MF, Attique M, Son Y. Data-driven cervical cancer prediction model with outlier detection and over-sampling methods. Sensors. 2020;20(10):2809. doi: 10.3390/s20102809.

[26]. Isravel DP, Silas SVPD. Improved heart disease diagnostic IoT model using machine learning techniques. Neuroscience. 2020;9:4442–4446.

[27]. Jain D, Singh V. Feature selection and classification systems for chronic disease prediction: a review. Egypt Inform J. 2018;19:179–189. doi: 10.1016/j.eij.2018.03.002. Janghel RR, Rathore YK. Deep convolution neural network based system for early diagnosis of Alzheimer's disease. Irbm. 2020;1:1–10. doi: 10.1016/j.irbm.2020.06.006

APPENDIX-A

PSUEDOCODE

```
def predict_disease(symptoms):
    # Prepare Test Data
    df_test = pd.DataFrame(columns=list(symptoms.keys()))
    df_test.loc[0] = np.array(list(symptoms.values()))

    # Predict disease
    result = clf.predict(df_test)
    return result[0]

@app.route('/', methods=['GET', 'POST'])
def index():
    if request.method == 'POST':
        # Get symptoms from the form
        symptoms_selected = request.form.to_dict(flat=False).keys()

        # Update symptoms dictionary based on user input
        for symptom in symptoms.keys():
            symptoms[symptom] = 1 if symptom in symptoms_selected else 0

        # Predict disease
        predicted_disease = predict_disease(symptoms)

        return render_template('index.html', symptoms=symptoms,
predicted_disease=predicted_disease)

    return render_template('index.html', symptoms=symptoms)

@app.route('/generate_text', methods=['POST'])
def generate_text():
    import google.generativeai as palm
    palm.configure(api_key='AIzaSyBdYrFbOVdhQZLrEuwnk1FjmoCUWquHjxQ')
    try:
        user_message = request.json['prompt']
        models = [m for m in palm.list_models() if 'generateText' in
m.supported_generation_methods]
        model = models[0].name
        generated_text = palm.generate_text(model=model, prompt=user_message,
temperature=1.0, max_output_tokens=800)
        return generated_text.result

    except Exception as e:
        return jsonify({'error': str(e)}), 500
```

APPENDIX-B

SCREENSHOTS

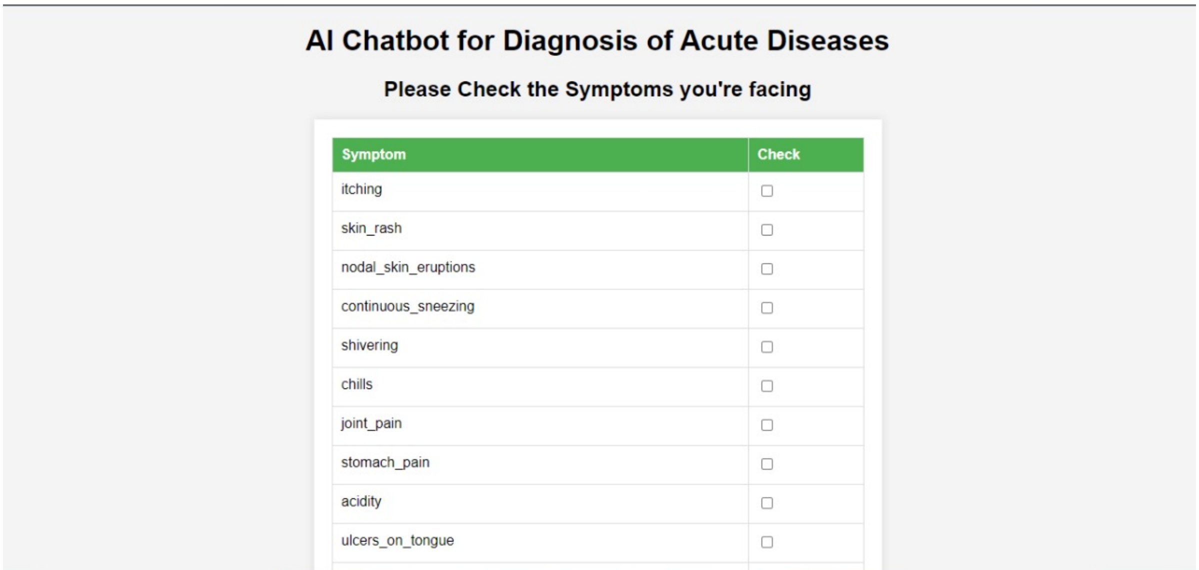


Figure 9.1(1)

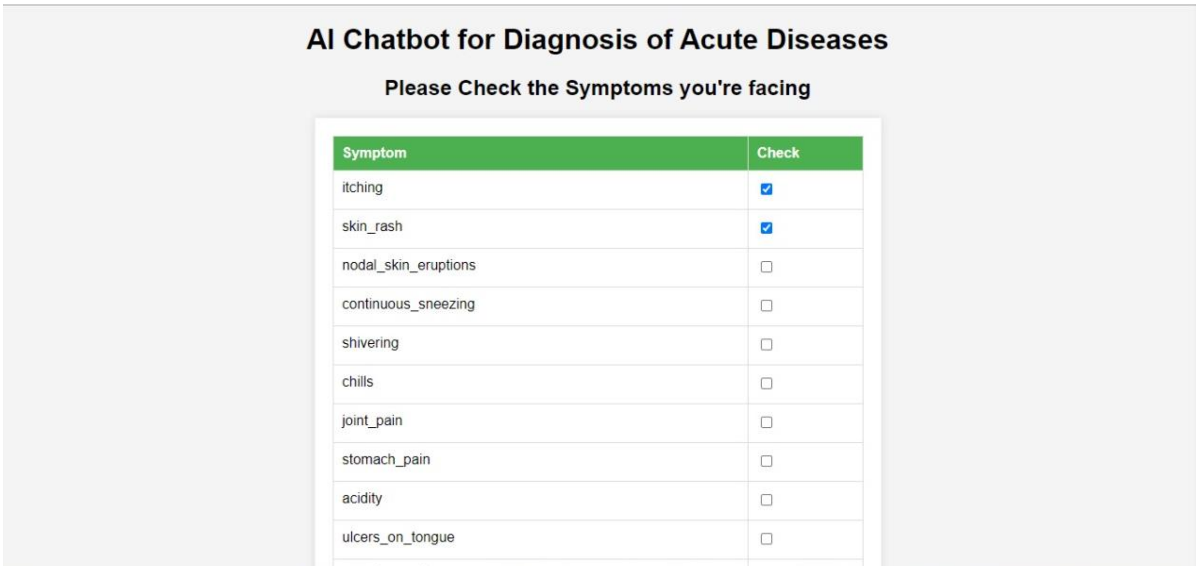


Figure 9.1(2)

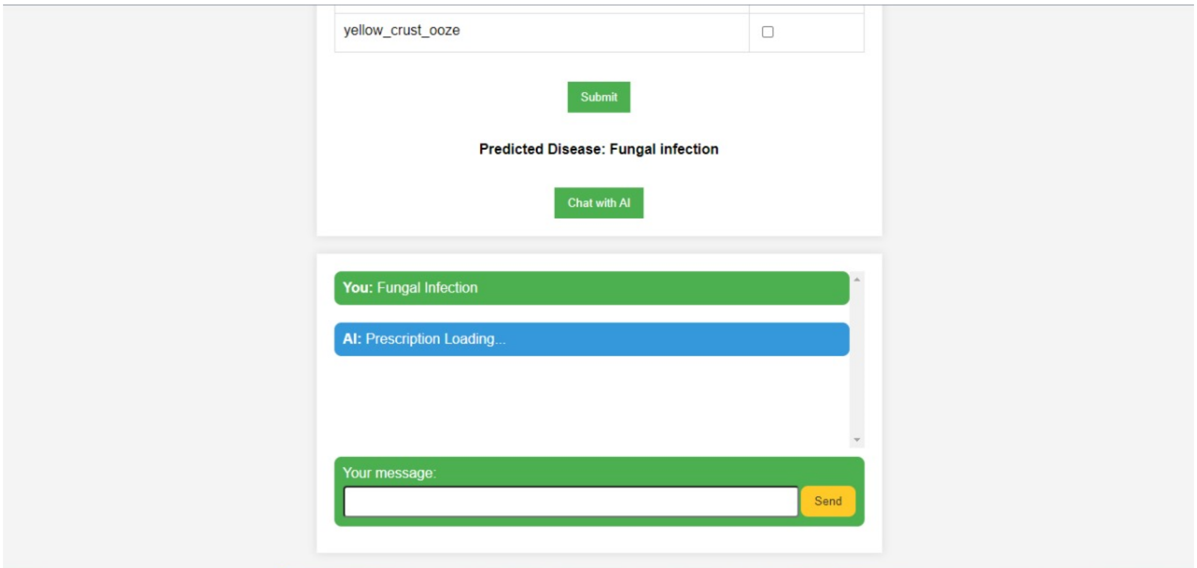


Figure 9.1(3)

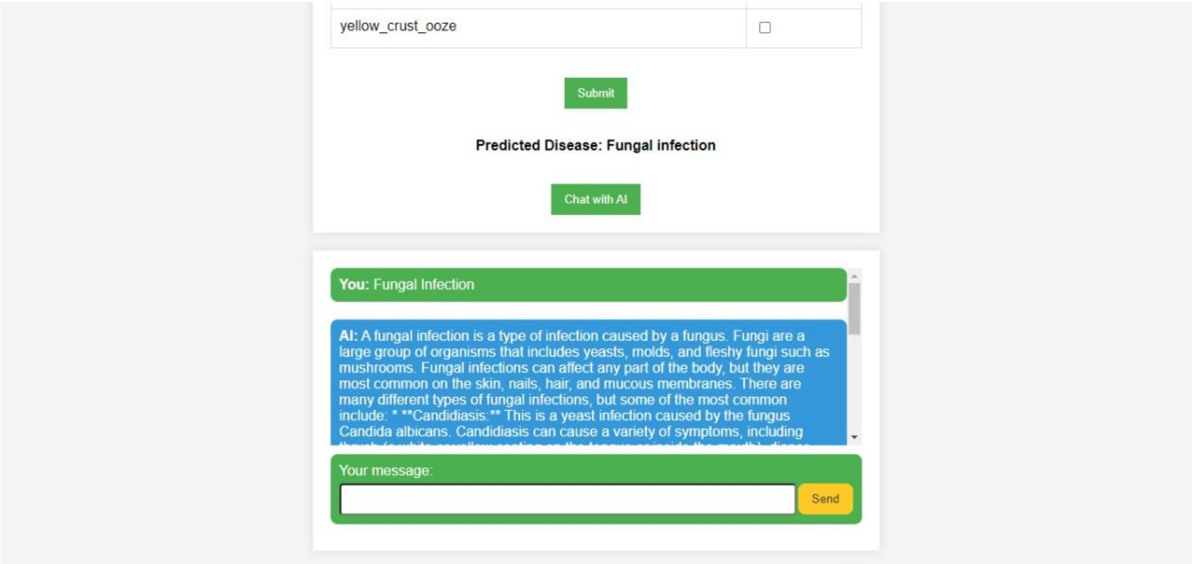


Figure 9.1(4)

APPENDIX-C

ENCLOSURES

PUBLICATION CERTIFICATES


International Journal of Scientific Research and Engineering Development

(International Peer Reviewed Open Access Journal) ISSN : 2581 - 7175

Certificate of Publication

This is to Certify that Paper Entitled

" AI Chatbot for Diagnosis of Acute Diseases "

Authored by

" Ms. Soumya "

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GitHub Link

https://github.com/syedasif321/Ai-Chatbot-For-Disease-Diagnosis.git

The Project carried out here is mapped to SDG-3 Good Health and Well-Being

The project work carried here contributes to well-being of the human society. This can be used for predicting disease based on symptoms so that required medication can be started based on our given prescription to avoid major consequences

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